NTNU – Trondheim
Norwegian University of
Science and Technology

Potential of New Consumer Services within the Smart Grid Context

Irena Gajic
Eli Gotteberg Welde

Industrial Economics and Technology Management
Submission date: June 2013
Supervisor: Øystein Moen, IØT

Norwegian University of Science and Technology
Department of Industrial Economics and Technology Management

NTNU
Det skapende universitet

MASTERKONTRAKT

- uttak av masteroppgave

1. Studentens personalia

Etternavn, fornavn	Fødselsdato
Gajic, Irena	**19. apr 1988**
E-post	Telefon
irena@stud.ntnu.no	**40472780**

2. Studieopplysninger

Fakultet	
Fakultet for Samfunnsvitenskap og teknologiledelse	
Institutt	
Institutt for industriell økonomi og teknologiledelse	
Studieprogram	Hovedprofil
Industriell økonomi og teknologiledelse	**Strategi og internasjonal forretningsutvikling**

3. Masteroppgave

Oppstartsdato	Innleveringsfrist
15. jan 2013	**11. jun 2013**
Oppgavens (foreløpige) tittel	
Potential of New Consumer Services within the Smart Grid Context	
Oppgavetekst/Problembeskrivelse	
The main purpose of this master thesis is to reveal business opportunities in new Smart Grid services in relation to the implementation of automatic meter reading in households. The research will examine business opportunities in Smart Grid in the Norwegian power sector directed towards end users. The main content of the paper will be structured with an a) introduction, b) review of relevant theory and industry background, c) methodology, d) results from data collection, e) analysis and discussion and f) implications for relevant industry actors.	
Hovedveileder ved institutt	Medveileder(e) ved institutt
Professor Øystein Moen	
Merknader	
1 uke ekstra p.g.a påske.	

4. Underskrift

Student: Jeg erklærer herved at jeg har satt meg inn i gjeldende bestemmelser for mastergradsstudiet og at jeg oppfyller kravene for adgang til å påbegynne oppgaven, herunder eventuelle praksiskrav.

Partene er gjort kjent med avtalens vilkår, samt kapitlene i studiehåndboken om generelle regler og aktuell studieplan for masterstudiet.

15.01.13 Trondheim
....
Sted og dato

Ivana Gajić
....
Student

....
Hovedveileder

Originalen lagres i NTNUs elektroniske arkiv. Kopi av avtalen sendes til instituttet og studenten.

NTNU
Det skapende universitet

MASTERKONTRAKT

- uttak av masteroppgave

1. Studentens personalia

Etternavn, fornavn **Welde, Eli Gotteberg**	Fødselsdato **12. mai 1987**
E-post **eligotte@stud.ntnu.no**	Telefon **40073196**

2. Studieopplysninger

Fakultet **Fakultet for Samfunnsvitenskap og teknologiledelse**	
Institutt **Institutt for industriell økonomi og teknologiledelse**	
Studieprogram **Industriell økonomi og teknologiledelse**	Hovedprofil **Strategi og internasjonal forretningsutvikling**

3. Masteroppgave

Oppstartsdato **15. jan 2013**	Innleveringsfrist **11. jun 2013**
Oppgavens (foreløpige) tittel **Potential of New Consumer Services within the Smart Grid Context**	
Oppgavetekst/Problembeskrivelse The main purpose of this master thesis is to reveal business opportunities in new Smart Grid services in relation to the implementation of automatic meter reading in households. The research will examine business opportunities in Smart Grid in the Norwegian power sector directed towards end users. The main content of the paper will be structured with an a) introduction, b) review of relevant theory and industry background, c) methodology, d) results from data collection, e) analysis and discussion and f) implications for relevant industry actors.	
Hovedveileder ved institutt **Professor Øystein Moen**	Medveileder(e) ved institutt
Merknader **1 uke ekstra p.g.a påske.**	

4. Underskrift

Student: Jeg erklærer herved at jeg har satt meg inn i gjeldende bestemmelser for mastergradsstudiet og at jeg oppfyller kravene for adgang til å påbegynne oppgaven, herunder eventuelle praksiskrav.

Partene er gjort kjent med avtalens vilkår, samt kapitlene i studiehåndboken om generelle regler og aktuell studieplan for masterstudiet.

15/1-2013 Toll Trondheim
....
Sted og dato

Eli Gottberg Welde
....
Student

....
Hovedveileder

Originalen lagres i NTNUs elektroniske arkiv. Kopi av avtalen sendes til instituttet og studenten.

PREFACE

This master thesis has been written as a part of a MSc degree at the Norwegian University of Science and Technology, NTNU. This work is a part of our specialization in Strategy and International Business Development at the Department of Industrial Economics and Technology Management.

The goal of this paper has been to gain insights and understand the Norwegian residential consumer to identify future possibilities for new services associated with Smart Grid. This is a highly relevant and discussed topic and much is expected to happen in the coming years. The work with the thesis has been demanding, but also both interesting and very informative.

First of all, we would like to thank our academic supervisor, Professor Øystein Moen, at the Department of Industrial Economics and Technology Management for his sincere interest in our study, valuable guidance and constructive feedback. Likewise, we would like to express our gratitude toward Tore Melland from Statkraft, for feedback and for providing us insights about the power industry. In addition, we are grateful for getting the opportunity to interview Jan Onarheim, Bernt Arild Bremdal, Anders Holme, Jan Berntzen and Lars Ødegaard to include their viewpoints. Lastly, we are very thankful for the opportunity to distribute our consumer survey through Nordmøre Energiverk AS, Demo Steinkjer and Nordlandsnett AS.

Trondheim June 8th, 2013

Irena Gajic

Eli Gotteberg Welde

Executive Summary

In recent years, the power sector has demonstrated an increasing interest in exploiting new business opportunities related to the introduction of a smarter transmission grid. A Smart Grid is an intelligent electricity network that may integrate the actions of generators and consumers simultaneously in order to efficiently deliver sustainable, economic and secure electricity supply. Thus, a Smart Grid may provide a dynamic platform for delivery of services and involvement of residential consumers in the same way made possible in the telecommunications industry. The introduction of AMR technology in all Norwegian households is the first indicator of the adoption of a Smart distribution network.

This dissertation distinguishes what is essential for energy companies to focus on in order to accomplish a successful market launch of new services targeted at residential consumer, delivered through a Smart Grid. As part of the research it was conducted four interviews with relevant stakeholders from the ICT and energy sectors. However, there is little actual market data available on service activities. Due to the lack of sufficient market data, a comprehensive questionnaire targeted on consumers was also conducted in order to gain a solid marked data basis to underpin strategic recommendations.

The consumer survey was analyzed using statistical modeling techniques. The analysis results, along with the interviews concluded in five main findings:

1. Norwegian consumers state they are highly interested in purchasing Smart energy services. More than 64% of the respondents say it is relevant or highly relevant to purchase a service that offers *Security features for electrical home appliances (i.e. automatic shutdown if security threat)*.
2. Norwegian consumers want to combine Smart energy services with consumption information, therefore Smart energy services should be supplemented by an energy price information platform.
3. Consumers is interested in purchasing radical Smart energy service innovations in order to save money on energy consumption.
4. Environmental friendliness and knowledge to the Smart Grid concept has little impact on the interest of services.
5. Communication strategy will be essential prior to and during a market launch. There is a very strong positive effect between if the consumers are familiar with a Smart energy service, and if they state they want to purchase these services.

In an effective Smart energy service launch Norwegian energy companies should adopt a multi-faceted approach. Participants should seek to be early followers, target innovators and early adopters, apply online marketing channels, use advertising, long tail and free-and-premium as payment models to attract the market, and price long-tail services at a relatively high level in order to make as early return on investment as possible. In addition, it will be important to maintain a close relationship with consumers through focus groups, market research and pilot projects in the development process leading up to the market launch in order to identify the most profitable service ideas.

Executive Summary in Norwegian

Denne masteroppgaven har som hovedhensikt å avdekke hva som skal til for å gjennomføre en vellykket markedslansering av nye tjenester som kan leveres gjennom Smarte nett, hvor kunden er norske husholdninger. Med vellykket markedslansering menes her utbredt salg og langvarig gevinst. For å svare på denne problemstillingen ble det utført fire intervjuer av relevante aktører innen IT- og energibransjen. Det har vært lite fokus på lansering av slike tjenester i energibransjen før våren 2013, og på grunn av manglende markedsaktivitet på området ble det i tillegg til intervjuene gjennomført en omfattende forbrukerundersøkelse. Spørreundersøkelsen ble distribuert gjennom nettselskap og sosiale media for å danne et reelt markedsdatagrunnlag som kan gi et fundament for å vurdere potensialet for Smarte energitjenester, som denne type tjenester er blitt kalt i denne oppgaven.

For å analysere dataen fra forbrukerundersøkelsen ble korrelasjon, regresjon, strukturell modellering, og klusteranalyse anvendt. Intervjuene og analyseresultatene viste fem hovedfunn:

1. Norske forbrukere sier det er høyst relevant å kjøpe Smarte energitjenester. Mer enn 64% sier det er relevant eller høyst relevant å anskaffe automatiske sikkerhetsløsninger av elektriske apparater i hjemmet, eksempelvis automatisk avslåing av apparater ved feil eller sikkerhetstrussel.
2. Norske husholdninger ønsker å bundle populære Smarte energitjenester med informasjon, en informasjonsplattform vil derfor være veldig attraktivt
3. Norske forbrukere ønsker å benytte forsikrings- og bonustjenester bundlet med energitjenester for å redusere energikostnader.
4. Miljøvennlighet og kunnskap om Smart nett-konseptet har lite å si for interessen av Smarte energitjenester.
5. Det er en svært sterk, positiv effekt mellom hvor stor kjennskap forbrukere har til energitjenesten, og hvor interessert er de i å kjøpe tjenester. Kommunikasjonsstrategi vil derfor være essensiell i forkant og under en markedslansering.

I lanseringen av denne type tjenester vil det derfor være taktisk å lansere tidlig, drive målrettet markedslansering mot ”innovators” og ”early adopters”, benytte seg av nettbaserte markedskanaler, anvende ”advertising”, ”long tail” og ”free-as-premium” som betalingsmodeller for å tiltrekke seg markedet, samt prise tjenester på et relativt høyt nivå for «long tail»-tjenester, for å tjene inn investeringer fortest mulig. I tillegg vil det være viktig å opprettholde et nært samarbeid med sluttkunde gjennom fokusgrupper, markedsundersøkelser og pilotprosjekter under hele utviklingsprosessen som leder opp mot markedslansering slik at de mest lønnsomme tjenesteideene kan identifiseres og realiseres.

TABLE OF CONTENT

List of Figures

List of Tables

1- Introduction

Introduction

1.1 Introduction

This introductory chapter presents the reader with the background of the problem statement that will be explored throughout this dissertation. The introductory chapter also presents the limitations of the thesis, and provides a guide to the reader.

1.2 Background

Both the Norwegian and international power industry is expecting major infrastructural changes due to the introduction of a smarter transmission grid (Smart Grid). Particularly power suppliers are expected to be affected by these changes, and to enter a new role in the industry value chain as more active participants in the retail market. A precursor of the coming changes is the installation of automatic meter reading (AMR) technology, called Smart Meters, in every Norwegian household before 2019. The Smart Meters have created a debate around the business opportunities of the future power grid, and have in recent years triggers an expanding interest in services that may be integrated on top of Smart Grid infrastructure. In particular, it is believed that a Smart Grid has the ability to function as a dynamic platform for development of services, similar to the infrastructure platform of telecommunications.

During an introductory study on service opportunities conducted in the fall of 2012, a classification of Smart Grid related services were created, and the potential of several services were evaluated. A new market for services may emerge depending on political incentives, cooperation between stakeholders, and new investments. The study made it particularly clear that there are immense amounts of unrealized value connected to the end consumer in the power sector value chain. It was also concluded that Smart Grid enable, and push for, radical new opportunities for end user involvement and the development of new business models that have not been tired out in the power sector before. However, there is little actual market data available on commercial service opportunities. This is an aspect of Smart Grids that many energy companies so far have undervalued, or not been able to follow up (Smart Grid Conference, 2012).

1.3 Problem Statement

Due to and the lack of market information and research, the main purpose of this master thesis became to assess the potential of new consumer services based on empirical data. To specifically address the potential of new consumer services, from now on called Smart energy services, the main problem statement is chosen to be:

> How may energy companies succeed with a market launch of Smart energy services?

To answer the problem statement it is considered necessary to study three issues:

1. Is there market demand for Smart energy services?

2. Are there particular factors within the power sector that highly affects the performance of a launch?

3. How should a successful service launch be conducted by a manager from the power sector?

In order to accomplish this objective it was deemed valuable to conduct a market survey targeted Norwegian households, and to interview people with different perspectives on this subject. Highlighting the importance of the Norwegian end customer may provide insight to what business opportunities lies in Smart Grid and what are good investment incentives for the existing and future power industry for the reader.

1.4 Limitations of the Thesis

The scope of the project thesis limits the research to the Norwegian power sector. This limitation was established because the Norwegian power industry context has very different characteristics and development drivers than that of other countries (Bremdal, 2013). Moreover, there has been little focus on incentives in the ICT sector, since the business-to-customer perspective is highlighted. The decision to make these restrictions was a result of wanting to have a concrete focus area, not repeat general information about Smart Grid, and to provide the power sector with insight on the value of including residential consumers.

1.5 Guide to the Reader

The objective of the first two chapters is to provide relevant background for the problem statement and give the reader an understanding of the power industry. Accordingly, there is provided an overview of the Norwegian power sector and Smart Grid. Next, the literature review discusses applicable findings on successful market launches and several propositions for Smart energy services are conveyed.

Together with the interviews the analysis of the market survey builds the foundation for discussing overall findings. That is, propositions described in the theory chapter are revisited and discussed based on the empirical findings. The discoveries from this thesis have led to implications for policy makers, researchers, and to managers that wish to launch new services in the Smart Grid context.

Managers with prior industry knowledge interested in the main findings of the thesis are suggested to read: interview summaries (Chapter 5), SPSS analysis (Chapter 6), discussion (Chapter 7), implications (Chapter 8) and conclusion (Chapter 9), as the authors believe these chapters are of most interest to him or her. Moreover, for the reader to follow the argumentation of the thesis, it is strongly advised to visit section 2.5 to get an understanding of the concept Smart energy services.

Chapter 2 – Background on the Norwegian Power Sector and Smart Grid

Background on the Norwegian Power Sector and Smart Grid

2.1 Introduction

This chapter provides a quick insight to the Norwegian power sector. This gives the reader an understanding of the most fundamental concepts used in the analysis in subsequent chapters of the thesis, in addition to allowing the reader to follow the argumentation throughout the paper. The concepts that are presented are the different aspects of the Norwegian electrical power sector that is considered to be the most relevant for development and support of Smart Grid technologies. First, a holistic view of the power sector, including the market actors, electricity demand characteristics and currents development trends are presented. In the next sections, demand side management and concepts specific for Smart Grid are described. Lastly, the chapter provides a brief presentation to what the authors regard to be Smart energy services.

2.2 Characteristics of the Norwegian Electrical Power Sector

2.2.1 Early Restructuring and Deregulation

The following section gives a brief introduction to the late history of the Norwegian power sector and what trends have defined and given the market its characteristics as it is today.

2.2.1.1 Deregulation Laws and Separation of Monopolistic and Competitive Businesses

In the 1990's the Norwegian government was a pioneer government to initiate deregulation laws of the power supply system by introducing third-party access (TPA) to the grid. TPA involves that a unit other than the service provider and infrastructure owner gains access to and are allowed to use capacity in the natural monopoly infrastructure. Thus, TPA is one of the most central elements of a power market, and is the fundament for market competition (Doorman, 2013). In particular, the market reform and 1991 Energy Act brought radical changes to the Norwegian power supply sector (BKK Nett, 2001).

Prior to deregulation the power system were strongly characterized by vertical integration where the retail market was based on fixed price contracts (Wangensteen, 2012). In 1996, free retail choice was also introduced. This meant that consumers were allowed to choose who they want to buy power from. It also created the foundation for retail competition in the power sector. (Doorman, 2013)

One of the most important design structures resulting from the deregulation laws was the clear separation of monopolistic operations related to power transmission on one side, from competitive operations such as power production and sale on the other side. Moreover, after deregulation the Norwegian power market has reached a mature state with increased market transparency, and the elimination of supplier switching fees have brought more flexibility to consumer choice. One of the characteristics of the sector today is also that there are a very high number of actors present in the industry's value chain.

2.2.2 The Electrical Power Sector Value Chain

This section gives a brief overview of the regulations in the power sector and what actors are dominant and have great influence in decision making. In particular, the section presents the different roles and responsibilities of the power sector participants.

2.2.2.1 Who Are the Actors in the Power Market?

One of the characteristics of the Norwegian power sector after deregulation has been the low level of centralization and the very high number of actors compared to continental Europe (Wangensteen, 2012). Table 1 provides a description of the different roles in the industry. It is in particular the power supplier's role in the value chain that is expected to change in coming years with the introduction of new technology such as Smart Grid technologies.

Roles and responsibilities in the Norwegian electrical power market	
Regulator - Norwegian Water Resources and Energy Directorate	The regulator is responsible for regulation of monopolistic activities, and determining each grid company's allowed level of revenue. NVE ensures that the electricity grid is available to any market operator without discrimination. NVE has duties within legal framework development, institution and capacity building, evaluation of studies and reports, and monitoring of water resources.
Grid companies or distribution system operators (DSOs) (e.g. Hafslund, Statnett)	Grid companies and transmission system operators (TSOs) operate and maintain the network. They are responsible for necessary investments and extensions, for keeping the grid open to third party access, as well as calculating and implementing tariffs for use. Grid companies have separate customer bases because of separate ownership of the grid
Power Generators (e.g. Statkraft)	Generates and sells electrical power on the market. Statkraft is the largest producing company in Norway, controlling around 35% of the market. In Norway there are 175 electricity producers
End users (e.g. consumers)	End users are households, companies, communities, the public sector, general industry and power intensive industry (e.g. Hydro). End users may choose their power supplier, but must pay rent of grid to their local grid operator
Power Exchange (PX) - Nord Pool spot	Nord Pool was established in Norway in 1996 and has until NASDAQ's acquisition in 2010 been the official PX in the Nordic market. Through Nord Pool, members can trade derivative contracts within the financial market
System Operator (ISO or TSO) - Statnett	In addition to the role of a normal grid company, TSOs are responsible for ensuring supply security and minute-by-minute power balance, as well as keeping sufficient capacity margins. They also own the interconnectors, providing a cross-border flow of power between Sweden, Norway, Denmark and Finland. Statnett is the Norwegian TSO
Balance responsible entities (e.g. Nord Pool)	Market operators (MOs) and PXs operate the electricity spot market, which is a dayahead market. The MO receives bids for sales and purchases of electricity, and matches bids such that price and quantity are settled. Nord Pool has a financial structure of multiple steps: power trade on Elspot must be registered the day before power delivery, and Elbas works as a buffer that balances the market
Suppliers or retailers (e.g. Hafslund)	The power suppliers are operators which sell electrical power to end users. In principle, they trade power at the same rate as the end users consume the electrical power
Traders, brokers (e.g. Statoil)	Traders and brokers are buying and selling in the market to make revenues based on price variations. There is a significant difference between financial trade and physical trade, where balance responsibility is required in the latter
Market surveillance or competition authorities	The Norwegian Competition Authority regulates the competitive activity within the electricity industry (generation and supply), and controls mergers and acquisitions to ensure fair market conditions

Table 1: Roles and responsibilities in the Norwegian electrical power market (Doorman, 2013; Wangensteen, 2012)

These market participants, as well as other actors in the Nordic market, are integrated through an electricity exchange over the common Power Exchange (PX), allowing effective competition across borders (Wangensteen, 2012). Figure 1 gives a simplified overview of the different actors' position in the value chain.

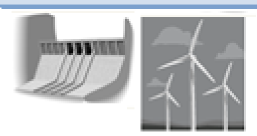
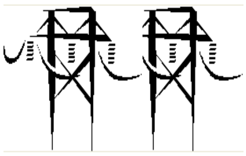
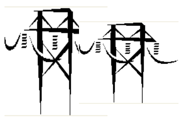
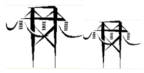
Generation	Transmission			Consumption
	Central Grid	Regional Grid	Distribution Grid	
				
	400-300 kV	132-66 kV	22-11 kV	400-230 V
Power producers	System operator	Grid companies	Suppliers (Market participants)	End users
Regulator (NVE)				
← Wholesale electrical power market →				Retail market
Market operator (Nord Pool)				
		Traders & brokers (e.g. Statoil)		

Figure 1: Value Chain in the Norwegian power sector (Wangensteen, 2012)

2.2.2.2 Dominant Decision Makers

The Norwegian Water Resources and Energy Directorate (NVE) is a directorate under the Ministry of Petroleum and Energy, and are responsible for promoting efficient energy markets and regulating monopolistic activities in the power sector (Table 1). The directorate plays a central role in encouraging research and development in its fields, and is the national center for hydrology in Norway (NVE, 2013). Figure 2 illustrates NVE's central role in the power sector as a regulating entity, informative authority and technology initiator. In particular, the figure illustrates that NVE plays a significant role in what information is distributed, and what development projects will be emphasized.

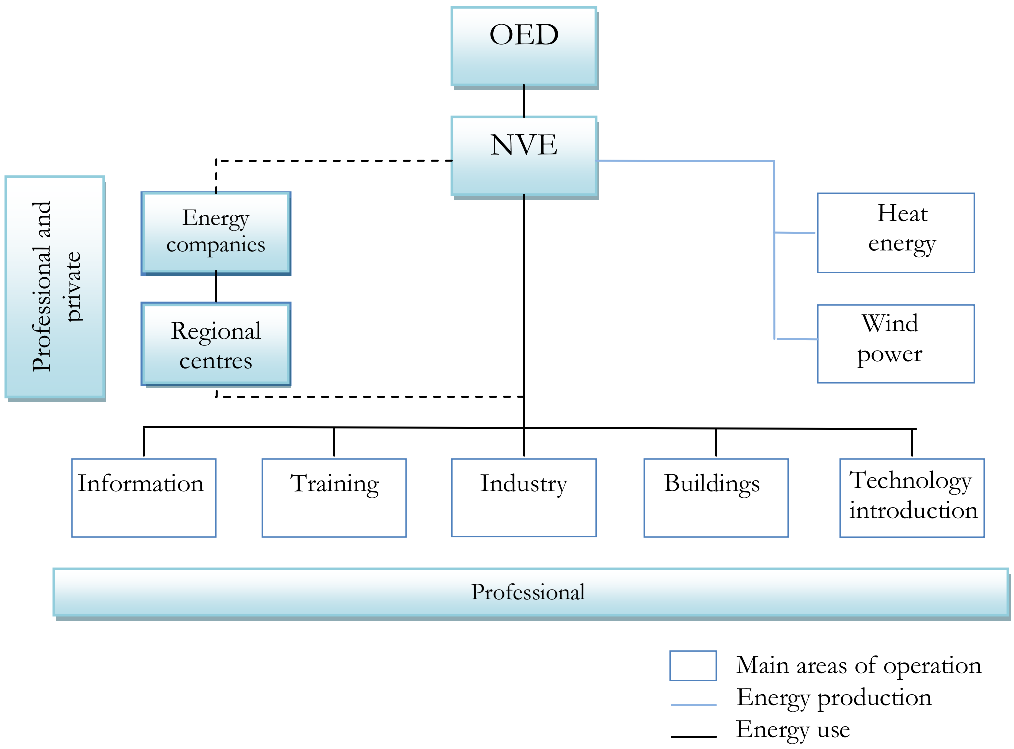


Figure 2: NVE's position in the Norwegian electrical power sector. Adapted from NVE (2000)

Organizations that are considered to have much influence on innovative thinking are Statnett and Statkraft because of their capacity and economic situation. Enova SF, Energi Norge and the Norwegian Smartgrid Centre are also important participants. These organizations are national competence centers that support collaboration between market actors, and that support smaller companies in negotiations with NVE.

2.2.3 Current Development Trends

In the following section the most important trends of development and happenings at present in the power sector are presented. These trends will be important to comprehend in order to understand where the power sector is heading in coming years.

2.2.3.1 Restructuring Towards Strategic Ownership

Even though there is a clear distinction between monopolistic activities and competitive activities in the sector's businesses, the development over the last ten years shows a tendency toward maintaining a vertically oriented structure of the organizations. This structure is often a group of companies, often based on one or several former vertical integrated company. Accordingly, through primarily acquisitions, and some mergers, new companies with very complex ownership structures have been established. (BKK Nett, 2001) This implies that there is an ongoing shift towards increased strategic ownership, and industry actors anticipate an ownership development in three phases of (1) national restructuring, (2) opening for private ownership, and (3) the entrance of international ownership (BKK Nett, 2001), as illustrated by Figure 3.

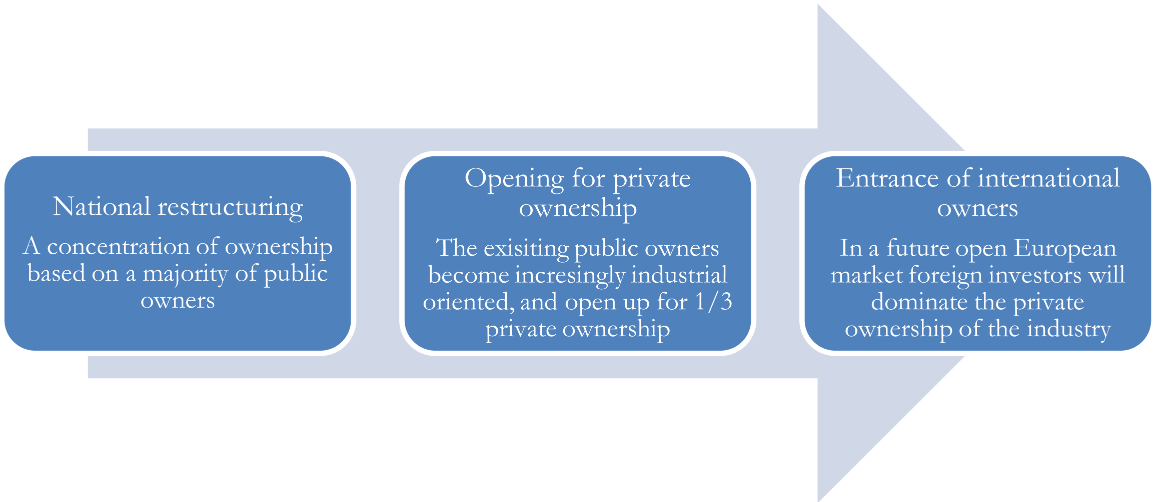


Figure 3: Anticipated ownership development in the electrical power sector

The ongoing shift has been predicted to result in a few regional companies that will include most of the existing power network units within short time. Subsequently, these companies are expected to develop towards more diversified infrastructure providers with an increasing range of products and services. (BKK Nett, 2001)

2.2.3.2 Customer Orientation

The power sector are also recognizing that monopoly businesses such as operational activities supporting power transmission are alone not sufficient to produce acceptable profits. Business models of power companies have been based on the premise that utilities provide a simple commodity, with operational strategies focused on reliability of supply, one-way flow of power from provider to consumer, and energy sales that use simple "all-you-can-eat" pricing structures for private consumers. This model is no longer sustainable (BCG, 2010). Many power companies are therefore preparing for competition in the telecommunication market, and many power companies are already offering broadband and smart house products. Customer orientation is one of the features that describe the present shift of industrial focus, due to the fact that customer access is a prerequisite to make profits in a competitive market. (BKK Nett, 2001)

2.2.4 Electrical Power Demand

The following section takes a look at the current situation of demand characteristics and the consumer side in the Norwegian power sector.

2.2.4.1 Composition of Electrical Power Demand

Electricity is a critical necessity for a modern society, and for that reason the design of the industry has some particular characteristics. For instance, the necessity of electricity has lead to the perception that electricity demand is most commonly viewed as completely inelastic. However, parts of the demand such as heating and cooling are to some extent storable and flexible, whereas lighting on the other side is only slightly flexible.

Figure 4 illustrate the main activities that contribute to electricity consumption in Norwegian household, which shows that approximately 80% of the household's electricity consumption relates to water and space heating, which are actually flexible demand. (Sæle, 2013) One of the main reasons why the demand have formerly been near to inelastic is that consumers have not been directly exposed to information on price variations, that most consumers in rich countries do not want to spend efforts to care about price variations, in addition to that many consumers do not know how to handle price variations. (Sæle, 2013) However, according to Kirchen (2003), a more active participation of the demand side would make the electricity market more efficient and more competitive.

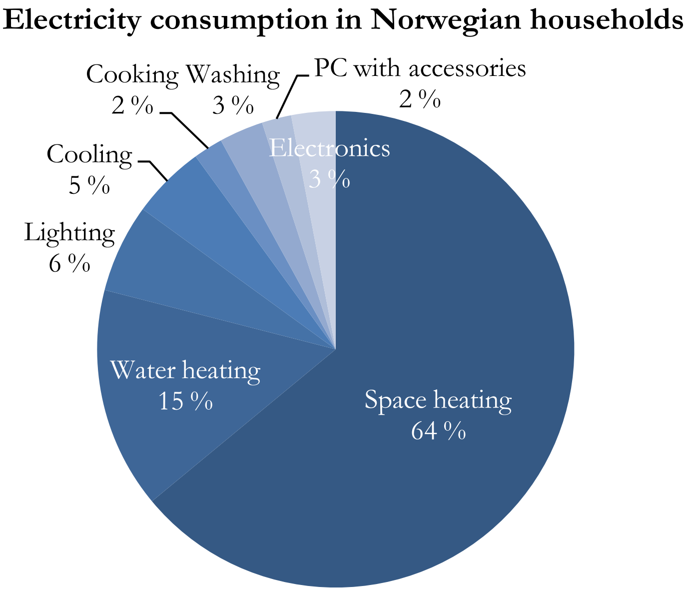


Figure 4: Household electricity consumption in Norway. Adapted from Sæle (2013)

2.2.4.2 Changes in the Demand Side - Awareness

After 2000, periods of high electricity prices has been accompanied by considerable media attention, allowing consumers the possibility to follow fluctuations in market prices. An indicator of the level of consumer awareness and the consumer activity in the electricity market is the number of supplier swaps. For instance, after the high price level during the winter of 2002/2003 there was a record number of almost 450 000 supplier changes in 2003. The frequency of supplier changes have been relatively high until 2010 (up to 300,000 units switching supplier in some years), particularly in relation to periods of high prices. (Holstad and Pettersen, 2011)

The development is expected to move towards a more active end user section, which may signify radical changes to the power sector's value chain. For instance, in the fourth quarter of 2010, the proportion of elspot contracts for households had risen to 58 % from 3% in 1998, which indicates higher rates of supplier changes and consumer price sensitivity. (Holstad and Pettersen, 2011) Table 2 provides an overview of the main categories of electricity contracts for Norwegian households.

Type of contract	Description
Fixed price	Fixed price contracts has a set price for a period of three to five years
Variable price	Variable price fluctuates, but prevents that you hit the largest variations in price by paying an extra premium, and is the most regular power contract in Norway. For the supplier it means that any change in electricity price must be reported with 14 days notice
Spot price	With a spot price the end user takes the risk himself in the fluctuating market, and gets a more fluctuating electricity price than in the other two payment options, but does not have to pay a premium. About 50% of Norwegian households choose the spot price option

Table 2: Main categories of household electricity contracts in Norway (Holstad and Pettersen, 2011)

2.3 Demand Side Management

2.3.1 Activating the Consumer Side of the Power Sector

In this section demand side management (DSM) is defined. Moreover, there is a presentation of techniques and designs for how participants in the power sector may use consumers in order to derive benefits.

2.3.1.1 Demand Side Management – What Is It?

DSM, also known as energy demand management, is techniques for achieving desired customer behavior and the ability to control usage through various methods such as financial incentives and informative education (DECC, 2012). One of the greatest benefits of DSM is that it allows consumers a greater role in shifting their own demand for electricity during peak periods, and reducing their energy consumption overall. This has positive consequences in form of reduced grid maintenance cost and reduced emission of greenhouse gases. Smart Meters is one of the communication devices that will *enable* advanced DSM. (Nilsson, 2007) For large industrial customers DSM collaboration already exist, however for residential consumers this is not the case.

2.3.1.2 Demand Side Management Techniques – How Does It Work?

The next generation of DSM technologies will enable consumers to make more informed decisions about their energy consumption. Existing DSM programs comprise two principal activities, (1) demand response programs, also called load shifting, or (2) what is called energy efficiency and conservation programs (McKinsey, 2010).

Demand response programs transfers consumer load during periods of high demand to off-peak periods and may reduce daily peak demand and critical peak demand over periods of time. This may prove very useful in Norway as there is an excess of generation availability, but a problem that the network capacity is approaching the maximum limit at peak load (for more information on capacity constraints view section 2.4.2.3). Figure 5 shows how Smart Grid technologies in combination with DSM may be applied to “shift load” and address environmental concern, transmission security issues and the capacity challenges.

The other category of DSM, energy conservation programs, encourage consumers to give up some energy use in return for saving money, such as turning down the thermostat a few degrees in winter to reduce air conditioning.

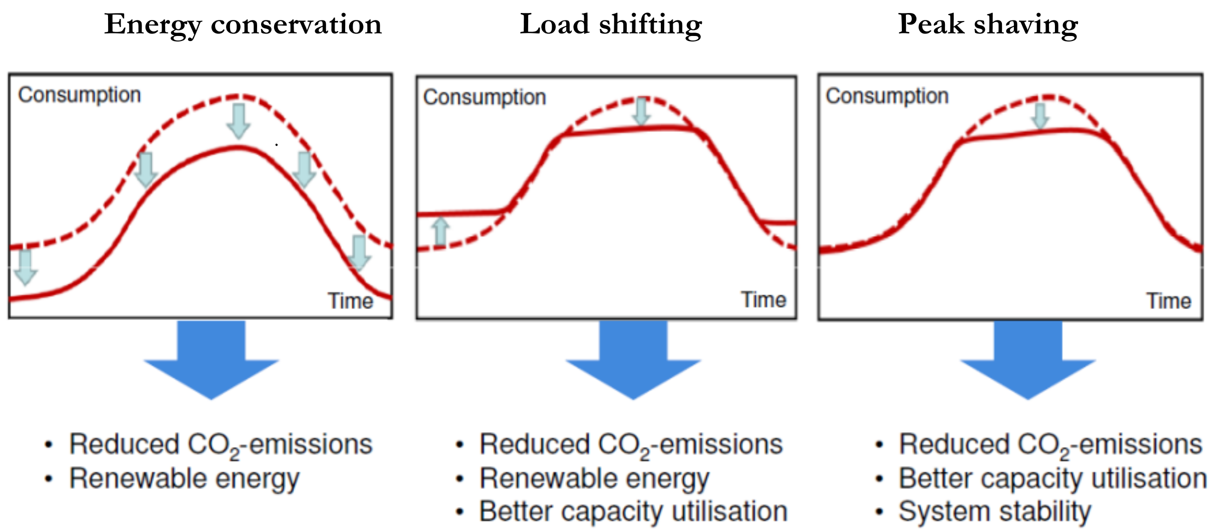


Figure 5: Demand response techniques. Adapted from Benum, Sollie and Solem (2011)

2.3.1.3 How Do Consumers Respond to DSM Techniques?

According to McKinsey (2010) there are six different levers of effective demand-side management given as rates, incentives, access to information, utility controls, education and marketing, and customer orientation and verification. Each lever has a distinct impact on consumer behavior. For instance, pilot projects show that real-time access to information provided thorough Smart Grid networks reduce energy consumption by up to 18% (McKinsey, 2010). A British study reviewing 30 demand response programs in Britain found the key evidence that consumers do shift electricity demand in response to economic incentives even when the incentives are accompanied with only simple information. This information may be basic information on the expected market prices, provided by fridge magnets displaying peak hours and/or prices, information sheets or basic bill inserts.

Automation has proved to be the most effective DSM technique. After automation, a combination of economic incentives and enhanced information generally delivers the greatest demand response (DECC, 2012). Enhanced information includes accessories that provide real-time interactive information and enhanced billing that breaks consumption into different tariff periods. The most sustained household shifts in demand were interventions to automate response where consumers had flexible loads, such as electric heating. (DECC, 2012)

2.3.1.4 What are the Effects and Potential of Demand Side Management?

DSM programs may alter the demand side and make demand dynamical and elastic. If this finds place it will highly impact the whole value chain of the electrical power sector (McKinsey, 2010). So far, consumer feedback on tariffs and interventions aimed at encouraging demand side response have been generally positive (DECC, 2012; McKinsey, 2010). Thus, immense economical benefits may be achieved if the consumer understanding of the market is increased.

2.4 THE SMART GRID FRAMEWORK

This chapter provides an introduction to Smart Grid. First, the meaning of the term in this thesis is described. Thereafter, main drivers for the concept are presented followed by an introduction to Smart meters and their relation to Smart Grid. Lastly, the chapter moves over to selected Smart Grid concepts. This also includes a review of the market drivers that are supporting commitment to Smart Grid, and why this development is happening now.

2.4.1 SMART GRID

The Smart Grid concept was defined in 2006 by the European Technology Platform for Smart Grids (ETPSG). Although there is no global definition for Smart Grid, EU defines Smart grid as: *"an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies."* (European Commission, 2012). Smart Grid will be the most significant change in the electricity grid and everyone will be affected. Figure 6 illustrates how the power system will change after implementation of Smart Grid.

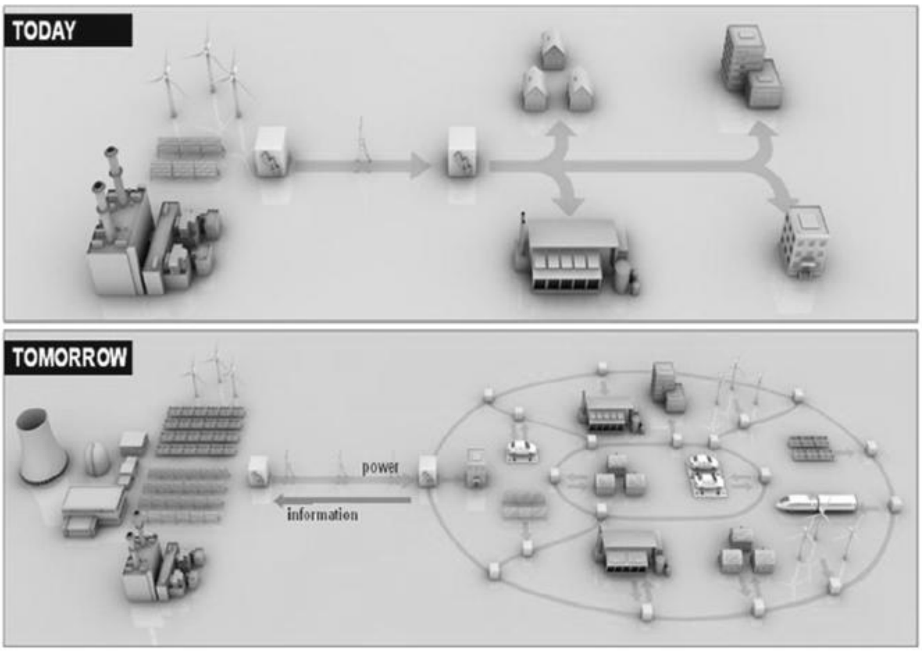


Figure 6: The possible future power system. Source: Statkraft

CEER and ERGEG (2010) present Smart Grid as the name of the future system of power supply that will provide power, information and intelligence. Together with smart monitoring, control and communication the system is expected to employ innovative products and services. Furthermore, Smart Grid is will foster development of a more integrated electricity market in Europe and will affect the entire electricity supply system, that is generators, TSOs, DSOs, suppliers and customers, as described in 2.2.2.1. Figure 7 illustrate the new supply system.

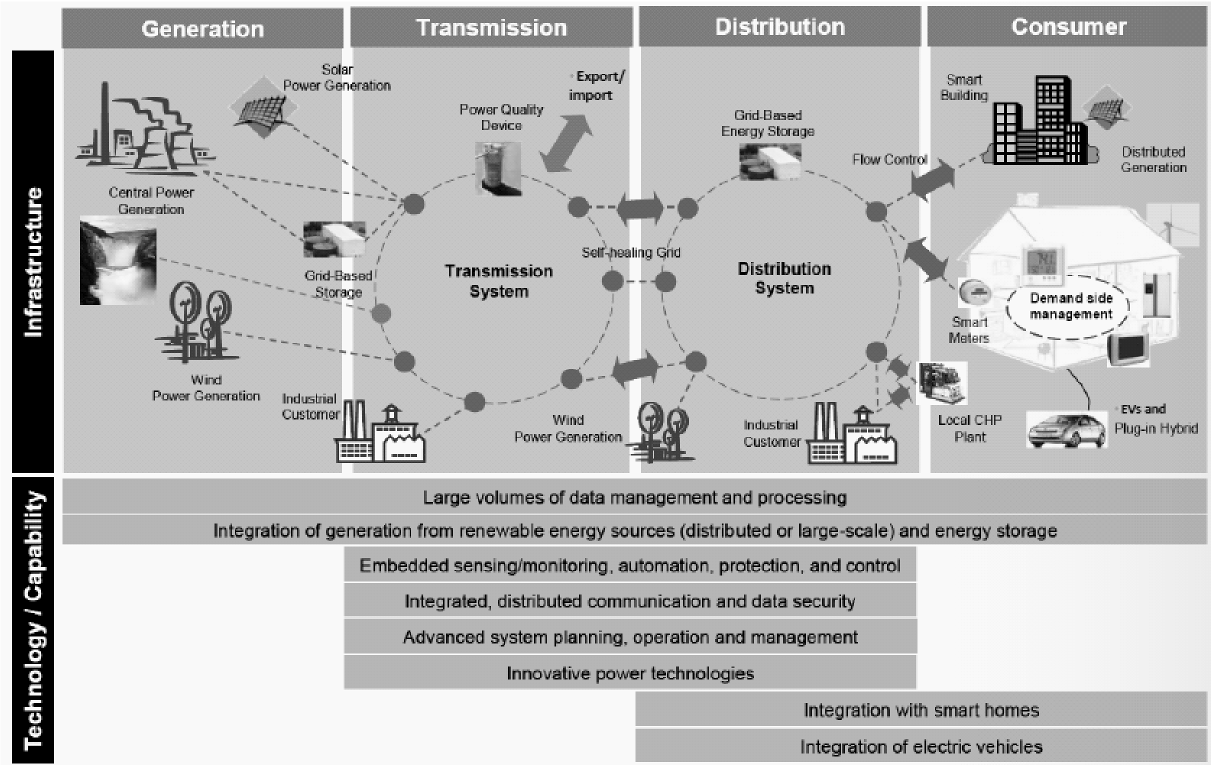


Figure 7: Illustration of the complexity of the Smart Grid system. Source: Powel (2011)

2.4.2 Main Drivers for Smart Grid

Important enablers for Smart Grid in Europe are grouped in three; EU's objectives, technological developments, and infrastructure of the power grid. In this thesis significant drivers for Norwegian grid companies are a focus area. Since generation from renewable energy sources is already very much implemented in Norway, environmental demands and a green profile constitute less important drivers than in other countries. (Sand, 2011)

2.4.2.1 EU's 20-20-20 Objectives

The European Union has set three targets for 2020, known as the "20-20-20" targets: aiming to reduce its CO_2 emissions by 20% from 1990 levels, achieve a 20% share of renewable energy sources (RES) in overall energy consumption, and an improvement of 20% in energy efficiency (European Commision, 2012) . Smart Grid has been pointed out to be one of the contributors in meeting these targets; "*Smart Grids are about building, expanding, operating and maintaining the electricity networks of the future in a way which will also help meet the EU's 20-20-20 climate change objectives*" (CEER and ERGEG, 2010)

2.4.2.2 Technological Developments

Smart Grid is empowered by fast technological development as new and cheaper technology is being introduced. As well as information and communication technology (ICT), electric vehicles and investments in variable renewable energy sources demand technological advances, as listed in Table 4. (Sand, 2011)

Technological Drivers for Smart Grid	
Information and communication technology	As ICT have a major role in managing the power grid, Smart Grid is facilitated by more ICT knowledge in general, improved and less expensive internet access, wireless network and the smartphone. This link will create a digital electricity grid that supports two-way communication and new sensor technologies. Moreover, the system will have the ability to monitor and control all equipment and appliances via internet. (Sæle, 2013; Sand, 2011)
Electrification of transport	The 2020 objectives translate into CO_2 reductions as electrical vehicles will be needed for decarbonization. For a considerable deployment of electric vehicles the target is a 10% share of electric vehicles in Europe by 2020, charged through the electrical system.(Eurelectric, 2011)
Variable Renewable Energy Sources	The development of large-scale renewable generation sources like for example offshore wind farms will call for large investments in the transmission grid, whereas distribution networks will have to accommodate an increasing number of small-scale energy sources. (Eurelectric, 2011) A higher penetration of renewable energy sources and distributed generation will be challenging to the electricity system in the terms of security, stability and reliability.

Table 3: Technological developments that facilitate Smart Grid

2.4.2.3 The Norwegian Power Grid Infrastructure

In hydropower intensive Norway capacity constraints in the existing grid is a significant driver for Smart Grid. That is an aging grid, reduction of peak loads, and reliability all push for a Smart Grid infrastructure. (Sand, 2011)

Aging Grid and Reliability

The electricity grid infrastructure needs modernization as it is getting older and reaching the end of its useful lifetime. Efficient and reliable transmission and distribution of electricity is essential to maintain functioning economies and societies. In order to avoid major blackouts and secure reliability Smart Grid investments will be a tool for greater monitoring by grid companies. (Statnett, 2010; Sand, 2011)

Peak Load Reduction

The peak load usually hits between 7 -13, as well as 16-20 every day. The load is increasing due to population growth and increased electricity consumption among Norwegian customers. The electricity demand is growing and the load demands are getting too close to the ceiling of the effect capacity. Once the ceiling is reached, the system shuts down automatically. Therefore, if end users and industry are provided with information about spot prices through the Smart Grid concept, it may motivate to lower the consumption in peak periods, both to release capacity which will lead to increased reliability, and to achieve reduction in power prices. (Statnett, 2010; Sæle, 2013)

2.4.2.4 Drivers for the Norwegian Grid Companies

It is generally believed that Smart Grid will provide grid companies a better overview of the electrical grid and the system. In particular, security of supply is expected to improve. As a result automation and more efficiency in manual work processes will occur. Smart Grid will also enable the grid companies to improve their customer service, one example being that customers can be notified when planned disconnections are going to happen. (Sand, 2011)

As explained in 2.1.2 the Norwegian electricity grid is divided in three parts; transmission, medium voltage (MV) distribution, and low voltage (LV) distribution. The present status of these is evaluated in Table 5 and the current standing may act as a driver for Smart Grid. Most importantly, a Smart Grid represents a grid where the whole system is smart and integrated; then all parts have to be in addition to interconnections between them. (Sæle, 2013)

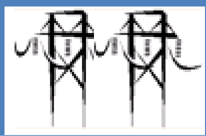
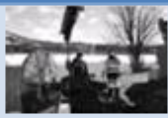
Transmission			«Smart»
MV Distribution			Not so «Smart»
LV Distribution/ Supply Terminal			Becoming «Smarter»

Table 4: Status of the transmission and distribution grid in Norway. Adapted from Sæle (2013)

2.4.3 Smart Meters

EU is currently promoting smart metering implementation in most member states. In Norway, NVE has decided that Smart Meters must be installed in nearly every household by grid companies, which also will own the customer data provided by the meters. Originally, the utilities were obligated to finish the installations before 2017; however this is now postponed further to 2019. (Sprenger, 2013) Moreover, NVE has identified the requirements for Smart Meters that the grid companies must fulfill, even though some grid companies have already implemented automatic meters before these requirements were set. (NVE, 2011)

The main feature of smart metering is the possibility of providing final customers with more information on their energy usage. After implementation of Smart Meters the customer will no longer meter and report own consumption as the smart meter will do it on a daily basis and send the information directly to the power supplier. Accordingly, the smart meters allows end users to take control of energy consumption and increase their understanding of the power market, and thus contribute to more optimal power distribution and a flexible grid. (NVE, 2010)

2.4.4 The Relation Between Smart Meters and Smart Grid

Oftentimes smart meter are associated to act as a platform for services related to Smart Grid. However, at the moment the smart meter is only facilitating Smart Grid, and does not act as a platform, because the fact is, the decision processes about smart metering and Smart Grids are not synchronized. Besides, it is possible that internet rather than Smart Meters will be used as a channel for information in a Smart Grid system. (Kester et al., 2010) Accordingly, there is a huge difference between Smart Meters and Smart Grid. First of all, smart meters are defined with technical specifications by governmental institutions and will be implemented. On the other hand, there are many uncertainties around Smart Grid; there is not an unambiguous definition, neither for the concept Smart Grid or what is included in Smart Grid services.

2.4.5 New Concepts Emerging with Smart Grid

With a Smart Grid several terms and concepts have occurred to describe the system, and some of the most important are Smart Home, Energy Service Company, prosumer, Aggregation and Virtual Power Plant.

2.4.5.1 Smart Home

A Smart Home is a house in equipped with technical options that are combined with social requests. This type of home may include devices such as kitchen appliances, clothes washers and dryers, water heaters and energy storage units that are "smart". These devices, in turn, may process information based on the wishes of consumers and act accordingly. A charging station for electric vehicles with systems that can coordinate load management and grid demands can also be a part of the Smart Home. Perhaps SmartPhones and websites will be the remotely used devices control the appliances. This kind of program has been tried in the past, but it possessed less potential that it does today. Smart Grid enabling technologies, interoperability based on standards, and low-cost communication and electronics facilitate Smart Home solutions. (Sæle, 2013; Statnett, 2010; Statkraft)

2.4.5.2 Energy Service Companies

The probable implementation of Smart Grid will have a great impact on companies that provide energy services. There are two types of energy service companies and there are significant differences between the services they provide. Energy services and other energy efficiency improvement measures are offered by so-called energy service companies (ESCO). The ESCO get paid for the services based on achievement in energy savings or energy efficiency improvements and other agreed performance criteria. The other type is energy service provider companies (ESPC) that deliver consulting services specialized in efficiency improvements and equipment manufacturing. The EPSC is usually paid a fixed fee for their advice or as an added value to the supply of equipment, rather than earning money on the basis of the outcome of their recommendations. (EU-EDDP, 2008)

2.4.5.3 Prosumers

The term «prosumers» is used to describe end users who are both producers and consumers of power. At some points in time prosumers feed power into the grid, and at others they need additional power, and hence act as an active participant in balancing the electricity system who switch between net production and net consumption of power. The barriers for lots of consumers in embracing the potential benefits of Smart Grid and becoming prosumers are a general lack of understanding the system, a lack of trust in electricity companies, and fear of discomfort (DNV Kema, 2012). Distributed generation and flexible pricing mechanisms enabled by prosumers may be exploited more easily with Smart Grid through more advanced information on available power and by the use of aggregators. (Statnett, 2010)

2.4.5.4 Aggregator

Smart Grid solutions facilitate opportunities for so-called *aggregators* to enter the power marked. An aggregator is an entity which brings together and coordinates individual customers into a coherent group through a digitalized system. In the future one may imagine two different types of aggregators. One type of aggregators is expected to aggregate demand side flexibility, also called flexible loads. Flexible load refers to program in which an aggregator or a utility can interrupt the consumer load at given times for economic purposes, when there is undersupply of power, or at the direct request of the TSO. Today, flexible loads usually only involves commercial and industrial consumers, however in the future it is likely that other end customers will be involved. Hence the aggregator would for instance be allowed to disconnect electrical machines or heath in households that are of less importance if there is an undersupply of power. By giving the aggregator this power, the consumers may demand compensation for earnings the aggregator makes due to the end user flexibility. (Eurelectric, 2011; Statnett, 2010)

Another type of aggregator will collect power from many distributed actors; in particular smallholdings power generators. Hence aggregators are aiming at optimizing the economic benefits by pooling customers for the actual power supply. Simultaneously aggregators can also be regarded as entities that bring a group of consumers together to buy electricity. Aggregation may help TSO and DSOs to better coordinate schemes in the transmission and distribution grid as well as balance the system at an acceptable cost. The role of the aggregator will presumably create demand for new business models and market structure. (EU-EDDP, 2008; Statnett, 2010)

2.4.5.5 Virtual Power Plant

Distributed energy resources can be aggregated into virtual power plants (VPPs), and as a result creating an interface to exploit technical and economic synergies. VPP may be described as several power installations that are together run by one common unit that distribute production and connect energy storage. Such multi-owned power stations are an alternative to a large centralized power plant, and also this system may possibly provide different additional services, for instance power-frequency control. (EU-EDDP, 2008; Statnett, 2010)

Accordingly, VVP is also expected to support the delivery of services to end consumers. Figure 8 illustrates the system of ESCOs, prosumers, aggregators and virtual power plants. This visualizes that new services will most likely be a natural part of the Smart Grid development.

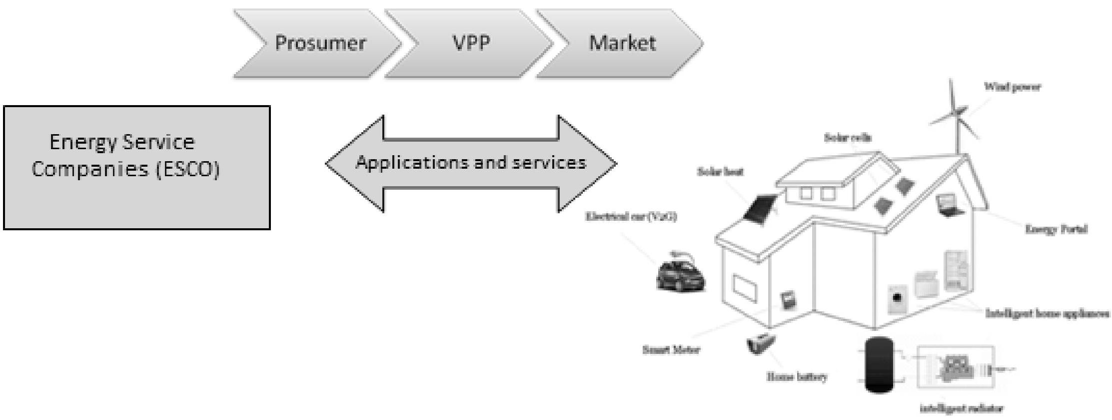


Figure 8 The relations between energy service companies, prosumers and virtual power plants. Adapted from Bremdal, 2010)

2.5 Smart Energy Services

This section provides the reader with a brief introduction to the concept of Smart energy services, the topic of evaluation of this thesis.

2.5.1 Definition of Smart Energy Services

To understand the idea of Smart energy services it is essential to distinguish between (1) services directly connected to the infrastructure, and (2) product specific services. What the power sector defines as Smart energy services, or Smart Grid services, are services directly connected to the infrastructure. These are typically described as demand-response, aggregation, virtual power plants or security of supply services (2.4.4). In this master thesis Smart energy services are extended to also include welfare technologies and any type of service that may be bundled with Smart Grid or integrated on top of Smart Grid infrastructure. It is important to include a wider span of services because the Smart Grid infrastructure and protocols are so general that it may form the basis for a very wide range of fundamentally different services, also services that do not have any direct relation to energy (Bremdal, 2013).

In particular, the Smart Grid infrastructure is expected to support service delivery in a similar way as that of telecommunications, where the infrastructure provides a dynamic platform for development of services. Examples of services are Smart Home services, bundling of power supply with other offerings such as insurance, and public health care services. However, Smart energy services also include future services of unexpected character.

Smart energy services are technological services that may be infrastructural services, commercial services that may be bundled with Smart Grid, and any type of welfare services that can be delivered through the Smart Grid infrastructure.

Appendix 1 provides further insight on Smart energy services. The table lists Gajic and Welde's (2012) classification of Smart energy services which is based on a given service's customer value proposition (CVP).

2.6 Key Findings

Principally, the Norwegian power industry is characterized by decentralization and a high number of actors in the industry's value chain. Up till now, companies generating and supplying hydropower have faced a very predictable market due to governmental regulations and fixed liabilities in generation and transmission systems. The development is expected to move towards a more active end user where customer orientation will become a prerequisite to make profits in a competitive market. With Smart Grid several concepts have occurred, all involving residential consumers to a larger extent. Together with smart monitoring, control and communication the Smart Grid system is expected to employ innovative products and services. In particular, the Smart Grid infrastructure is expected to provide a dynamic platform for a very wide range of different services in a similar way as that of telecommunications. In conclusion, there are trends toward a more customer focused market. Being aware of the market situation described in this chapter helps evaluate what will be beneficial for a market launch of so-called Smart energy services.

Chapter 3 – Literature Review

Literature Review

3.1 Introduction

Market launch is identified by various academics as the most difficult stage of a development process (Sandberg, 2002; Hultink and Hart, 1998; Montoya-Weiss and Calantone, 1994). To make it more complex, the innovation process allows for many different market entry tactics. This chapter addresses which of these market launch tactics are the most critical determinants for launch success.

Introductory, there is a brief presentation on the findings of the project thesis of Gajic and Welde (2012). This describes internal factors that are essential for organizing successful new service development (NSD) and business model innovation. The next sections explore various literatures on successful market launches. After a preliminary literature review, the factors determined to be examined were limited to (1) market entry timing, (2) segmentation and targeting, (3) adoption and rejection (4) customer interfaces, (5) payment models and (6) pricing strategies. Each of the topics is concluded with a proposition linked to new products and services launch. The problem statement concentrate on services delivered to end users, and consequently business to customer (B2C) literature is emphasized.

3.2 Internal Organization of Successful New Service Development and Business Model Innovation

3.2.1 Successful New Business Model Development is Based in the Customer

One key result from the project thesis was that there is a large body of academic literature devoted to recognizing customer as the most influential element for business model success (Gajic and Welde, 2012). In order to succeed, it is important to make a sustainable business model before launching new services or products.

According to Chesbrough and Rosenbloom (2002, p. 523), a good business model must start by creating value for the customer, followed by delivering that value. Teece (2010, p. 190) agrees, and adds that in order to do so, a company must first recognize how to deliver what the customer values. Also Magretta (2002, p. 4) suggests that in order for a business model to be successful it must be founded in the customer; it must "*offer more value to a discrete group of customers, or replace the old way of doing things and become the standard for the next generation.*" These academicians coincide with Osterwalder (2010), which have developed one of the most acknowledged frameworks on business model development in his 2010-book *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. He considers customers to be the core of any business model, and further stresses that understanding customer segments is a critical success factor. Ultimately, when a company develops a new product or service they need to ensure that the technological core will deliver value to the end customer (Osterwalder, 2010).

Overall, in order to reinvent successful business models Gajic and Welde (2012) found that a company should give emphasis to opportunities in the interconnections between the (1) customer value proposition, (2) profit formula, (3) key resources, (4) key processes, and (5) external environment (Figure 9). Thus, firms will build sustainable business models.

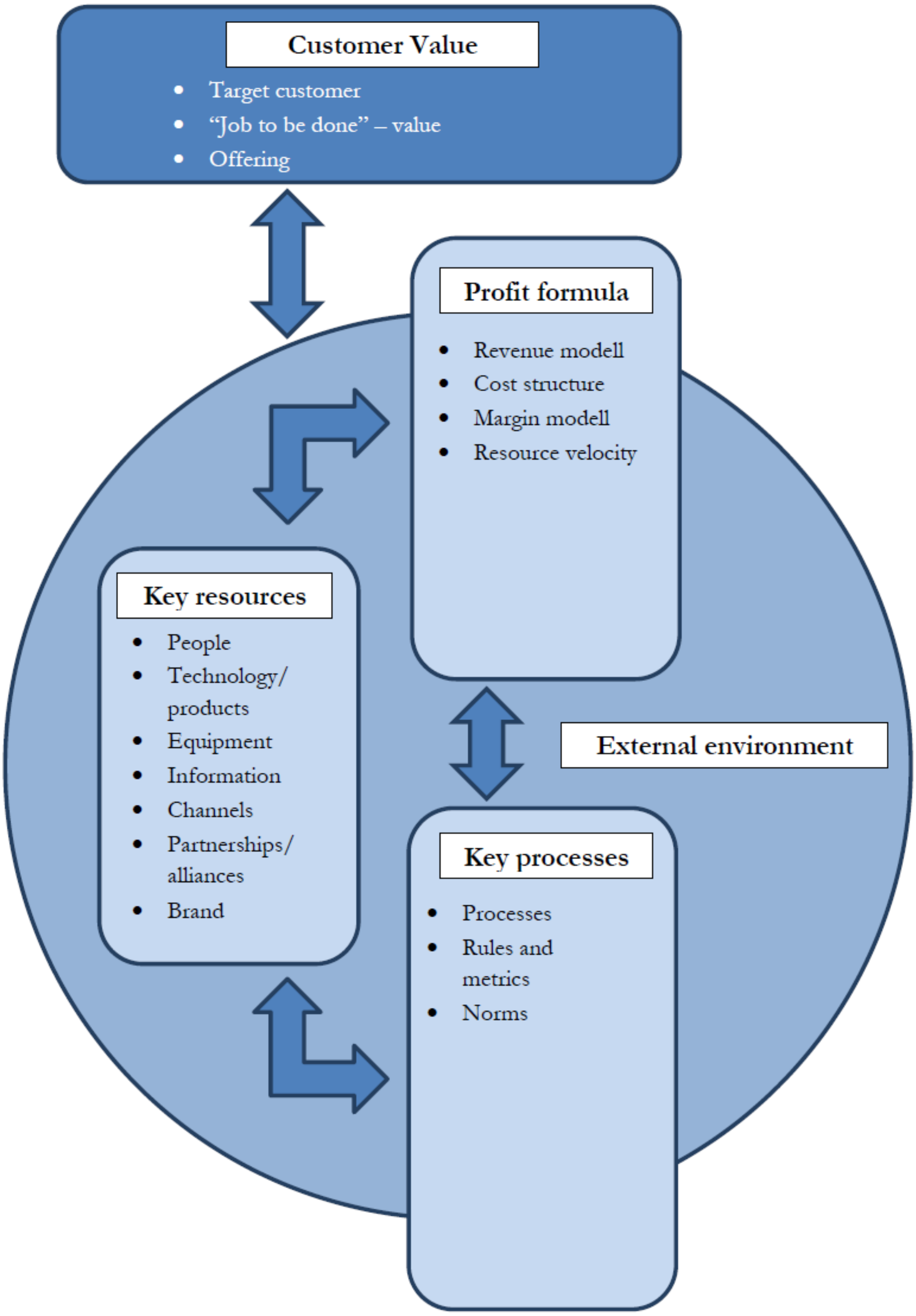


Figure 9: Sources of business model opportunities and reinvention (Gajic and Welde, 2012)

3.2.2 What Characterizes Successful New Service Development?

In her empirical work on innovative and incremental new business services de Brentani (2001) investigated what factors impact performance for different types of innovation projects, and she found that a formal "stage-gate NSD" system is particularly helpful in the front-end and design stage of service development. A successful development process is in such organized in several stages, consisting of separate phases, as illustrated in Figure 10. (de Brentani, 2001; Cooper, 2008)

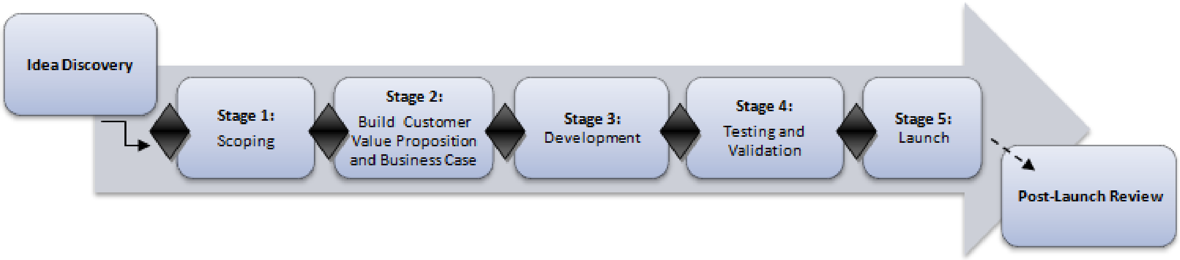


Figure 10: Cooper's Stage Gate model for a successful NSD. Adapted from Cooper (2008)

Figure 10 shows that successful NSD should be a formalized process that starts with coming up with a new idea, the innovation, and ends with creating a market out of the idea through launch and commercialization. Many authors have however acknowledged that competencies related to idea generation, often is not found in companies that are good at commercialization in the launch stage (Markides and Geroski, 2005). In order to win at both innovation and launch, Gajic and Welde (2012) concluded that an organization should focus on seven key aspects in the internal organization; (1) a service strategy, (2) effective resource allocation, (3) having a clearly defined and workable new service development process, (4) supporting a customer oriented approach, (5) attain market synergy, (6) having the right corporate culture, and (7) establishing a separate unit that has the responsibility for service development, but that are still closely coordinated with the rest of the firm.

Figure 11 shows how these success factors relate to NSD within the Smart Grid context. In particular, the power sector is considered to not possess the appropriate service culture and service attitude for developing new services. (Gajic and Welde, 2012)

Essential factors to create successful new service development						
Establish a service strategy	Effective resource allocation	Well-defined and standardized NSD process	Customer orientation	Market synergy	Service oriented corporate culture and market fit	Separate division responsible for NSD

Figure 11: Internal determinants of successful NSD (Gajic and Welde, 2012)

Both the business model theory and the NSD theory studied in the project thesis accentuate customer access to be a prerequisite for making profits in a competitive market (Gajic and Welde, 2012). Accordingly, one basic strategic proposition for market entry is suggested:

P1: Companies that develop new services in close coordination with end customers have an increased likeliness to succeed with NSD.

3.2.2.1 What is the Criticality of the Launch Stage in a New Service Development Process?

Introductory, market launch was referred to as one of the most demanding stages of a development process. Based on what has influenced product performance in previous times of innovation, Hultink and Hart (1998) point out that defining a clear launch strategy have been confirmed to be essential to success (Montoya-Weiss and Calantone, 1994; Cooper, 1986). In an exploratory study di Benedetto (1999) even found that the launch stage tactics were more important than having a service strategy. Today, it is actually the launch stage that is still not managed well by many small and mediocre enterprises (SMEs). This indicates a great potential for improvement of the new product development (NPD) if the launch stage is improved (Ledwith and O'Dwyer, 2008).

3.3 What is the Significance of Timing in a Launch?

3.3.1 Are There Any Advantages of Being an Early Mover?

One weak point of new product and service introduction is the elapsed time required to bring the service to market. Prasad (1997) indicates that many manufacturing companies are losing the competitive race of bringing successful products to life due to a speedy and effective execution process executed by other successful companies. Other literature such as the work of Robinson and Fornell (1985), and Lieberman and Montgomery (1988) also emphasize the benefits of being an early mover. Basically, it appears that the early literature on first mover lead mainly support that only a market pioneer may secure an enduring market share advantage. On the contrary, later literature questions this line of thought, and has found evidence of a higher rate of unsuccessful pioneers. (Cleff and Rennings, 2011; Markides and Geroski, 2005; Robinson and Min, 2002). One may therefore question if there are any real benefits for early movers? What are the major advantages or disadvantages companies may expect from being the first or early introducer?

Lieberman and Montgomery (1988) conducted a literature review on what factors impact first-movers, and their findings exposed three main categories of first-mover advantages; advantages may be attained through (1) sustainable leadership in product and process technology, (2) buyer switching costs, or (3) superior assets. Only the first category, technological leadership, is limited to a single firm. In particular, this source of early mover advantage corresponds to a learning or experience curve, success in R&D or patent races, or quick reduction of costs (Cleff and Rennings, 2011). The second category of advantages is switching costs. These switching costs depends on the investments or transaction costs the customer has to make in order to adapt to the product, the degree of learning and habits of use that will be connected to the first product, or the contractual commitments connected to the first mover. All these aspects imply costs for the second mover that will have to be faced in the race for surpassing the first mover, and thereby be barriers for entering the market. An example of the third category is getting hold of scarce assets such as location or natural resources before its competitors. (Lieberman and Montgomery, 1988)

The most substantial disadvantages of being the first mover are the risk of free-riding, shifts in technology or consumer needs, various types of organizational problems, and delayed resolution of uncertainty related to for instance regulations (Lieberman and Montgomery, 1988; Hultink and Hart, 1998).

3.3.2 Moving Fast versus Slow – What Is the Most Successful Strategy?

More recent literature that expand the research base on first-mover companies tends to point out that a successful innovator is not necessarily the first, but very often one of the early movers within the competition of different innovation designs. In the case of radical innovations, the timing of end results, and also their consequences, is highly unpredictable. Speed and responsiveness therefore have high significance for success when entering a dynamic technological market. (Reff and Clennings, 2011) Highlighting this effect, Jennings and Haugthon (2001) states that it is not the big companies that outperform the small, however, it is the fast that eat the slow. Also Suarez and Gianvito (2005) address the market dependency of the first mover advantages. They found that the opportunity of first mover advantages very often depends on the pace at which the industry's technology is changing, and the speed at which the market is evolving. Thus, the aforementioned literature indicates that the value of winning early mover opportunities should be carefully considered by the individual company before taking the decision to launch.

Empirical evidence found by Min, Kalwani and Robinson (2006) supports that early followers outperform pioneers, and that this position is the most successful strategy. This conclusion was based on 66 really new industrial product-markets, in which only 23% of the market pioneers survived for more than 12 years. In contrast, the study showed that survival was much easier when the pioneer started in a new market with an incremental innovation. In this case, 61% of the market pioneers survived for 12 years. These results indicate that market pioneers must overcome greater resistance than early followers in building primary demand for really innovative products because of higher levels of market and technological uncertainties.

The initiators do not often succeed in scaling the product into the mass market, but the established market followers do. This concur with the technology adoption life cycle model, stating that innovative products are normally first accepted by a niche of people with particularly high interests of technology, before it is gradually accepted by common people, and ultimately sold to the mass market. Thus, the early followers are more successful in scaling the product to the mass market and gaining widespread adoption. This supports that in particular established companies should not move fast to be the first mover, however choose the right time to move (Min, Kalwani and Robinson, 2006). This is contrary to the findings in the earlier research of Lieberman and Montgomery (1988).

It appears that in timing there is no one strategy that is ideal for every business development strategy. However, the most relevant literature indicates that being an early follower is most suitable in relation to technological markets, and thus also for Smart Grid opportunities:

P2: Companies that want to enter the Smart energy service market must seek to be early followers.

3.4 Segmentation and Targeting

3.4.1 Is Segmentation a Good Idea?

Advocates of segmentation propose that businesses adopting a segmentation approach can enjoy several benefits. (McDonald and Dunbar, 2000; Smith, 1956; Wind, 1978; Chesbrough and Rosenbloom, 2002; Osterwalder, 2010). According to McDonald and Dunbar (2000) customer segmentation has a profound impact on business strategy, and as a result they claim that it is seen that rather than the latest idea, customer segmentation is essential to commercial success. In general the academic that delivers a major theoretical rationale for segmentation suggest that segmentation leads to (1) a better understanding of customers, (2) allowing greater responsiveness in terms of the product on offer, (3) greater competitive responsiveness, and (4) more effective resource allocation.

When segmenting, it is already presumed that the given market is heterogeneous. However, Wind says through his journal article *Issues and advances in segmentation research (1978)* that it is not unusual to discover markets in which no important differences are found among the separate segments. Some companies introducing several new technologies have succeeded by targeting the mass market. One example is Apple's products and services, though it is discussable if it was the targeting that ensured the company's success. (Gajic and Welde, 2012)

According to Dibb's article *Market segmentation: strategies for success* (1998) there are many documented cases where segmentation has not resulted in a solution which can be implemented. This includes cases such as poor understanding of segmentation principles, unsuitably oriented literature and absence of practical implementation guidance. However, if the obstacles of segmentation are overcome, a segmentation approach has the potential to add clarity to the process of marketing planning by developing marketing programs based on customer requirements. Dibb (1998, p.394) concludes *"Both the underlying logic and the rewards which segmentation offers are well established in the literature."*

P3: The market for Smart Energy services is heterogeneous. Recognizing different market segments for the services will help to identify and implement market launch programs that will lead to success.

3.4.2 Segmentation Principles

Four premises are emphasized to create a successful and applicable segmentation. First of all, a segment must be detectable, meaning that it must be possible to measure the segment's size, economic situation, and predictability for purchase. Second, they must be available for marketing; third, the segment should be of a certain size with regard to the profitability; and fourth, the size of the segment must be relative to the company's marketing resources. (Framnes et al., 2011; Kotler, 1994)

In order to create detectable and applicable segments of a market, it is common to use classifications based on (1) demographic segmentation, (2) psychographic segmentation, and (3) behavioral segmentation. Table 5 lists typical marketing criteria, in accordance with Framnes et al. book *Marketing Management* (2011).

Segmentation criteria	Example
Demographic segmentation	
Age	Situations specific intervals
Gender	Male/female
Housing type	Single house, row house, apartment, shared house or flat, bedsit
Geography	Municipality, trade region
Income	Situation specific intervals
Work status	Full-time employee, part-time employee, self-employed, student, retirees, unemployed
Number of people in the household	1-6, over 6
Behavioral segmentation	
Interests	Involved in sports
	Politically active
	Interested in enjoying TV, radio, cinema, technology
	Holiday customs
	Lazy
Attitudes	Environmental concern
	Technology adoption
	Cultural relations
	Religion/moral
	Economy
Psychographic segmentation	
Personality parameters	Extrovert, introvert, initiator, impulsive, leader type, masculine, feminine

Table 5: Segmentation criteria. Adapted from Framnes et al. (2011)

3.5 How to Increase the Chances for Adoption when Launching by Segmentation?

3.5.1 Decide which Type of Customer Groups will Increase the Success Rate of a Market Launch

In general, several authors of academic articles suggest that targeting could either be focused on mass, selective, or niche market (Hultink and Robben, 1999). Moreover a suitable number of segments need to be targeted; too many segments will lead to difficulties in inter-segment heterogeneity, whereas too few segments can hinder the success of the segmentation process due to absence of intra-segment homogeneity (Foedermayr and Diamantopoulos, 2008). Even so, there is an agreement among most academics that customer groups ought to be defined in order to succeed when launching. One example is prestigious brands such as Rolex, Gucci and Rolls Royce. All these brands focus on carefully defined groups of customers and have prioritized their segments, and thus they have interconnected with the customer in a clear and consistent way. Customer, potential customers and competitors are left in no doubt for whom these brands try to target. (Dibb, 1998)

Adoption and capturing value is likely to be faster if the marketing strategy is well-matched with the targeted customer group. In their article based on a study of telecommunications products

Beard and Easingwood (2006 p. 91) state: *"Interestingly, target markets were often found to be defined in terms of the groups that adopt at different stages of the product life cycle"*. Therefore, targeting innovators is an appropriate tactic for very new technologies and since innovators are very responsive to the benefits of a new technology. Moreover, they are known to be influencing others (Beard and Easingwood, 2006 p. 91).

The study of Slater et al. (2007) evaluates firm performance in high tech markets based on responses from 160 senior marketing managers in high-tech firms. Their results support the view of Beard and Easingwood (2006). That is, if a company is to pursue new product launch the innovator and early adopter segments ought to be targeted. They add that buyers from these customer groups do not require a complete solution to their problems (Slater et al. 2007, p. 6). Moreover, their findings suggest a negative relationship between targeting the early majority and performance, and this is in accordance with Moore's (1991) proposition that innovative firms struggle to "cross the chasm" between the early adopter and early majority market segments. (Slater et al, 2007 p.14). Accordingly, proposition P4 is suggested:

P4-A: Companies ought to target the innovator and early adopter segments for Smart Energy Services.

P4-B: High degree of technology adoption is the behavioral factor that characterizes the people that are most likely to purchase Smart energy services.

3.5.2 The Diffusion of Innovations – Adoption or Rejection

There are many factors that affect whether a new technological idea will be adopted or rejected in the market. The superiority of service functionalities or features is not enough to ensure success; behavioral factors are also important determinants for whether a service will be adopted. Rogers (1995) presents the theory behind adoption and rejection as diffusion of innovations. He describes adoption or rejection of an innovation as a social process where individually perceived information about a new idea is communicated. In his 2003 book, he further elaborates that adoption or rejection is the process in which an innovation is communicated through specific channels over time among the members of a social system. On this accord, the social system defines the target group. In such, Rogers (2003) work support the idea of segmentation, as he focuses on the importance of the target group.

Furthermore, Rogers (2003) emphasize that (1) uncertainty, and (2) information has a great effect on adoption likelihood. An innovation may trigger uncertainty, which motivate an individual to seek information. For instance, if the innovation is perceived as complex or difficult to use, an individual is unlikely to adopt it. Uncertainty may in advance be reduced if consumers have access to more information from the supplier of the innovation. This is particularly important to remember regarding radical innovations, as these innovations may trigger uncertainty to a higher degree than incremental innovations. For radical innovations, technological knowledge required to exploit the service is very different from existing knowledge. Contrary, for incremental innovations, the knowledge required to offer and exploit the service builds on existing knowledge. Providing consumers with information is therefore essential in order to ensure adoption of innovations. Effective communication that provides information on services will increase the likeliness of adoption and a successful market launch.

According to this theory, proposition P5 is presented as:

P5: The more incremental innovation, the more likely end users will adopt a Smart energy service after a pioneering launch.

3.6 How to Successfully Reach the Customer in a Market Launch?

3.6.1 What is the Significance of Channels for a Successful Market Launch?

Channels are important for launching since they are customer touch points that play a significant role in the overall customer experience. Through channels companies communicate and reach their market segments. When launching the most important channel functions to get right is raising awareness among customers about the company's products and services. (Osterwalder, 2010).

Easingwood et al. (2006) agrees with Osterwalder (2010) that channels matters for a market launch. Through empirical research they recognized: *"Successful launches can increase the levels of support from the channels, and unsuccessful launches can do the opposite."* (Easingwood et al. 2006, p. 500). In fact, they conducted a telephone-based survey targeted at 300 organizations, resulting in 190 interviews, a response rate of 63%. The survey showed that high-tech companies need the continuing support of their distribution channels to support their products and services and to present them efficiently to the customer. Easingwood et al. (2006) suggest that the most beneficial way is to create distinctive distribution channels at the preparation stage and next concentrating on the channel partners at the execution stage. Most importantly it is to develop mutually beneficial relationships with customers who will work as reference sites for the new products and services that are launched. (Easingwood et al., 2006)

Through her article about the long tail and targeting in the digitalized world Elberse (2008 p. 7) states: *"You won't make the right calls unless you understand how online channels are actually changing markets."* According to her, in order to succeed, companies must take in mind that demand shifts from off-line retailers to online channels with considerably larger assortments. Therefore, using digital channels may improve the position of a company when launching.

P6: In the launch of Smart energy services companies will benefit from using online channels to reach the customer.

3.7 Customer Based Payment Models

3.7.1 What is the Importance of Payment Models?

Endres et al. (2008) conducted large-scale empirical studies for social network sites to recognize the correlation between payment models and success. A proper payment model creates customer value and captures parts of this value as sustainable revenue. Each payment model might have different pricing mechanisms, for instance fixed list prices or loss-leader pricing (Osterwalder, 2010 p. 30).

Table 6 lists different types of payment models presented by several well-known authors. The existing literature describes payment models as one piece of the business model and separate between traditional industries and internet based revenue models (Teece, 2010). However, several payment models are somewhat similar, but described with different terms by the authors.

Payment Model	Description
Free and Premium	Service is given away for free. Value added services or an enhanced version of the service is offered for a premium price.
Lock-in	One part contributes to purchase of another. An example is built in elements to retain customers.
Long tail	Targeting the most profitable customer segments for the niche items, in addition to selling fewer popular items in large quantities.
Subscription	Charge a subscription fee for access to some or all of its offerings. The revenue stream is generated by selling continuous access to a service.
Advertising	Placement of advertisements on internet sites.
Transaction	Receiving a fee for enabling or executing a transaction.
Asset sale	Selling ownership rights to a physical product.
Usage fee	Revenues are generated by the use of a particular service. The more a service is used, the more the customer pays.
Lending/Leasing	Temporarily granting someone the exclusive right to use a particular asset for a fixed period in return for a fee.

Table 6: Different payment models. (Endres et al., 2008; Osterwalder, 2010; Johnson et al.,2008)

3.7.2 Which Payment Models have Shown to be Successful?

Newer literature regarding successful payment models suggest choosing a payment model should be done according to customer wishes. Today's consumers have advantages that no previous generation had; because of internet, selections are now huge reinforced by much information (Elberse, 2008). Therefore, it has shown where for instance the customers have a low willingness to pay; a company will succeed when choosing a particular revenue model rather than another. One way to decide which payment models will contribute to a successful market launch is to consider; the number of users for a platform, the customer's willingness to pay, and the level of customer trust (Endres et al, 2008).

3.7.2.1 Advertising, Subscription or Transaction as the Payment Model?

When there is a high level of traffic on the platform and when the user bases are large, preferably with highly differentiated users, advertising models have been implemented successfully. When the users' willingness to pay is low and a small level of consumer trust is needed, this payment model has shown to provide higher success rate than many others. Advertising appears to be chosen as one of the foremost forms of revenue generation for many internet services. One important reason for this predominance is a tendency among users to demand free services. (Enders 2008, p. 209).

However, if the customer's willingness to pay exceeds a minimum level other payment models have shown to be more effective. When a company has built a high degree of customer trust a transaction model has shown to be the most optimal option, whereas in those cases where willingness to pay is high, a firm has shown to succeed in selecting the subscription model. Even so, a critical mass of users is necessary for the subscription model because user activity is often an influencing factor. (Enders, 2008 p. 209)

3.7.2.2 Will Compaines still have Success in Pursuing Long Tail as the Payment Model?

Accoring to Endres' (2008, p.201) article *The long tail of social networking* the long tail concept illustrates how the occurrence of electronic retailing and digital goods created a paradigm shift in the way companies can make revenues. Anderson (2006) elaborated the concept in his book *The Long Tail: Why the Future of Business Is Selling Less of More*, in which he mentioned Amazon.com and Yahoo! as examples of companies applying this strategy successfully. They realize major profits out of selling small volumes of hard-to-find items. Today, consumers may find, and afford products more closely tailored to their individual taste. As a result, Anderson believes consumers will migrate away from homogenized products and services. He further trusts that the successful companies will focus on profits to be made from the long tail.

3.7.2.3 Will the Free and Premium Revenue Model Provide a Successful New Launch?

For information related services free and premium has shown to be a successful payment model. Internet and information industries often choose free and premium payment models to receive revenue from several streams including value-added premium services and customer acquisition. Tecce (2009, p. 178) suggest that one reason may be because information is often challenging to price, and consumers have numerous ways to obtain much information without paying.

Software companies such as Linux, Firefox, and Apache, who operate with open source, have thrived with a free and premium revenue model. The normal form of the software is licensed under an open source license and then premium versions with additional features and associated services are made available under commercial license terms (Teece,2009 p.179). Another example is apps for smartphones. Often an app might be free to download, but if you want extra features you have to pay for it. This is one of the ways app makers earn money, another is advertising.

What the literature review boils down to is that when choosing a payment model companies should look at the customer (Osterwalder, 2010; Endres, 2008, Anderson, 2006; Elberse 2008). When launching it will therefore be wise to ask the question; "How will the customer prefer to pay?"

P7: When launching Smart energy services companies will have greater chances to succeed if the payment model is accustomed around the customer.

3.8 Pricing Strategies

3.8.1 What Is the Impact of Pricing Strategies?

According to Shipley and Jobber (2001, p. 301) "price management is a critical element in marketing and competitive strategy and a key determinant of performance. Price is the measure by which industrial and commercial customers judge the value of an offering and it strongly impacts brand selection among competing alternatives." Thus, the pricing of a new product or service reflects the competitive positioning of the service as well as the customers' measure of a service's benefits (Hultink and Hart, 1998; Calantone and di Benedetto, 2007; Taher and Basha, 2006). Moreover, pricing is the only element of the marketing mix that generates revenues for the company, and may quickly be adapted to the internal and external environment of a company, making it a dynamic marketing mix tactic (Indounas, 2009). This suggests that effective pricing strategies will be a powerful differentiator between successful and unsuccessful launches. But what strategy should a company use to decide what pricing strategy to apply? Should the pricing strategy simply be the price that the customers want to pay?

3.8.2 What are the Most Successful Pricing Strategies?

Pending recently, the literature regarding successful pricing strategies have been relatively consistent in suggesting that a skimming strategy is the most profitable strategy for innovative products (Hultink and Hart, 1998). When applying a skimming strategy the company charges a high price to reap the maximum benefits, after which they lower the price gradually when equally good competing products and services enters the market (Calantone and di Benedetto, 2007). Hultink and Hart (1998) examined the launch strategies of 293 firms across five industries in the UK associated with high and low levels of product advantage. Their data empirically confirmed that products with high advantage are launched with higher levels of promotion and distribution expenditures, exhibit a broader mix of promotional types, and pertains a skimming or early return on investment (ROI) pricing strategy.

The penetration strategy is the other pricing strategy that is often accentuated by the literature. In this instance, company charges a comparably low price, lower than the eventual price, for the innovative product in order to attract new customers and achieve long term market share. Penetration is often advised when the scale of entry is large. Nonetheless, many empirical studies have shown that products with high advantage have tended to be adopted with a skimming strategy (Hultink and Hart, 1998).

On the contrary, the work of Calantone and di Benedetto (2007) states that the pricing strategies often are oversimplified as skimming versus penetration, or as a high-low decision. In their research, they found that the effect of pricing on success cannot be evaluated separately from timing of the launch, the inventory strategy or the extent of market research, testing and planning. In fact, most of the recent literature work on new service and product pricing and introduction supports Calantone and di Benedetto's (2207) conclusions (Indounas, 2009; Bergstein and Estelami, 2002). Also Avlonitis and Indounas (2007) identified the need and practice of different pricing behavior across different service industries. Table 7 lists different pricing methods elaborated by the literature (Avlonitis and Indounas, 2007; Indounas, 2009)

Type of pricing method	Description
List pricing	Setting a standard price for all customers
Differentiated pricing	Offering different prices to different customer on the basis of a number of criteria
Geographical pricing	Offering prices to customers located in different geographical areas
Negotiated pricing	Prices determined on individual agreements between the company and customer
Quantity, cash and trade discounts	Discounts on purchase of large quantities, discounts for customers that pay their total amount within a given time frame, and discount to agents that promote and support the product or service
Loss-leader pricing	A service is offered at a low price to attract customers that will be offered other more profitable services
Image pricing	Setting a high price to convey a luxurious image
Pure bundling	Two services that cannot be purchased separately are offered at a reduced price
Mixed bundling	Two services that can be purchased separately are offered at a reduced price
Relationship pricing	Customer-oriented approach that aim to build long-term customers and understanding the needs of customers for further service development and pricing
Yield management	Using the company's resources to monitor different market segments' demand anfd charge maximum prices to segments that are willing to pay
Efficiency pricing	Efforts to lower company costs to the minimum level in order to permit low prices for customers that are price-sensitive

Table 7: Pricing strategies of service companies. Adapted from Avlonitis and Indounas (2007), Indounas (2009)

Indounas (2009) followed successful service firms in the IT and transportation sector, and found that pricing-competent firms are relying on the simplest pricing method of "cost-plus" one, and at the same time do not neglect their competitors' prices. He concludes that the high-performing companies in his sample have developed a holistic and multi-faceted pricing approach that pays attention to customer and competition-related pricing objectives according to the value that the customers connect to the service. The high-performing companies also differentiate the prices across unique target segments, collect market research and follow target return pricing due to the high investments and characteristics of the information technologies industries. In particular, Indounas stresses that customer orientation has a penetrating influence across the pricing objectives. With this, he further indicates that managers of firms with successful service use the principles of customer orientation in their efforts to set final prices. His findings are supported by Calantone and di Benedetto (2007) who report that good understanding of customer need and excellent market timing are necessary to support a price strategy.

The practical implications of the findings refer to the fact that managers might have much to gain by adopting a "situation-specific approach" when setting prices. Nonetheless, having this in mind, it is evident that many studies support that a skimming approach in combination with other launch tactics have shown to be associated with high level of product success.

P8: Successful pricing strategies for Smart energy services are situation-specific; they will depend on customer characteristics and service characteristics.

3.9 Literature Review Propositions

Throughout this chapter the eight propositions are linked to market launch of new services. Figure 12 sums up the propositions. Each proposition belongs to the different topics that are considered to be the most critical determinants for a successful market launch. The first proposition suggests what need to be done before launching, whereas the remaining propositions are denoted to market launch tactics. It is expected that all the propositions will increase the chances of success when launching Smart energy services.

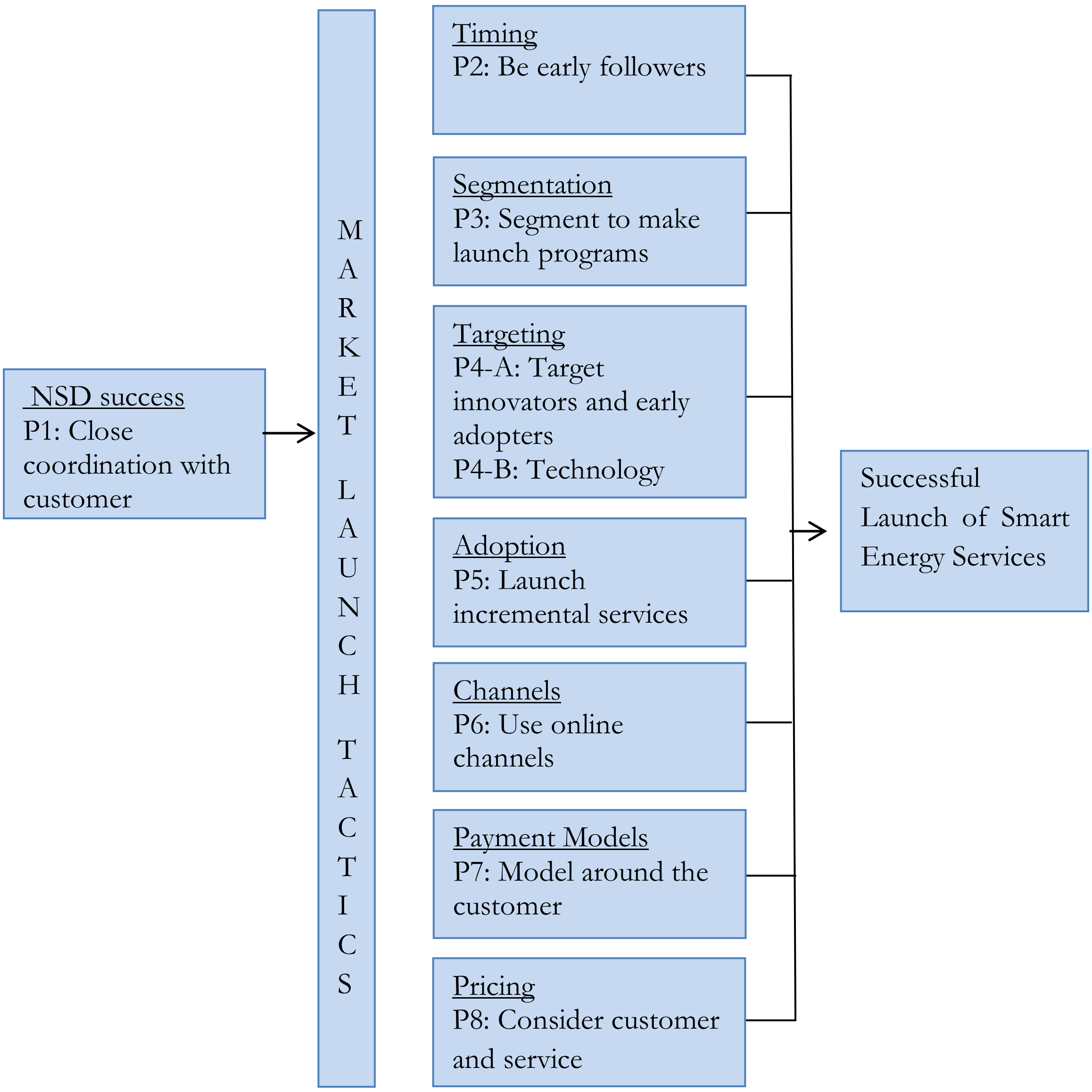


Figure 12: A model of the propositions for successful market launch

Chapter 4 – Research Design

Research Design

4.1 Introduction

This chapter outlines the approach for developing a deeper understanding of Smart Grid and to answer the given problem statement. The methodology in this thesis consists of interviews with industry professionals as well as a comprehensive market survey. The research was designed in this way because it was considered necessary to collect market data, which was insufficient, if not present, before spring 2013. Market data was deemed necessary in order to suggest what to do for a successful market launch, since it is believed that investigating customer attitudes will provide useful indications for the launch context. First, how the literature study was conducted for this topic will be described, thereafter the interviews are presented. Last, a more comprehensive description of the methodology for the survey is presented in order to understand the argumentation used in the last chapters of the thesis. That is, the authors chose to conduct several statistical tests to compare the results, and evaluate if they provide the same trends of the data.

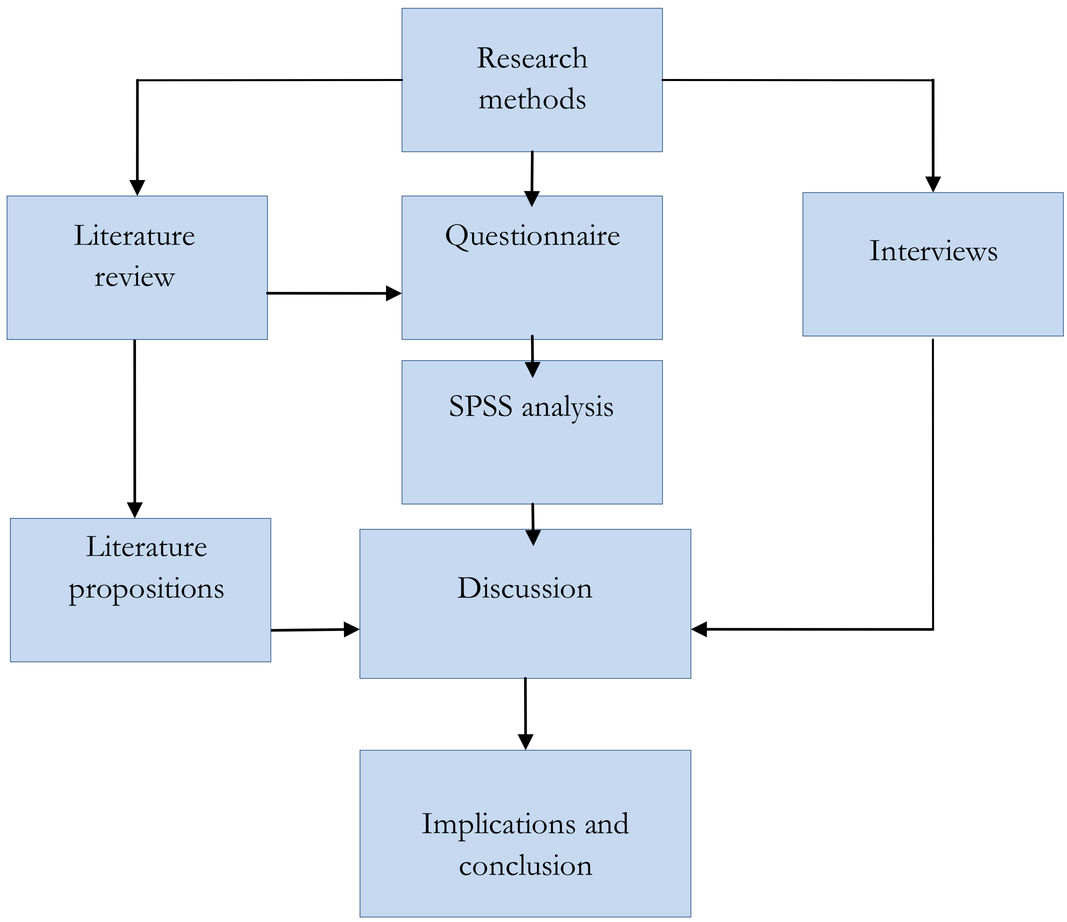


Figure 13: Research methods

4.2 Literature Study

As an introductory part of the thesis work, literature on successful market launch from relevant scientific journals and published books of high standards were collected. Thereafter, what was considered to be the most important criteria for a successful market launch in this particular case was further investigated. The focus area was to look at how other companies have succeeded with a market launch. The utmost used databases were Scopus Elsevier, ProQuest ABI/Inform and ProQuest Entrepreneurship to select the most important works. Overall, several emphasis areas were set; one was to elect literature where the focus was on research for business-to-customer (B2C) services. Moreover, academic literature focusing on cases related to the telecom industry was given extra attention due to the similarities between the telecom industry and the power industry. Additionally, even though the focus was on services launch, product launch literature was used as this launch theory is more comprehensive as well as the nature of some Smart energy services is evaluated are combination of products and services.

4.3 Interviews

To gain an overall view four interviews were completed with people from the energy and IT industry that have thorough Smart Grid knowledge, briefly presented in Appendix 4. The interview objects were chosen based on a market focus and similar interview guides were made for each of the interviews (Appendix 3). Interview guide was for the purpose to ensure that the most central topics in relation to the overall problem statement were covered and to give the interviewees a possibility to prepare. As a result, the interviews were semi-structured facilitating comparison of the different answers to the same questions, while having an informal tone and let the interview objects talk freely when desired. This form for interviewing assisted insights that expanded beyond the guide questions, as well as it uncovered more material of relevance.

Three of the interviews were completed by phone, and this decision was a result of time and resource constraints as the interviewees were located in other cities in Norway. This method worked fine because the authors were able to collect the information they needed in the process. All of the interviews were carried out in Norwegian; therefore they were translated from Norwegian to English. The authors consider these interviews to be good supplements to the conducted customer survey to uncover information for the overall problem statement.

4.4 Statistical Methodology

4.4.1 Data Collection

The respondents of the survey were consumers from Norwegian households. The survey was distributed through two Norwegian grid companies, a Smart Grid pilot project and social media. The details of the distribution are listed in Table 8. The survey was mailed to customers by the grid companies and participants of the pilot project, and distributed over social media. It was launched through the different distribution channels in the time period between the 14th of March and 17th of March, 2013 and was active for 27 days.

Grid companies were chosen as distribution channels to generate respondents with different demographics and thus to create a more representative sample of the Norwegian population.

Demo Steinkjer was also selected in order to provide respondents that are likely to have familiarity or at least a certain degree of knowledge and experience with AMR technology.

Moreover, before launching the survey a pilot was sent to a focus group in order to get feedback, and if necessary, the questions were refined for the launch. Moreover, when launching the survey questions were provided in dissimilar sequence to gain more diversification. This was beneficial since for most questions an ordinal 7-leveled scale was used, representing in disagreement or agreement with various statements. When investigating interest for services, the respondents that rated 5(agree) and above are the ones that are considered to be interested. This is also the case for the other cases such, i.e. technology adoption. The survey is presented in Appendix 2.

Distribution channel	Number of questionnaires distributed	Number of respondents	Number of valid respondents	Percentage of total valid data [%]	Valid response rate [%]
Nordland nett AS	500	64	52	8.6	10.4
Nordmøre Energiverk AS (NEAS)	2000	236	217	36.0	10.9
Demo Steinkjer	300	118	109	18.1	36.3
NTNU Innsida	Social media	125	116	19.2	-
Facebook	Social media	118	109	18.1	-
Total	-	661	603	100	-

Table 8: Questionnaire distribution channels

Of the total sample of 603, 112 did not answer the questions about the possibility for buying the services, leaving 491 respondents in the population that answered the mentioned question. This question is a key element in the questionnaire, therefore it was performed a t-tests to test if there were any differences in age of the respondents that did answer contrary to the respondents that did not answer. Likewise, it was performed chi-square tests of the other demographic dimensions in order to make sure there were not significant differences between the total sample and the population analyzed when addressing hypotheses related to this question.

The results of this analysis showed that there are not significant differences. Therefore, the demographics of those who gave and did not give answers to the service question do not matter. Moreover, in order to find out if any of the questions has been misunderstood, the separate responses were scanned for internal consistency.

4.4.2 Statistical Methods

The tests and analysis of the collected survey data was conducted by using the statistical program SPSS to test if the different methods would show similar effects, for ensuring evidences and quantitative support for the statements. What is seen is that the tests provide similar results, and thus are backing up one another. Factor analysis was performed to find the underlying relations among a group of related variables. Pearson's correlation looked upon the strength and direction of the relationship between variables and interest in the different services. Next, multiple regression analysis was performed to assess the relative contributions of the behavioral criteria and demographic variables on the services interest. Lastly, a cluster analysis was employed to form groups according to the similarity of interest for purchasing Smart energy services. This last step was performed to determine what characterizes the people that state they want to purchase services, and to further establish what the strongest determinant for service adoption is.

4.4.2.1 Factor Analysis

To make sure that measures for service interest and attitudes are reliable, several new variables were created by conducting factor analysis. When using factor analysis a large sample is necessary, having 300 cases is satisfactory according to Comrey & Lee (1992). In this case the sample of 491useful respondents is therefore sufficient. In general a factor analysis can conclude whether the responses of specific variables are influenced by the same underlying dimensions of the data (Field, 2009). Furthermore, principal component analysis with Direct Oblimin as the rotating method was used in this case. For the cases with a large amount of single items, this type of rotation method is anticipated to produce meaningful factors if there is an expectation that the variables are correlated. However, the differences between factor analyzes are unimportant when the sample size is large according to Comrey and Lee (1992).

Moreover, each variable is in being represented by a load value measuring of the strength of the correlation between the factor and the component, and consistent with the principles of Stevens (1992, cited in Field, 2009) the loading value should be greater than 0.3. Also the Cronbach's Alpha value is useful when creating factors as it evaluates reliability (Pallant, 2011). A high Cronbach's Alpha indicates steadiness and that there is a strong internal consistency within the questions (Zinbarg et al. 2005). All factors extracted here have a Cronbach's Alpha above the limit of 0.7, and along with Nunnally (1978) a Cronbach's Alpha exceeding this gives a tolerable degree of internal consistency. Moreover, to verify that the data set is suitable for factor analysis, the KMO value should be above 0.6 and the lowest limit for eigenvalues is set to be 1. This was ensured for all factors that were created for this survey.

Six behavioral and attitude associated factors were constructed on basis of 33 questions related to the respondent's attitudes towards technology, environment, energy prices, confidence in professional handling of customer data, and how resilient they are to allow energy companies to control electrical appliances in their homes. Each of the components loads included in these factors, and corresponding Cronbach Alphas, are listed in Table 9. What should be remarked is that for the factor called energy price sensitivity there are only around 220 responses.

	Load	Cronbach's Alpha
Technology Adoption		
Interested in technology	0.866	
Would buy Smart Energy Services because interesting with new technology	0.825	
Think it is easy to learn new technology	0.804	
Is usually among the first ones to try a new technology product	0.733	
Compared to most others like to take risks	0.555	
		0.816
Environmental- Friendliness		
Environment and climate questions are important	0.912	
Consider the environment when purchasing	0.882	
Would buy Smart Energy Services to be environmentally friendly	0.848	
		0.852
Energy Price Sensitivity		
Wish for reduced costs from Smart Energy Services	0.738	
Have too high electricity bill	0.721	
Believe the electricity price in Norway is too high	0.694	
Would buy Smart Energy Services for the possibility to save money	0.671	
Would change power supplier to get a lower price	0.649	
		0.741
Energy Price Curiosity		
Development of electricity costs	0.848	
See electricity costs through internet/e-mail	0.769	
Comparison of own electricity costs with others	0.756	
See electricity costs through a screen	0.754	
Buy Smart Energy Services for control over power usage	0.744	
See electricity costs through SmartPhone/tablet	0.707	
Wish for predictability from Smart Energy Services	0.589	
		0.858
External Control Approval		
Let power supplier control electrical appliance in exchange for reduced electricity prices	0.882	
Permitting grid companies to reduce the usage of electricity intensive appliances in periods with high loads	0.860	
Allowing power supplier to control electrical appliances for increased safety	0.822	
For cold periods, permitting power companies to decrease home temperature to secure safe power supply	0.813	
Not worried that external actors will control electrical appliances	0.471	
		0.824
Customer Data[1]		
Energy Supplier	0.873	
Insurance company	0.837	
Bank	0.802	
IT companies	0.792	
Norwegian Tax Administration	0.742	
Data Protection Authority/ Consumer Council	0.725	
Trust that energy companies will not spread my customer information	0.673	
Trust that companies do not misuse customer data	0.488	
		0.879

Table 9: Behavioral factor analysis. [1] Confidence in professional customer data treatment. On a scale from 1 to 7 where 1 was "totally disagree" and 7 "totally agree" The questions presented here are translated from Norwegian

Additionally, the interest in purchasing services turned out to be highly correlated for several of the Smart energy services. A factor analysis was therefore performed on the 15 questions regarding the wish to purchase services. This resulted in a grouping of eight services in a scale labeled Automatic energy services, three services labeled Insurance and bundling services, and two services remaining separate because of their distinct characteristics. This is however an interesting finding that may be exploited in a business setting, and this factor analysis therefore presented in 6.3.1, listed in Table 16.

4.4.2.2 Pearson Correlation

When examining the relationship between new services and other factors Pearson correlation coefficient was used to see the strength and direction of the relationship. A correlation of 0 indicates no relationship at all, a correlation of 1.0 indicates a perfect positive correlation, and a value of –1.0 indicates a perfect negative correlation. For the values between, 0.1-0.29 is considered to be a small correlation, 0.3-0.49 medium, and 0.5-1 is a strong correlation 1 (Cohen, 1988, p. 79–81, citied in Pallant, 2011). If the direction of the relationship between two variables is positive for what was investigated in this study, it means that the *more* the value of one increase, the *more* interested they are in Smart energy services, whereas a negative relationship shows the opposite. The Sig. (2-tailed) value has to be equal or less than 0.05 in order for the correlations to matter.

Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. However, according to Eikemo and Clausen (2007), the assumption of normality is mainly important in cases of small samples because in larger samples of independent variables the population will be approximately normal distributed according to the central limit theorem. The total sample is in this survey is exceeding 300, and therefore the slight divergence from normality is neglected.

4.4.2.3 T-Test and ANOVA Analysis of Variance

For categorical variables such as demographical variables one-way ANOVA and independent sample t-tests were to determine whether there are significant differences in the mean scores on service interest across the groups. That is, between woman and men, individuals with dissimilar work status, different age, and type of household. In general, using ANOVA allows comparison of mean scores and standard deviation of two or more different groups of people. If the Sig. (2-tailed) value is equal or less than 0.05 there is a significant difference in the mean scores on interest for Smart energy services for each of the groups (i.e. men/woman). However, if the value is exceeds 0.05, there is no significant difference between the two groups. If there is a significant difference, post-hoc comparisons are looked at to find out where these differences lie. (Pallant, 2011)

4.4.2.4 Multiple Regression Analysis

A stepwise multiple regression analysis was performed to assess the relative contributions of the demography and life style factors on interest for each of the 15 services and the service groups. Multiple regression use correlation as foundation, also allowing a more sophisticated search of the interrelationship among a set of variables, which is suitable for examining of complex real-life research questions. For this sample it tells how well the chosen variables are able to predict interest in Smart energy services. This is measured looking at the standard error, R squared, adjusted R squared, and beta. The standard error tells the deviation for the mean interest in purchasing the services where values for every variable have been converted to the same scale. R^2 reveals how much of the variance in service interest is explained by the included variables whereas adjusted R^2 value takes into account the number of participants and thus compensates for model complexity to provide a better comparison of true population performance. Finally, from the beta it is seen which of the model variables contribute to the prediction of service interest and how much. (Pallant, 2011; IBM, 2013)

The stepwise method was chosen, where the a list of independent variables are included, and for each step the statistical procedure decides which one is that predict service interest the most second most etc., based on a set of statistical criteria. The method ends when no more variables should be included or removed. When independent variables are greatly correlated with the dependent variable and with one another and, often only one of these becomes listed as a predictor. This only means that the last variable adds nothing to the prediction, even though it also predicts service interest. Thus, other methods for determining service interest ought to be used as well. (IMB, 2013)

Standard tests for multicollinearity were conducted to reveal if there are significant flaws in the regression model. The test of multicollinearity between the independent variables is shown in Table 10 as a Pearson correlation matrix. The correlation matrix indicates that there are significant correlation levels between several of the independent variables. There is naturally a correlation between age and many of the other variables, but it is in particular important to note the correlations between technology adoption and (1) environmental friendliness, (2) knowledge to Smart Grid, (3) energy price sensitivity and (4) energy price curiosity.

The correlations among the variables raise alarm for multicollinearity. However, the highest significant correlation is 0.457, which is below 0.8, the number considered to be a limit for collinearity concern (Field, 2009). To ensure no multicollinerarity, the Variance Inflation Factor (VIF) and eigenvalues were inspected. SPSS showed that the highest VIF of all the regression analyses is 1.704, which is considerably below the maximum value which is 10 (Cohen et al., 2003). The eigenvalues were all above 0.21.

Independent variable	1	2	3	4	5	6	7	8	9	10	11
1. Birth year											
2. Education	.169**										
3. Annual household income	-.408**	-.206**									
4. Technology adoption	.123**		.107*								
5. Environ. conservation		.106*		.187**							
6. Knowledge to Smart Grid	.130**	-.168**	-.109*	-.257**							
7. Energy price sensitivity				.295**		.182**					
8. Energy price curiosity	.251**			.457**	.362**		.434**				
9. External control approval			.093*	.170**	.268**			.273**			
10. Customer data[1]	.167**				.160**			.250**	.316**		
11. Electric car[2]	.264**				.312**			.226**	.203**	.163**	

Table 10: Correlation matrix for the independent variables of linear regression. **Sign. ** p < 0.05, * p < 0.10**
[1] Confidence in professional customer data treatment, **[2] Interest in buying an electric car as car no 2**

4.4.2.5 Structural Equation Modeling

Structural equations modeling (SEM) is a statistical modeling technique which is widely used in behavioral sciences. This technique provides a convenient framework for statistical analysis including several multivariate procedures, for example factor and regression analysis (Hox and Bechger, 1998). This technique was for that reason applied in AMOS 20 to investigate if this method would confirm or provide further clarifications of the results found from multiple regression.

Responses with missing data were completely removed before SEM, resulting in 179 cases due to the incomplete number of responses on questions regarding price sensitivity. It was performed t-tests on age, technology adoption and service interest of this group to ensure similar sample characteristics, which only showed that birth year is significantly one year higher for this sample.

The model was estimated using maximum likelihood. To create the model five of the six factors listed in Table 9 were used. In this model, Smart Grid knowledge, confidence in professional customer data treatment and the interest in electric cars, were not included as the effect were not significant at a 0.05 level. For the same reason only birth year from the demographic factors is included. The model fit was evaluated using root mean square of estimation (RMSEA). Byrne (1998) state a RMSEA under 0.08 provides reasonable good fit. The model had a RMSEA of 0.15, indicating that the model is a plausible fit. It is however emphasized for this specific method that with a reduced sample size it is not the intention to determine a model that explain every case, but to illustrate the trend of the data. It would be necessary to test any model on several different samples before it reflects a reasonable picture of the real situation of service interest.

4.4.2.6 K-Cluster Analysis

The goal with k-cluster classification is to determine whether demography, behavioral criteria, or other factors may be used to predict interest in new Smart energy services. To accomplish this, and in order to find groups in data, k-cluster analysis was employed. This method is well suited when trying to split consumers into different market segments, within which customers have similar characteristics. Unlike other statistical methods for classification, cluster analysis there is no prior assumptions about significant differences within a population. (Punj and Stewart, 1983)

The sample was clustered form the wish to buy different types of services by the k-means cluster method. This method identifies relatively homogeneous groups by mean values of cases based on selected characteristics with large clustering data and with mixed attributes and divides cases in clusters that are as close to each other as possible and as far from other clusters as possible at the same time. However, the algorithm requires you to specify the number of clusters. In fact, the k-means cluster analysis command is efficient mainly since it does not compute the distances between all pairs of cases, as do many clustering algorithms. (Norusis, 2003)

4.5 Evaluation of Methodology

In order to evaluate the quality of the chosen methodology, the authors choose to look at validity and reliability, as these are commonly useful as a quality evaluation of empirical research (Yin, 2009 p.40). This investigation has been both quantitative and qualitative in nature to increase the external validity and generalizability. Together with the market survey, interviews and were used to analyze the underlying factors in order verify or decline the propositions for a successful market launch.

4.5.1 Literature Study

To secure some transferability for a market launch of potential Smart energy services, literature published between 1990 and 2013 was emphasized. Internet has changed the context of services, and consequently the majority of literature before 1990 does not have transferability. Additionally, academic literature focusing on cases related to the telecom industry was given extra attention due to the fact that similarities between the telecom industry and the power industry (as described in 7.4.1). Moreover, in order to identify reliable literature and ensure credibility, articles published in the most relevant scientific journals, and written by the most influential researches were investigated.

4.5.2 Qualitative Empirical Study

For the purpose of collecting accurate information concerning Smart Grid and the industry, the reliability is evaluated as high, as the authors collected various sources of evidence from trusted sources like, government reports, and EU goals, and Smart Grid conferences. Moreover, what is included from the interviews has been ensured high validity by returning interview summaries to all the interviewees for validation and quotation inspection.

4.5.3 Qualitative Empirical Study

In relation to the survey results several types of validity and reliability may influence the data (Pallant, 2011). To ensure validity of the survey results, the data was manually inspected before conducting tests and analyzes. For all the statistical tests and analysis procedures to check reliability were executed. That is, before testing correlation preliminary analyses to ensure no violations were employed (4.4.2.2), whereas Cronbach's Alpha was useful when creating factors as it evaluates reliability, as described in 4.4.2.1. The test of multicollinearity between the independent variables checked in relation to multiple regression (4.4.2.4).

Moreover, using a stepwise multiple regression there are possibilities to manipulate the data that will result in low validity, therefore there are some controversy concerning their use (Pallant, 2011). However, the authors of this thesis did not manipulate the regression analysis; the first model SPSS delivered was employed without removing any independent variables.

Moreover, the survey contains questions about assumed new services that are not launched and some do not exist. Thus, this makes the responses for these questions less reliable than for those that state the facts, i.e. if participants have changed their power supplier during the last five years. That is, the authors are aware of the fact that even though many are interested in purchasing certain services, does not mean that they are actually going to buy if or when the services are launched. Still, the responses provide some indicators for where the interest is most apparent.

External validity in this overall research is evaluated to be good since it generate some general statements from the findings about the industry, end customers, and energy companies in Norway. However, the scope of the thesis limits the area of research to the Norwegian market, and consequently lowers the transferability of the findings to other geographical markets. By the large, the authors consider the extent of the collected empirical data to sufficiently support the validity of the findings.

4.6 What Could Have Been Done Differently?

During this study there are several things that could have been done in another way. First of all, for the Smart Grid context, the power industry and energy companies were given most attention. What could have been done differently is to have more focus on IT and telecommunication as several potential new services require IT competencies. However, when it comes to Smart Grid, currently most IT organizations have a business to business (B2B) perspective, and hence energy companies were emphasized. Moreover, the thesis limits the area of research to the Norwegian market and does not look at other geographical markets. The reason is that the Norwegian situation is unique compared to many other places in the world (Holme, 2013 Bremdal, 2013).

Furthermore, some questions could have been included or removed from the survey the authors made; however this is not seen until after an investigation of the results. Moreover, there could have been a focus on a smaller specter of services, in example only including services directly related to the Smart Grid infrastructure. However, the authors wished to examine multiple types of service in order to compare end customer interest to purchase.

Chapter 5 – Interviews

Interviews

5.1 Introduction

In the following chapter the qualitative results are presented. The key findings from four interviews with representatives from the energy and IT-industry provides input that help evaluate the potential of Smart energy services. As the model of Smart energy services are a relatively new concept, quite an extensive part of the interviews is included in this chapter in order to provide the reader with sufficient background on the framework surrounding these services. The interview focus is on successful market launch, how to include the residential consumer in Smart Grid related service innovation and barriers for increasing the success likelihood of Smart energy service development. For the complete interview guide, refer to Appendix 3. Table 11 lists the interview objects in the order they are presented.

Interviewee	Organization
Jan Onarheim	The Norwegian SmartGrid centre
Bernt Arild Bremdal	NCE Smart Energy Markets
Jan Berntzen and Lars Ødegaard	Tieto AS
Anders Holme	Lyse Energy

Table 11: Interviewees

5.2 Jan Onarheim, The Norwegian SmartGrid Centre

Leader of the Norwegian SmartGrid Centre March 2012 – May 2013
April 16th, 2013; NTNU, Trondheim

"Why haven't anything happened yet, and why aren't anyone doing anything? Companies must understand that customer driven innovation is a requirement to be successful."

Jan Onarheim pinpoints that welfare technology and comfort services have the greatest potential to succeed in Norway. That is, a larger amount of senior citizens are going to live longer in their homes and consequently need easier solutions. Furthermore, residential consumers wish for details on what they are paying for. This may be provided through a display that will motivate demand for other services. Basically, the first ones to sell comfort instead of kWh are going to be market winners, however that this call for innovative solutions.

Lyse Energy seems to be one of the only energy company in Norway that have realized that telecom services need to be interconnected with energy solutions. Apparently, the company is thinking future opportunities when installing Smart Meters in households. In their work, they install a Smart Gateway that is an infrastructure which allows placement of telecommunication technology in addition to the AMR technology. Moreover, Lyse Energy has developed packages that are uncomplicated for the user and this is tested by senior citizens. In contrast, other energy companies have instead sold the activities that are not within their core competence, such as alarm services or broadband solutions.

On the question related to timing, Onarheim says that first movers will benefit from media publicity for being innovative and creating something totally new and exciting. Accordingly, being a first mover will give success. He further believes innovative companies like Google or Facebook that may reach a large customer base and can turn out to be the first ones launching Smart energy services. Another option is that a smart individual makes an application that might turn the whole industry around.

For a successful launch of Smart energy services user friendliness and a system that is very easy to understand are critical factors. When developing Smart energy services you have to be good at business development, have market knowledge, and also holding telecommunication competences will be more important looking forward. However, most energy companies do not have market knowledge and interest in making alliances with companies from the IT sector. They rather want to focus on their core activities.

In essence, the power companies have many excuses for not being innovative and forward moving, as they are not afraid to lose their customer bases. Even though the grid is regulated by NVE, this should not be a barrier for developing new services and there has been too much focus on barriers and difficulties. The power companies should not wait for standards to be set; they have to be more dynamic, because you never know when standards will change. Energy companies are too risk averse and in Norway no one challenges the industry.

5.3 Bernt Arild Bremdal

Professor and advisor and research coordinator at NCE Smart Energy Markets
April 24th 2013, Telephone interview from NTNU, Trondheim

"We need to understand what the consumer is doing, and also what is happening further up the value chain. As the system is today, this doesn't benefit the consumer, but Smart Grid may give the consumer their flexibility's value in return."

When asking which companies he believes are going to succeed with a launch of Smart energy services, Bremdal claims that it will be the ones that view their infrastructure as a value network and want to develop a large specter of services. This will decrease the competition in energy as it is today, but there will be competition in entire new arenas of services, and the energy market will be more closely linked to the retail market. Because of this fact he believes many new services of unpredictable character will emerge in this market. Thinking like Lyse Energy and Sogn og Fjordane kraft, focusing on low price scenarios, will lead to success in the future market of this sector. If you look at the most successful companies over the last decades you may see that it is the companies that have organized value networks that have increased their value the most.

NCE work a lot with how to approach a launch in the DeVID project and have pushed NTNU and other instances in Europe to perform research and highlight the factors for success in service launch. For Norway, a formula is generated as follows:

Happiness = 4xC + J.

This represents comfort, coziness (extremely important for Norwegians), cleanliness and convenience (easy to live) and the last part is the J, standing for the investment. It is important to remember that Norwegians have much debt versus other Europeans, as Europeans often rent their houses. It is also essential to look at parallel industries and their approaches to the consumer, and see if there is anything to learn here (i.e. insurance companies). It is clear that the consumer have totally different incentives to participate and contribute to a Smart Grid, they want to ensure that they have heating, they want comfort; they wish to combine these factors with being environmental friendly without extra cost.

Companies ought to launch demand- response services since these types of services are very easy to expand. In order to gain effective load management one must know how the home is used, and at least if the home is in use. In fact, there is a lot of hardware that preposition and allow for demand-response routines. This is relatively inexpensive hardware that is already available and may be integrated on top of the infrastructure in the energy sector.

NCE is observant in relation to the consumers as well as paying attention to things that are happening abroad. However, it is frequently seen that what are working abroad does not necessarily work in Norway. Moreover, in the Norwegian context it is seen that the models that are right for consumers at Hvaler, are not necessarily right for other Norwegian areas, for instance in Oslo. Moreover, NCE has conducted surveys in Norway, and are working with communication strategies and have been involved in the rollout of 6800 Smart Meters in Hvaler. From this it observed that there are many consumers that are very interested in new solutions.

NCE has also conducted a segmentation of the consumers after a significant number of dimensions. For instance, the survey has shown that there is an extremely large difference between attitude/idealism and action. In general, it is also typical that older, mature people are not so interested in Smart Grid, AMS and environmental concerns; they are more concerned with having the possibility to living the life as they are used to. However, when it comes to down to business, it is them that take action turning of the heater and the lights, and believe that one should be careful with the use of electric power. In contrast, young people that assemble for demonstrations do not care one thing about their energy consumption.

When asking which customer channels should be used for a market launch, Bremdal says that it is important to work with multiple sales channels as these may enforce one another. When it comes to customer channels there are several dimensions. In general, it may be divided into three main categories of communication: (1) background information (i.e. NRK, TV2) that have great value in being attitude creators. (2) direct communication, without any form of obligation. The third thing is (3) direct obligating information, where you will have to decide on an offer there and then.

If the government or municipalities realize the enormous gains and savings that they can achieve though Smart Grid, that the health and welfare sector are the great money machines, then the governments will change their attitude. However, it seems that you will have to reach a critical point in order for people to realize this potential, “seeing is believing”; you have to experience it first. Lyse Energy has already gotten sympathy in Rogaland, and Bremdal cannot believe that others are standing still and watching without taking actions.

The Norwegian grid companies that will remain in the future will most likely bundle power sale with sale of services and load management services. Some of the energy companies with many customers, such as Hafslund will maintain the operations as they are today, however, for most of the companies there will be few that persist. The prices are not getting higher and everyone understands that it is not business to sell energy at purchase price. Therefore there is an enormous incentive for the energy groups to revitalize power sale.

5.4 TIETO

Jan Berntzen, Product Manager AMI Managed services, Energy and utilities
Lars Ødegaard, Sales Manager Utility, Energy Sales and Marketing
Telephone interview April 29th, 2013; NTNU, Trondheim

"If an industry actor is to succeed it has to find a good business model that addresses and to all party players: grid operators, energy suppliers, end customers and the society as a whole because the benefits comes from all."

Looking forward the IT industry will be more involved, and there will be consolidation of power suppliers, that leads to fewer but more competition among them. As of now Tieto has no ambition to develop or launch services directly towards end customers as they do not have customer services or marketing channels, but Tieto may work as enablers or be in partnership with third part delivery.

In developing new Smart energy services most of all, it is important to have interdisciplinary commitment, and professionals from various industries. It is vital to have domain knowledge about the energy industry with its technology, market, customers and regulations supplemented with technical expertise within electronics, IT, and telecommunications. Experience from related markets such as the telecom industry will be advantageous because what will happen in the power industry is similar to what happened in telecommunication, thus 20 year delayed. Moreover, it is important for the industry to cooperate with research, academic and businesses. That is, groups with different core competences helps to drive Smart Grid forward, but this also depends on NVE and regulations. In general the government will decide who should have access to what type of data that is essential for this type of new services.

The answer to the question on how to successfully launch Smart energy services is that it is essential to segment the market into customer groups. Also, functioning technology and design is important, selection of compatible equipment has significance, as well as the development of services must be based on technological standards. There must be an extreme degree of simplification for the end user and very simple services should be introduced firstly with good marketing attached. The selection of marketing channels and an acceptable price for the services will also be important success factors.

For end customer the reasons for buying new services are economics, but also ideology and technology interest are factors that the companies should play on. It is beneficial to be early with Smart energy services, but not necessarily first. Total cutting edge is not optimal because it is expensive, and to be able to succeed, framework conditions and laws must be in place beforehand.

Power suppliers or other actors that already have an established relationship and channels into the consumers' homes (i.e. Telenor, broadband providers, security companies etc.) will be essential as customer channels for new services. New web channels will also be important; meeting customers online makes it easier to offer more services and to segment the market. The challenge is that it is a messy picture, the grid companies will deploy the AMS in the home; however the power suppliers are the ones that may have an interest in developing new services.

5.5 Lyse Energy

Anders Holme, Program Manager Lyse Smart AS
Telephone interview April 30th, 2013; NTNU, Trondheim

"It is important be aware of the difference between the Norwegian situation and the typical situation in other parts of the world when seeking new competences and experiences internationally. Much is not directly transferable to the special situation here. It is necessary to establish what Smart Grid is in a Norwegian context and find out what should be done here."

Overall, in order to become successful launching new energy services you have to be familiar with the Norwegian needs, which are unique compared to other places in the world. We already use sustainable energy, have relatively solid distribution grid, contradictory to many others. There is a need to understand the market and the special needs and drivers of the Norwegian customer and energy companies, rather than holding a particular core competence that may be acquired. Moreover, compared to many other countries the potential of energy saving is not the prime focus in Norway.

When Holme was asked who will be successful, he responded that Lyse Energy has a great potential for succeeding with a launch of new Smart Grid related services. They are going to launch commercial services during the autumn, and start this summer with commercial pilots and mini-launches for internal customers. For the launch the services will be foremost available for Lyse's el-grid customers. In the days to come Lyse Energy will probably want to sell to others, but before this, co-operation with other energy companies and business frameworks have to be in place. The focus is on what the customer wants, by first analyzing surveys and focus groups, and most of all Lyse Energy tries pilots together with the end user. It is important to remember that it is not just about having the best technological solution, but also how the parts work together for the end customer, as well as good documentation.

When it comes timing for launching the new energy services there are both benefits and disadvantages being a first mover. Lyse Energy is a first mover in Norway, and have also been so in the telecom industry. This means that they will get a lead. On the other side, it costs more; as they are doing some mistakes that others will be spared of in the future. Even so, it is valuable to be early as this will enable Lyse Energy to help others with new energy services going forward.

Soon we will experience a new volume of Smart Homes and this requires new distribution channels. The first services that need to be launched are the ones trigging interest, and this will be Smart Home solutions; people know what remote control is, therefore this should naturally be the first step. More advanced and bundled services may be launched successfully later on. Buying through internet and web shops is essential in order to improve the efficiency and help customers understand the offers. Moreover, other good channels for sale may also be the traditional ones such as newspapers.

There are too many small DSO's in Norway, thus not enough investments potential for each one to focus on other things than operating the grid, which is a major barrier for Smart Grid. However, Holme believes that in the future the grid companies will consolidate to obtain operational advantages. Today's situation is not optimal.

5.6 Key Findings

The interview objects have quite similar opinions but somewhat different focus. Holme pinpoint the special Norwegian energy conditions compared to other countries, Bretzen and Ødegaard talks about the importance of interdisciplinary commitment for the success of new services, Bremdal focuses on how essential value networks are, whereas Onarheim believe in general Norwegian energy companies need to be more innovative. However, both Bremdal and Onarheim talk much about welfare technology and health related services, stating that this has a great potential to succeed in Norway as it will allow retirees to live longer in their homes. Also, the interviewees claim that the implementation Smart Meter is one of the aspects that sets the agenda for Smart Grid.

When it comes to new service development and market launch the interviewees have similar view on several topics. All agreed that telecommunication competences and an increased end user focus will be important for new service development. Moreover, several of them pointed out that for Smart energy services, user friendliness and solutions that are easy to understand for customers are critical factors for adoption. To increase the chances for a successful market launch they believe that it is valuable to be early and that Lyse Energy has great potential in the Norwegian market. However, they also state that well-known multinational corporations such as Google and Microsoft may be the ones launching Smart energy services as they can reach a large customer base. In general, energy companies in Norway must consolidate in order to focus on other than their core activities.

Chapter 6 – Survey Results

Survey Results

6.1 Introduction

This chapter presents the key findings from the SPSS analysis of the data material collected in the market survey. The analysis uncovers comprehensive amounts of valuable data, but the presentation is limited to the questions most relevant for the problem statement. Accordingly, the presentation is divided in five main parts. First, the sample characteristics are presented to give an overall impression of the sample. Second, the tests on Smart energy service demand and service preference is introduced. In this part, also frequencies on power supplier swaps and knowledge to Smart Grid technology are included. Third, what services may be grouped together is presented. Forth, the effect of demographic factors and behavioral criteria on interest for purchasing a service based on a correlation, regression and AMOS methods are presented. Fifth, the cluster analysis is presented to provide the reader the characteristics of the people that are interested in purchasing services. For the complete questionnaire, refer to Appendix 2.

6.2 Sample characteristics

6.2.1 Demographic Characteristics

The demographic characteristics of the total sample are listed in Table 12. The age ranges from 17 years, born in 1996, to 80 years, born in 1933. The sample's mean age is 43, with a vaguely negative skewness and kurtosis. This indicates there is a slightly larger population of younger respondents, but in general a relatively flat distribution without any particularly peak values. The presence of different age groups may also be supported in the distribution of work status. The sample consists of 31.5% students, 51.4% full time or partial workers, 10.9% self-employed, and 5.2% retirees.

Gender, education, and yearly household income also have good scattering on their respective categories. In particular, there is a very even dispersion between women (43.8%) and men (56.2%). For education level the sample have a large group of people that have taken or are taking more than three years of higher education. However, there is also good representation from other educational levels.

Overall, the sample appears to be diverse with a rather good spread on the demographic characteristics. Thus, the data material enables a discussion about the Norwegian population and as a whole. The only demographic factor that is slightly unjust is living place, where a significant share of the sample lives in the central parts of Norway in Møre og Romsdal, Nord-Trøndelag and Sør-Trøndelag. The other two counties that have high representations are Oslo and Nordland. However, the distribution between living in large (41.1%) and small cities (58.8%) are evenly divided.

Sample characteristics							
Birth year							
Parameters	Minimum	Maximum	Mean	Std. deviation	Skewness	Kurtosis	N
Value	1933	1996	1970.3	15.7	- 0.2	- 1.2	584
Gender							
Categories	Male	Female					N
Valid %	56.2	43.8					593
Education							
Categories	Elementary school	Upper sec./ vocational school	University up to three years	University more than three years			N
Valid %	26.6	14.7	12.0	40.5			598
Work status							
Categories	Full-time employee	Part-time employee	Self-employed	Student	Retiree	Unemployed	N
Valid %	35.5	15.9	10.9	31.5	5.2	1.0	597
City size							
Categories	Open settlement/ country side	Population between 10,000-20,000	Population between 20,000-50,000	Population between 50,000-100,000	Population above 100,000		N
Valid %	16.2	11.0	31.6	4.5	36.6		598
Annual household income							
Categories	< 200,000	201,000-500,000	501,000-750,000	751,000-1,500,000	> 1,501,000		N
Valid %	15.5	22.5	20.6	37.8	3.6		466
Housing							
Categories	Single house	Row house	Apartment	Shared house or flat	Bedsit		N
Valid %	52.2	6.6	28.5	8.1	4.5		467

Table 12: Sample characteristics

6.2 Key Descriptives Related to Service Demand

6.2.1 What is the Interest in Purchasing Smart Energy Services?

Using descriptive statistics, the survey revealed that there is a large interest in Smart energy services. In Figure 14, the numbers represent the portion of the sample that has responded 5-7 on a scale from 1-7, on the service interest question. This means that they say it is likely or very likely that they will purchase the given service. Out of the 15 services *Security features for electrical home appliances* had the highest proportion of interested respondents (63.7 %), whereas there was limited interest for a service deal that includes both insurance and power supply (18.6 %), listed in Table 13. Figure 14 and Table 13 also illustrates that each and all of the services that have the highest interest rate are services that are based on services available in various forms in the market today, making them incremental innovations.

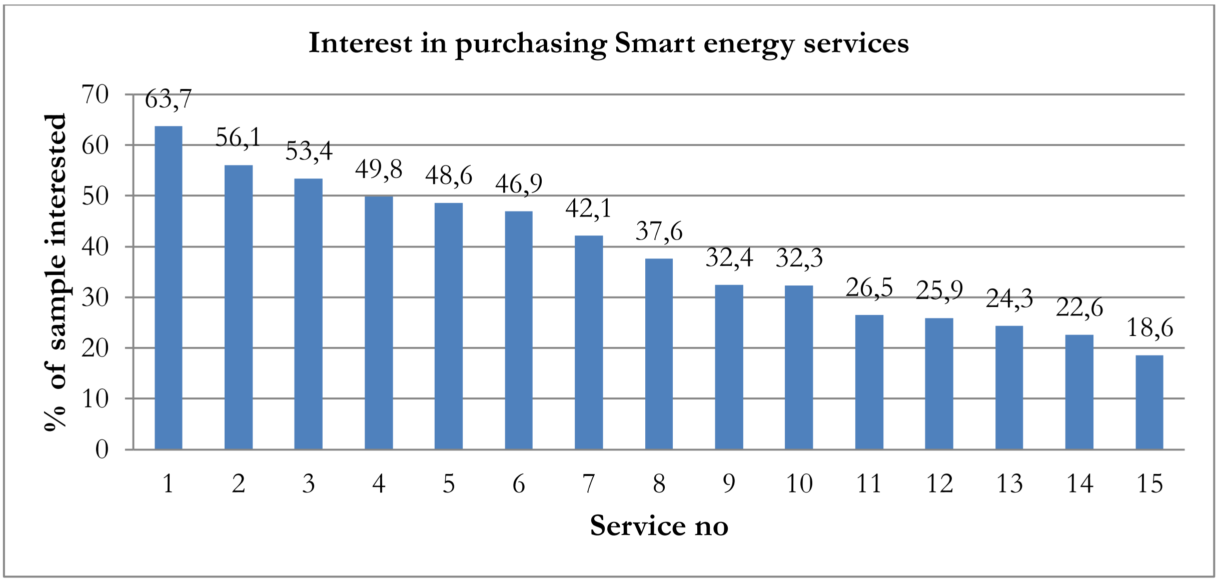


Figure 14: Interest in purchasing the 15 services

No	Description
1	Security features for electrical home appliances (i.e. automatic shutdown if security threat)
2	Automatic time control of heating systems in the household
3	History statistics on personal power expenses
4	An online service supporting monthly monitoring of a wide variety of home appliances
5	Remote control of home appliances
6	Local wireless control of home appliances
7	Home appliances that automatically start when the electricity is cheapest (ie. Dishwasher)
8	SmartPhone accessories to play around with light, sound, heating and other home appliances
9	Ability to choose origin of power supply
10	Bonus point offerings based on energy efficiency
11	Preset room temperature for a specified time period
12	Allow energy companies to control electrical appliances in exchange for a reduced electricity price
13	A system that supports power generation and sale of power to the surrounding area
14	Insurance against high power prices
15	A service deal that includes both insurance and power supply

Table 13: Description of the services

In terms of properties of Smart energy services, consumers are looking for user-friendliness (80.7%), cost reductions (77.5%) and predictability (69.1%), as illustrated by Figure 15. Not as many respondents care if they have to adjust to a new pattern of consumption in order to make use of the new service (36.8%). It is also interesting to notice that the same sample says that they are pliant to purchase a new technological product when someone they know recommends the product (47.3%), illustrated in Figure 16.

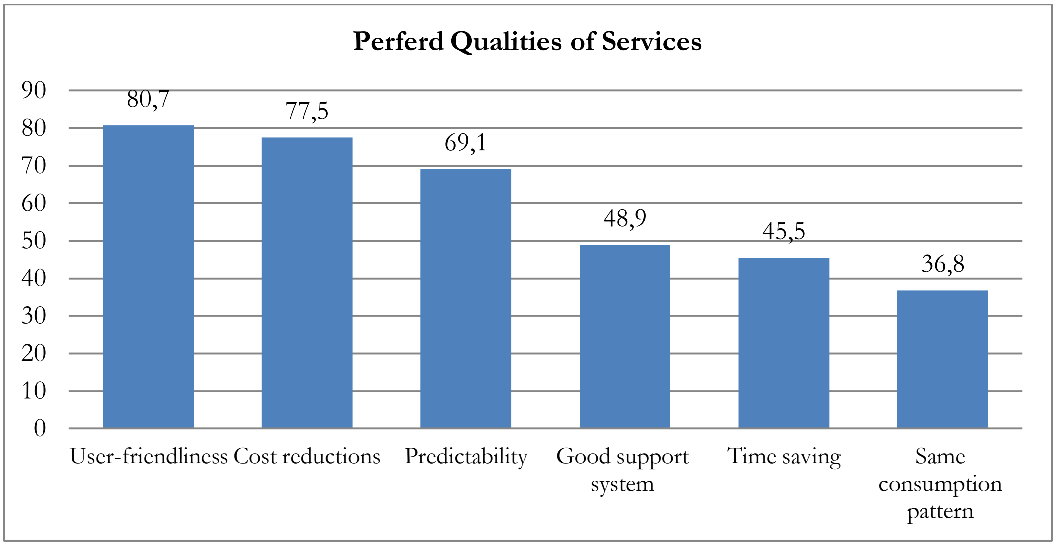


Figure 15: Preferred service qualities

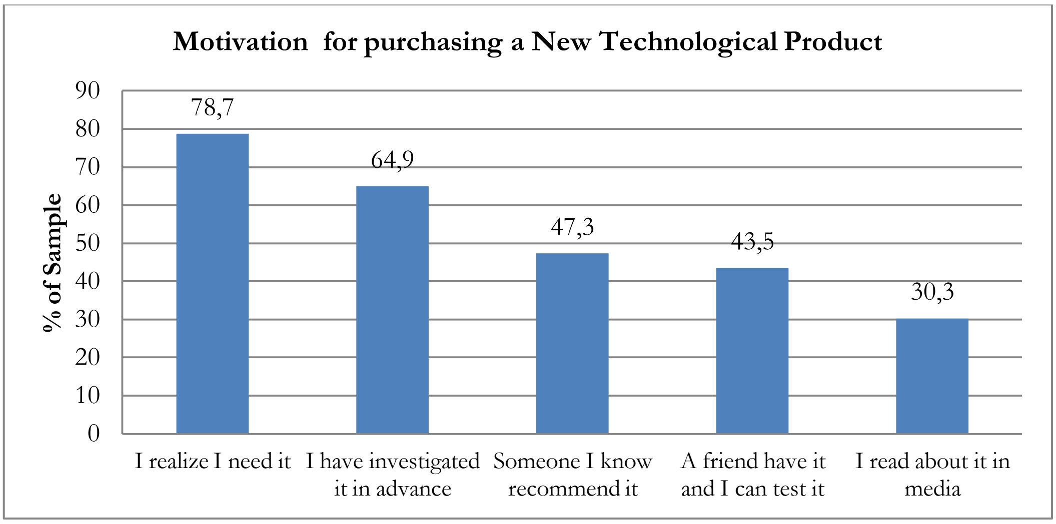


Figure 16: Motivation for purchase

6.2.2 Energy Price Awareness – Why do the consumer Swap Power Supplier?

The results highlight that 65.3% of the respondents are paying attention to the development of electricity prices. In total, 33.9% of the respondents have changed their power supplier within the last five years, and today 19.0% are considering doing the same. The main reason for changing the power supplier is price driven (77.7% agrees). Other suggested reasons are environment profile, service offers, reputation, and more predictable electricity bill, all which did not matter as much. The type of electricity payment varies and most of the respondents are paying a variable price (39.7%). Remarkably, 17.4% do not know what kind of payment type their household has.

6.2.3 Knowledge and Associations to the Smart Grid Concept

In general, the respondents do not know much about Smart Grid. The evaluation of their own Smart Grid knowledge is listed in Table 14, illustrating that 47.8% have not even heard of the term before. In fact, some of the participants believe that Smart Grid is the same as Smart Meters. In Table 14, the population from Demo Steinkjer is excluded in the numbers because they are part of a Smart Grid demonstration project, and therefore not representatives of the average Norwegian. In fact, 19.8% of the Demo Steinkjer population responds that they have much knowledge about Smart Grid.

Level of knowledge	Frequency	Percentage [%]
Much knowledge	19	4.2
Some knowledge	81	17.8
Have heard the term before	137	30.2
Have never heard the term	217	47.8
Total	454	100.0

Table 14: Knowledge to Smart Grid

The sample has both positive and negative associations towards Smart Grid. Positively, they generally believe that Smart Grid technologies have the ability to provide consumers with better management of electricity consumption in terms of more detailed information and better overview of their electricity costs. The negative associations are connected to the fear of higher costs, technical breakdown and that the power supplier will enter what they consider their private area, and gain more control in the supplier-customer relationship. Negative and positive associations to the term are quoted in Table 15.

Smart Grid associations	
Positive associations	**Negative associations**
Optimization of network utilization	Virus and hacking issues
Flexible usage, distributed production, improved security of supply	The power companies take advantage to earn more money from their customers in a smart way
Better customer service	Unnessecary social costs
Environmental friendly, resource-saving, plus customers	Power suppliers get free access to my consumption pattern whether I want it or not

Table 15: Quotes from the responses when asked about Smart Grid associations (translated from Norwegian)

6.3 Are There Links Between the Interest in One Smart Energy Service and Another?

6.3.1 Service Interest May Be Separated in Four Groupings

To investigate if consumers are interested in purchasing similar, or bundles of services, the Pearson correlation was used to see if there were positive relationships between the interests of different services. Inspecting the correlation matrix revealed the presence of many coefficients of 0.3 and above. (Appendix 5) Thus, a factor analysis was performed to group together the most closely interconnected services as described in 4.4.2.1. This resulted in a grouping of eight services in the scale labeled *Automatic energy services*, three services labeled *Insurance and bundling services*, and two services remaining separate because of their distinct characteristics. The two distinct services are service no 9, *Ability to choose origin of power supply*, and service no 12, *Allowing* *energy companies to overrule electrical appliances in exchange for a reduced electricity price*. It is interesting to note that consumers that want wireless control products also have a high interest in consumption statistics and a service that provide preset room temperature for a fixed price.

The two service groups are listed in Table 16 with corresponding factor loads and Cronbach's Alpha. From the table one may observe that most of the services have quite strong loading, showing that the two factor groups are appropriate for groupings, which also have support in the Cronbach's Alpha.

Service groups			
Service no	**Description**	**Load**	**Cronbach's Alpha**
	Automatic energy services		
6	Local wireless control of home appliances	0.846	
5	Remote control of home appliances	0.767	
2	Automatic time control of heating systems in the household	0.753	
8	SmartPhone accessories to play around with light, sound, heating and other home appliances	0.749	
7	Home appliances that automatically start when the electricity is cheapest (i.e. Dishwasher)	0.711	
3	History statistics on personal power expenses	0.711	
1	Security features for electrical home appliances (i.e. automatic shutdown if security threat)	0.706	
11	Preset room temperature for a specified time period	0.661	
			0.881
	Insurance and bundling services		
14	Insurance against high power prices	0.606	
15	A service deal that includes both insurance and power supply	0.589	
10	Bonus point offerings based on energy efficiency	0.387	
			0.861

Table 16: Service groups

6.4 The Effect of Demographic and Behavioral Criteria on consumer Interest for Purchasing Services

The following sections presents the results from the exploratory study of correlations, one-way ANOVA and multiple regressions investigating the effect of (1) demographic factors, and (2) behavioral criteria on service interest.

6.4.1 Which Demographic and Behavioral Factors Are Positively Related to Service Interest?

To examine the relation between service interest and demographic/behavioral factors the Pearson correlation was again tested in SPSS (4.4.2.2). Table 17 reveals many medium and large correlations between Smart energy services interest and the independent variables. In particular energy price curiosity, energy price sensitivity, technology adoption, and environmental friendliness have moderate levels of positive correlations to seven services or more. In Table 17, the two service groupings are marked as A, Automatic energy services, and B, Insurance and bundling services.

6.4.1.1 Energy Price Curiosity is Strongly Correlated to Service Interest

The strongest correlation found in the data set is given as interest for energy price information, which means that the respondent has an interest in having an overview of his own historical energy consumption, as well as an overview of energy consumption compared to his average neighbors, as listed in Table 9. Naturally, this scale has a large correlation to price information related services; however, it is an interesting finding that interest for wireless control services and automatic fixed-time control of heating systems also has a strong relationship to energy price curiosity.

Moreover, the preliminary propositions suggest that increased technology adoption will have a positive correlation to service interest. This turned out to be verified with medium to high levels of correlation. It is in particular the SmartPhone accessories and wireless control services that appeal to the technology adoption. Also environmental concern was deemed to have a positive effect on service interest, and it appears that also this is supported by the data. Looking at Table 17 it is clear that people with high environmental interest are very interested in the possibility of a service that ensure origin of supply.

Moreover, knowledge to Smart Grid does not have a relationship to service interest. In fact, one of the most prominent premises towards behavioral criteria was that with increased knowledge, there will be a tendency for increased service interest. However, no significant relationship was found in the sample data, and consequently the link between knowledge and service interest is discarded.

6.4.1.2 Age is Positively Correlated to Service Interest

The test on correlations yielded significant results for birth year. It is apparent that decreasing respondent age, as for the technology scale, has a positive effect on the interest for purchasing (1) SmartPhone accessories allowing for amusement with light, sound, heating and other home appliances, (2) online monitoring of energy consumption and (3) wireless control services. This may be due to that the younger population of the sample has more familiarity and interest in IT intensive services and wireless control.

Pearson Correlation Matrix																	
Service no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	A	B
Demography																	
Birth year	.174**	.223**	.151**	.333**	.272**	.266**	.156**	.371**	.222**	.199**	.161**		.262**	.087	.098*	.304**	.154**
Education		.126**		.126**													
Annual household income																	
Behavioral Criteria																	
Technology adoption	.289**	.224**	.331**	.361**	.379**	.418**	.326**	.515**	.134**	.245**	.277**	.283**	.321**	.231**	.280**	.482**	.304**
Environmental friendliness	.262**	.345**	.269**	.340**	.163**	.178**	.267**	.118*	.653**	.129**	.217**	.234**	.279**	.203**	.222**	.303**	.226**
Knowledge to Smart Grid		-.115*	-.126**	-.092*	-.105*		-.142**	-.111*		.091*		-.119**		.126**		.116**	-.094*
Energy price sensitivity	.338**	.279**	.318**	.226**	.350**	.409**	.242**	.302**		.341**	.395**		.245**	.476**	.334**	.470**	.462**
Energy price curiosity	.433**	.482**	.612**	.613**	.498**	.567**	.476**	.568**	.415**	.360**	.408**	.333**	.371**	.346**	.334**	.692**	.429**
External control approval	.186**	.288**	.211**	.288**	.192**	.263**	.410**	.189**	.205**	.243**	.333**	.578**	.181**	.149**	.202**	.355**	.238**
Customer data[1]	.321**	.233**	.221**	.375**	.199**	.326**	.247**	.217**	.138**	.220**	.149**	.258**		.094*	.124**	.327**	.175**
Electric car[2]	.198**	.252**	.215**	.249**	.255**	.149**	.246**	.186**	.293**		.159**	.107*	.190**			.294**	

Table 17: Pearson correlation matrix. Sign. ** $p < 0.05$, * $p < 0.10$. For complete matrix with all correlations included, refer to Appendix 6.

[1] Confidence in professional customer data treatment

[2] Interest in buying an electric car as car no 2

6.4.1.3 Retirees State They Are Less Interested in Automatic Energy Services

T-test and one-way ANOVA were used to test if there were significant differences in service interest between different categories of (1) housing type, (2) gender, and (3) work status. The test was performed on the service groupings, and the individual services.

The results show that there is only a statistical significant difference in service interest between students and retirees, as well as full-time employees which had a mean difference of 0.9-1.0 on a scale from 1-7. This result may support the positive correlation between decreasing age and high service interest. Table 18 shows the other numbers from the one-way ANOVA analysis.

Demographic test variable	Grouping variable/factor				
T-test		**Mean difference**	**p <**	**t**	**Std. error**
Gender	Automatic energy services	.005	.969	.039	.125
	Insurance and bundling services	.119	.366	.905	.132
	Let energy companies control electrical appliances in exchange for a reduced electricity price	- .277*	.087	- 1.716	.162
	Ability to choose origin of power supply	.711**	.000	4.467	.159
One-way ANOVA		**Mean difference**	**p <**	**F**	**Std. error**
Work status	Automatic energy services		.004	3.534	
	Student - retiree	.989**	.006		.277
	Full-time employee - retiree	.873**	.021		.279
	Insurance and bundling services		.617	.708	
	Let energy companies control electrical appliances in exchange for a reduced electricity price		.970	.180	
	Ability to choose origin of power supply		.025	2.600	
Housing	Automatic energy services		.268	.1.304	
	Insurance and bundling services		.237	1.388	
	Let energy companies control electrical appliances in exchange for a reduced electricity price		.369	1.074	
	Ability to choose origin of power supply		.001	4.957	
	Single house – apartment	- .748**	.001		.188
	Single house – bedsit	- .849**	.045		.306

Table 18: One-way ANOVA and t-test of demographic categories

6.4.2 What Are the Key Demographic and Behavioral Predictors of Service Interest?

To further investigate the relation between interest in purchasing services and demographic and behavioral factors, multiple regression was applied in order to see whether it is possible to predict service interest based on behavior and demography. The models were estimated using stepwise multiple regressions. To ensure a good regression model the demographic and behavioral criteria was inspected for no signs of multicollinearity, as described in 4.4.2.4.

6.4.2.1 Energy Price Curiosity is the Strongest Predictor for Service Interest

The results show that both birth year and each of the behavioral criteria make considerable contribution to predicting service interest. Looking at Table 19, it is clear that energy price curiosity are particularly decisive for service interest, and that this factor makes an important contribution to predicting whether a person will be interested in one of the particular Smart energy services. In addition to information related services, energy price curiosity is the strongest predictor for wireless control and automatic control systems at home.

The analysis also supports the correlation findings on technology adoption, environmental consideration, and energy price sensitivity as strong predictors. It is particularly to note that a person interested in purchasing the most popular service, *Security feature for electrical home appliances (i.e. automatic shutdown if security threat)*, may also be identified as sensitive to energy prices, having relatively high level of trust in proper handling of customer data, and that the person care about environmental friendliness and energy information.

6.4.2.2 Company Trust is an Important Predictor for Interest in Demand-Response Services

Also whether you trust energy companies to control your home appliances have a strong deterministic effect. What may be interesting to note for the importance of company trust is that in addition to being a strong predictor for Security feature for electrical home appliances, this is a strong predictor for who is interested in local wireless control and letting energy companies overrule electric home appliances. Accordingly, a result may be interpreted to be that trust in energy company professionalism is important to implement demand response systems.

The results from the linear regression may be found in Table 19. The implications of these results will be further elaborated in the Discussion chapter.

Stepwise Multiple Regression of Service Interest																	
Service no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	A	B
Regression model parameters																	
R^2	.303	.328	.374	.468	.341	.464	.311	.459	.494	.248	.324	.382	.236	.275	.191	.648	.338
Adjusted R^2	.288	.311	.371	.457	.324	.448	.304	.451	.484	.232	.310	.372	.221	.268	.178	.635	.324
Std. error	1.397	1.390	1.294	1.317	1.584	1.286	1.495	1.457	1.260	1.588	1.397	1.395	1.556	1.416	1.437	.788	1.158
								Beta [β]									
Demography																	
Birth year		.169***		.173***	.149**	.162***		.241***	.128**	.196**	.155**		.229***			.165***	.166***
Education																	
Annual household income																	
Behavioral Criteria																	
Technology adoption					.170**	.172***		.320***				.136**	.188***			.173***	
Environmental friendliness	.162**	.210***		.125**					.590***				.238***	.220***	.190***		.174***
Knowledge to Smart Grid									-.111**								
Energy price sensitivity	.280***	.198***			.189***	.272***				.361***	.354**		.202***	.484***	.346***	.296***	.479***
Energy price curiosity	.186**	.226***	.612***	.472***	.268***	.245***	.394***	.361***	.177***		.128*	.129**				.331***	
External control approval		.188***				.121**	.302***			.224***	.320***	.520***			.163***	.188***	.219***
Customer data[1]	.266***			.208***		.206***				.139***						.149***	
Electric car[2]					.145**											.105***	

Table 19: Stepwise multiple regression analysis. Sign. ***p<0.01, **p< 0.05, *p<0.10 [1] Confidence in professional customer data treatment [2] Interest in buying an electric car as car no 2

6.4.3 Which Behavioral Criteria is the Strongest Predictor?

In order to verify which attitudes are particularly important for service interest structural equation modeling was developed using AMOS 20. The model was estimated using maximum likelihood (4.4.2.5).

To create the model the service factors, Automatic energy services and Insurance and bundling services, were used along with the two separate services. Figure 17 illustrates the model calculated in AMOS, including standardized regression weights and significance level. In this model, Smart Grid knowledge, confidence in professional customer data treatment and the interest in electric cars, were not included, as the effect were not significant at a 0.05 level. For the same reason only birth year from the demographic factors is included. In the figure, regression weights less than 0.15 are left out of the model, even though they are significant. For the complete AMOS model, refer to Appendix 7.

From the model one may observe four main effects; (1) price sensitivity affects the interest for the two services groups Automatic energy and Insurance and bundling; (2) information seeking behavior indicate a consumer is interested in Automatic energy services, (3) propensity to allow energy companies control the power supply of electrical home appliances determines the performance of the demand-response service; and (4) it is only the environmental-friendly that is interested in origin of supply services. However, Automatic energy service interest is the dependent variable that is best explained in the model. Information seeking behavior has an evident high effect on interest for these services, and should therefore be noticed.

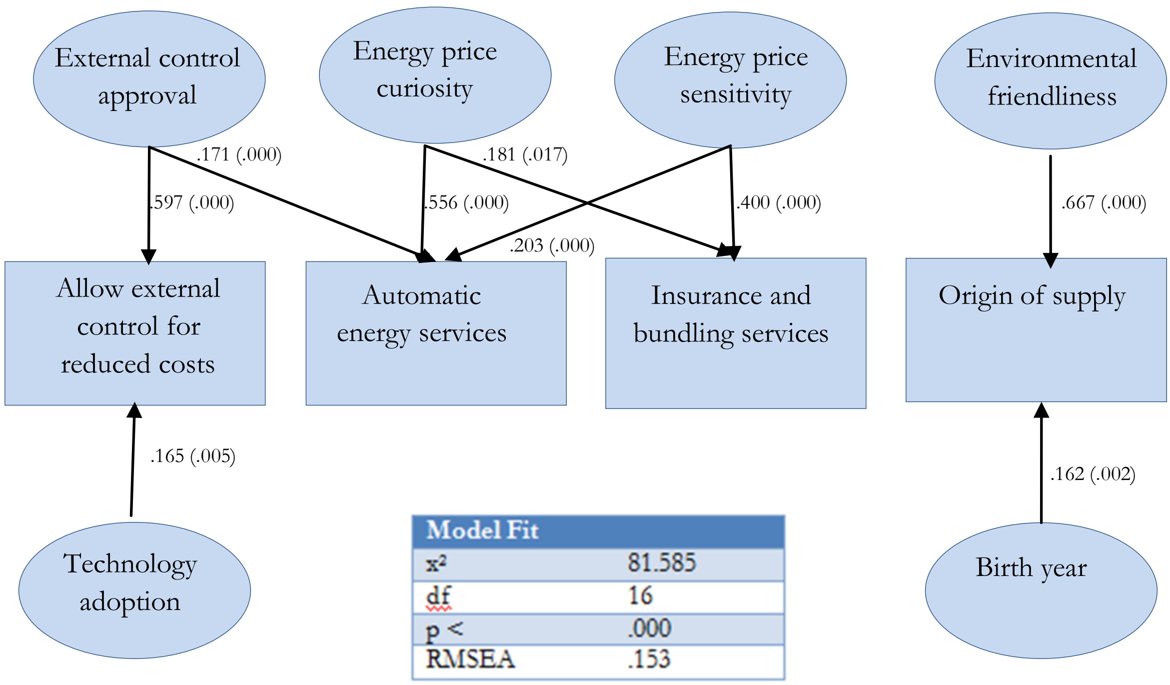


Figure 17: Structural equation model

6.5 Tests on Distinct Group Classifications

6.5.1 Is the Sample Heterogeneous in Terms of Service Interest?

To better understand and support the implications of the regression analysis, a cluster analysis was used to see if separate clusters would provide clearer answers to what is the most important determinant of service interest. The cluster analysis was also applied to investigate whether it is possible to divide the sample into separate groups with different levels of service interests, which refer back to proposition P3 (3.4.3). In doing so, the recommendations of Field (2009) are followed, emphasizing the importance of using different analytical techniques to reap the benefits of several methods. K-cluster analysis was applied, and the clusters were created based on the service scales Automatic energy services, Insurance and bundling services, and two individual services. For further insight on how the k-cluster method was conducted, refer to 4.4.2.6.

6.5.1.1 The Sample May Be Divided into Four Subgroups Based on Service Interest

The population may be divided into four distinctive clusters that are recognized by considering interest for different Smart energy services and comparing final cluster centers. The largest dissimilarities for interest are between cluster no 2 and cluster no 4, as illustrated by Table 20. It is notable that there are three groupings with a generally high, medium and low interest in purchasing services, whereas cluster no 1 illustrate that there is a clear contrast in the interest for one of the services compared to the others. The complete numbers on the final cluster centers and distances between cluster centers are listed in Appendix 8.

Final cluster centers illustrating the mean service interest				
Cluster no	**1**	**2**	**3**	**4**
Cluster size	98	128	158	107
Automatic services	Medium	Medium	Medium	High
Insurance and bundling services	Medium	Low	Medium	High
Allow energy companies to control electrical appliances in exchange for a reduced electricity price	Low	Low	Medium	High
Ability to choose origin of power supply	High	Low	Low	High

Table 20 Final cluster centers

6.5.2 What Are the Characteristics of Residential Consumers with Different Levels of Service Interest?

In order to understand what distinguish the different clusters from one another, the demographic and behavioral characteristics of the four groups were tested using descriptive statistics. Also one-way ANOVA was applied in order to determine if there are significant differences in demographic and behavioral criteria between the different groupings, which turned out to be positive. Figure 18 summarizes the main cluster characteristics based on the final cluster centers and descriptive statistics shown in Table 21, Table 22 and Table 23. The cluster analysis is shown in form of mean values.

Cluster Statistics – Mean of Demographics and Behavioral Criteria				
Cluster no	**1**	**2**	**3**	**4**
N interval	[94,98]	[113, 128]	[143,157]	[98, 107]
Demograpic factors				
Birth year	1974	1964	1970	1973
Education	3.13	2.97	2.76	2.96
Annual household income	2.61	3.03	2.99	2.93
Behavioral Criteria				
Technology adoption	3.67	3.54	3.93	4.51
Environmental friendliness	5.09	3.36	3.79	4.93
Knowledge to Smart Grid	1.78	1.91	2.11	1.94
Energy price sensitivity[1]	4.86	4.57	4.75	5.22
Energy price curiosity	4.92	3.81	4.64	5.54
External control approval	2.69	2.24	3.39	3.84
Customer data[2]	4.30	3.93	4.52	4.76
Elcar[3]	4.02	3.18	3.51	4.03

Table 21: Cluster statistics [1] **N = [50, 54]**
[2] **Confidence in professional customer data treatment**
[3] **Interest in buying an electric car as car no 2**

Cluster Statistics - Motivation for purchasing a new technological product				
Cluster no	**1**	**2**	**3**	**4**
N interval	[95, 98]	[116, 118]	[146, 149]	[99, 101]
Motivational factors				
I realize I need it	5.54	5.14	4.95	5.49
Read about the product in media	3.63	3.36	3.85	4.40
Investigated the product in advance	5.10	4.51	4.77	5.26
A friend have it and I can test it	4.41	3.78	4.18	4.78
Someone I know recommend it	4.35	3.74	4.30	5.05

Table 22: Cluster motivation for purchasing a new technological product

Cluster Statistics – Mean of wanted service properties				
Cluster no	**1**	**2**	**3**	**4**
N interval	[97, 98]	[118, 119]	[150, 151]	[103, 104]
Properties				
User-friendliness	5.73	4.97	5.15	6.09
Time saving in everyday life	4.30	3.57	4.27	5.34
Predictability	5.22	4.28	4.74	5.78
Sustaining the same pattern of consumption as before	3.90	3.68	3.85	4.58
Cost reductions	5.54	4.82	5.20	5.99
A good service support system backing up the service	4.63	3.77	4.22	5.25

Table 23: Cluster preferences for service properties

6.5.2.1 The Most Attractive Group of Consumers Are Information Seekers and Price Sensitive

Figure 18 lists the main traits of the different customer groupings. Cluster no 4 stand out because of their positive attitude towards Smart energy services. Examining cluster 4 consumers more closely, their income levels imply they have sufficient capability to pay for Smart energy services to form a target market. Moreover, their information seeking behavior implies that many innovators and early adopters are likely to belong to this group.

Cluster 1 - **The green profile**	These consumers prefers green options, and households that are environmental friendly belong in to this group. They would like to purchase services that may guarantee that the energy originate from a green source. This group is also interested in energy information. and companies to control their home appliances in exchange for reduced prices.
Cluster 2 - **The older generation**	Cluster no 2 are older people with little interest in buying Smart energy services. They are fairly price sensitive. Moreover, residential consumers belonging to this groups is highly unlikely to deassign control and allow energy companies control their home appliances in exchange for reduced power prices.
Cluster 3 - **The average Joe**	Consumers in this cluster tend to be medium interested in Smart energy services. If they purchase a service, it would most likely be one of the Automatic energy services. However, a service that provide origin guarantee for energy is the least preferred option, signifying low environmental consideration. Smart Grid is not an unfamiliar term to this group.
Cluster 4 - **The energy interested**	Cluster 4 consumers are interested in purchasing Smart energy services. They favour the Automatic energy services, but are also optimistic to all the other service categories. They are energy information seekers and sensitive to power prices. Like cluster no 1, they do consider environmental friendliness when they make a purchase.

Figure 18: Key findings in the cluster characteristics

As shown in Appendix 9, the motivational factors for making a purchase, as well as product qualities are similar for cluster 4 and the overall sample (6.2.1). What normally influence Cluster 4 to purchase new technological services are recommendations from people they know as well as examining the particular product (Appendix 9). Furthermore, the quality this group is looking for in a new technological service is user-friendliness and everyday cost reductions. However, the results indicate that all the listed characteristics are essential for them, no single trait stand out.

In addressing where Cluster 4 seeks information on new services, test and product experiences well as friends and acquaintance are important information sources. It should also be noted that internet surfing is a substantial aspect, as listed in Appendix 10.

6.6 Key Take-Aways from SPSS Analysis

It is apparent that the questionnaire has revealed an immense amount of valuable marked data. Most importantly, the SPSS analysis concludes that there are distinct factors which influence service interest. The separate methods for data analysis verify one another in supporting the same results; the Pearson correlation coefficient, linear regression model and cluster analysis all distinguish energy price sensitivity and energy price curiosity as the most important predictors for service interest. Moreover, the regression model is solid, having an adjusted R^2 that in average explains 33.5% of the variance for service interest. These results are surprising as it was expected that knowledge to the Smart Grid concept would be a strong predictor of interest.

One must also be attentative to the effect of high and low levels of environmental friendliness confidence in professional customer data treatment, and technology adoption for a few of the services. These are however low in comparison to the effect of price-related predictors. The next chapter will further elaborate the discussion of these findings, and what this may imply for successful Smart energy service launches.

Chapter 7 - Discussion

Discussion

7.1 Introduction

In the following chapter a discussion of the results will be presented, providing a fundamental for strategic recommendations to the reader in the last chapters of the thesis. Based on valuable knowledge provided from a comprehensive survey, extensive interviews, and presented theory the key findings from the interviews and data analysis are addressed. The eight theoretical propositions presented in the literature review are evaluated in order to answer how to best execute launches of Smart energy services. The first section addresses the preliminary propositions; the second discusses the key takings from the SPSS results, and the third is concerned with how the market for Smart energy services will develop due to the market drivers that were uncovered in the industry chapter.

7.2 Discussion of Theoretical Propositions

In this section the reader will be presented the discussion of whether or not the theoretical propositions are supported. Since there have not yet been performed Smart energy service launches in Norway, a proposition have been evaluated to be supported if it has support in the questionnaire results or experiences from industry experts, represented by the interviewees.

7.2.1 Develop Smart Energy Services in Close Coordination with Residential Consumers

A major point of interest for managers is to what extent the customer should be included in the service development process. Both Bremdal (2013) and Holme (2013) report the extraordinary value of input from end users through pilot projects. Including the customer has allowed pilot project teams to perform extensive primary market research, which is essential in order to obtain appropriate feedback and responsiveness to actual demand prior to a launch. Bremdal (2013) elaborate that companies may miss out on the most innovative Smart energy ideas if they do not maintain an active interface with residential consumers. This have support in NSD literature which also point out that consumers' service ideas are more successful and innovative than professional service developers' ideas in terms of originality and user value (Matthing, Sandén and Edvardsson, 2004).

The literature on NSD also emphasize that a company must identify what qualities the customer values in the service or product in order to increase chances of market success (de Brentani, 2001). The survey reveals that the consumers that want to purchase Smart energy services want user-friendliness and simplicity. This suggests that the user interface of a Smart energy service should have a very low degree of technical complexity. As Cooper (2008) point out, this should be identified early in the development process, in order to avoid unnecessary costs and increase speed to market (Cooper, 2008), in addition to increasing user value.

In order to gain feedback and ideas from consumers, it will be beneficial to define a standardized and workable new service development process where customer involvement is a standard requirement of the process. As a part of this process, one should have focus groups and obtain market information well in advance of the market launch through questionnaires. The most beneficial would be to set up generic pilot projects where pre-launch tests, including feedback, may be conducted. However, the other six levers of an effective NSD development process, as outlined in 3.2.2, should not be forgotten.

In accordance with the experiences from pilot project, the empiric data seem to support proposition P1, stating that "*companies that develop new Smart energy services should conduct the development in close coordination with end customers have an increased likeliness to have success with NSD*". However, as no Smart energy services have been launched in Norway yet, there is no empirical evidence supporting P1. However, the market trends give support to P1.

7.2.2 Smart Energy Service Suppliers will Benefit from Being Early Followers

Proposition P2 states "*Companies that want to enter the Smart energy service market must seek to be early followers*". The evident factors that must be evaluated in relation to timing are the substantial barriers to market entry. There are barriers related to infrastructure, knowledge to the Smart Grid concept, regulations and structure of the power sector, NSD competence, supply of hardware, and customer data treatment to mention some. In particular, regulations and infrastructural barriers, in addition to the knowledge barrier signify substantial costs that may decrease the lead benefits of first mover advantages, as described by Lieberman and Montgomery (1988). These were given to be leadership in process technology, buyer switching costs, or a first-lead in superior assets.

Each and every one of the interviewees distinguishes infrastructural barriers as an immense barrier for service pioneers. In order to prepare a smarter transmission grid that supports the delivery of Smart energy services major investments must be made in the existing infrastructure. The type of infrastructure that is envisioned is comparable to that of telecommunication; a network that provides a dynamic platform for development of services, which is structured in three levels containing of (1) infrastructure (grid), (2) hardware and (3) services. This is a great step forward for an infrastructure that are highly vulnerable to security sensitivities, and that are believed to be a natural monopoly. For instance, the power grid is owned and operated by many separate distribution grid operators (2.2.2.1), making it hard to expand the customer base (Holme, 2013). Also Onarheim (2013) and Bremdal (2013) elaborated on how much easier the situation would be for pioneers if the Norwegian grid was consolidated. However, the fact is that first mover will have to overcome these infrastructure challenges, risking much free riding from potential early followers.

Another barrier highlighted by Holme (2013) and Bremdal (2013) is the knowledge barrier. The data analysis showed that only 22% of the sample has a reasonable level of knowledge to the concept (6.2.3), illustrating a low level of knowledge in the common public. This implies that regulators and policy makers also have limited knowledge to the benefits of a smarter transmission grid. Unmistakably, it is not necessary that municipality officials know all the technical language and specification of Smart Grid, however, if the government and municipalities realize the health care potential of automatic services that may be applied in care of the elderly, the government would soon change their attitude about financial support for Smart energy service launch programs (Bremdal, 2013). Many smaller power sector entities do not possess large resources ear-marked for innovation (Gajic and Welde, 2012), and support would most likely increase chances for a successful launch.

Moreover, the results show that service interest, and thus consumer demand, is highly affected by how incremental the Smart energy service is. This is supported by Min, Kalwani and Berry (2006), who imply that early followers are more successful in scaling innovative products to the mass market, which may be explained by uncertainty surrounding the purchase of an innovation (Rogers, 2003). This will be further discussed in section 7.2.5. Consequently, it is therefore essential to devote significant amounts of resources to communication and knowledge campaigns. Early followers may have substantial benefits from the efforts pioneers have been investing in communicating and advertising services to the public.

On the positive side, first movers may experience great advantages from consumer switching costs. If companies are able to establish customer relationships where customers are loyal, there will be a great market barrier for second movers. Each of the interviewees made an example of Lyse Energy and Sogn og Fjordane Energy as pioneers. Lyse Energy is about to launch Smart energy services, and it is considered highly valuable that Lyse Energy is developing launch competencies and processes that will be very valuable experience-based market knowledge to other companies that want to launch services. If Lyse Energy is tactical, they may utilize their position to become service system providers for other energy companies that want to offer their customers Smart energy services. However, Lyse Energy is vulnerable to shifts in consumer needs and delayed resolution of uncertainty related to regulations. One may also expect much trial and error in the start phase of launching for pioneers. At this point, Lyse Energy is in a very blessed situation as they have a large customer base and resources available for innovation and launch incentives, which is not shared by most Norwegian energy companies, which is smaller entities. To conclude, the investment requirements are so immense that being a second follower is still viewed as the most profitable for most Norwegian energy companies. Thus, P2 are supported by the empirical data.

7.2.3 Adopting a Segmentation Approach will be Beneficial

In addressing proposition 3, the cluster analysis indicates that there are differences among the separate segments in connection with age, environmental-friendliness, technology interest, and energy price sensitivity (6.5.1.1). Therefore, according to literature on segmentation it is possible to segment the market (Wind, 1978). This finding agrees with what Bernt Bremdal said, during the interview April 24th 2013, about the market survey conducted by Smart Energy Hvaler; the survey resulted in a segmentation of Norwegian power customers. These findings support that *the market for Smart Energy Services is heterogeneous.*

Furthermore, from the cluster analysis it is seen that the distinct clusters have relative dissimilar desire to purchase services, exemplified by Cluster 1 that stand out for being particularly interested in the service that provide origin guarantee (6.5.1.1). Therefore, it seems reasonable to suggest that recognizing different market segments for Smart energy services is an indication for what kind of services that have the greatest market potential. According to Dibb (1998) being aware of this fact allows managers to evaluate what services will be favorable to launch. As a result they can construct suitable market launch programs to identify; when to launch, which customer channels to use, what payment model and pricing strategy to implement.

However, it is important to be cautious in presuming that certain services do not have potential as there might be latent needs that surveys are unable to capture and new segments can arise in the future. Still, this survey ought to be looked at as a useful pointer to address what services are the most lucrative to launch at the outset.

Thus, the proposition is verified; the market for Smart Energy Services is in fact heterogeneous and realizing the different segments will help construct suitable launch programs.

7.2.4 Targeting Technology Trendsetters will Increase the Success Rate

First of all, one essential theoretical rationale for P4-A; *Companies ought to target the innovator and early adopter segments for Smart Energy Services*, is that innovators and early adopters and do not require a complete solution to their problems. That is, they are willing to tolerate initial glitches and do not require proven applications or totally reliable services (Slater et al. 2007). Smart energy services related to electricity usage will be something completely different compared to only paying for the electricity bill like what has been the case so far in Norway. Therefore it cannot be expected that the first launched solutions will be complete, thus looking at this matter it seem reasonable that the innovator and early adopter segment should be targeted first. Moreover, it allows room to adjust services after some tires and failures in the market when trying to reach the majority. This is beneficial because companies struggle to reach this group of people (Moore, 1991).

Second, Beard and Easingwood (2006) propose through their study that innovators are responsive to the benefits new technology can provide, and also these individuals are known to influence others. The survey data reveals that people rely considerably on friends and acquaintances for information when purchasing new technological devices (Appendix 10). This feature corresponds with the assumed proposition, and hence there are strong data supporting proposition 4A.

In order to decide if people with a high degree of technology adoption are the ones that are most likely to purchase Smart energy services the cluster analysis was examined. The Cluster analysis show that Cluster 4, the group of respondents that is most positive towards new services, they also score high on technology adoption (6.5.2.1). This would instantly suggest that P-4B; *High degree of technology adoption is the behavioral factor that characterizes the people that are most likely to purchase Smart energy services*, is verified. However, what classifies Cluster 4 is that this group of people generally scores high on all behavioral factors. To get more insights, the regression analysis was studied, and showed that technology interest is only one of the aspects influencing purchase interest for several services; however the most important predictor is energy price curiosity (6.4.2.1). As a conclusion technology adoption is not the behavioral factor for service interest, but rather one of the factors, and hence this proposition is not supported by empirical findings.

7.2.5 The More Incremental, the More Interest in a Service

As pointed out earlier, it was interesting to note that Smart energy services that already exists in one form or another gained the most positive response from both the overall sample, as well as the most positive cluster. This may indicate support for proposition P5 "*The more incremental innovation, the more likely end users will adopt a Smart energy service.*" To illustrate, there are given three examples.

First, all the services that received the highest popularity in terms of purchase interest already exist today, or are only incremental innovation to existing services or products. These services are given as the automatic, information and wireless services evaluated. For each of these incremental services, between 38-64% of the sample state it is highly relevant to make a purchase of this service (refer to Figure 14 and Table 13). One may therefore conclude that services consumers are familiar with, have experience with, or may easily relate to are the Smart energy services residential consumers are interested in acquiring. This is in accordance with Rogers (2003), which state that the less uncertainty connected to the innovation, the higher chances for consumer adoption. He proposes that providing customers with sufficient information is critical in order to make customers make a purchase. The adoption or rejection process is a social process in which communication and information are key factors. Accordingly, effective information is just as important as if the service embody properties that outperform competitor's services. Information decreases uncertainty.

Second, services directly related to Smart Grid infrastructure, such as demand-response services, receive medium levels of interest, with a positive response rate ranging from 24-42% of the total sample. These services do not exist in the market today, and have not been tried out in commercial launches previously. They represent an innovation leap in peak load management, where the customer may be involved in the value chain in an entirely new way. Accordingly, these services are less incremental innovations than the automatic, information and wireless services. An example of one of these services is *home appliances that automatically start when the electricity is cheapest (i.e. dishwasher or washing machine)*. This category of service do not exist in residential homes today, however, they are relatively easy to develop on top of existing infrastructure, or a Smart Grid (Bremdal, 2013).

Third, services that are radically new have the smallest popularity. The interest in purchasing these services ranges from 19-32%. Furthermore, the survey results identified that these services have the highest frequencies of respondents stating it is out of the question to make a purchase. One example is the *bundling of power supply with insurance*-service. Another example is bonus point offerings based on energy efficiency. For these bonus points you may free-of-charge, or at a discharge, purchase flight tickets, hotel stays or heat pumps. Energy companies have not delivered service packages of this type before, and people cannot relate to them. They represent radically new business models that have not been tired out in the energy sector before. They represent entirely new relationships between customer and supplier. There is a lot of uncertainty connected to these services. They are radical business innovations, and they score the lowest on purchase interest.

These data observations support that the one most important thing predicting service interest is whether a person has familiarity to a service, thereby giving support to proposition P5. As a result, it is clear that providing sufficient information on services and communicating service benefits will increase the likeliness of consumer adoption, and a successful market launch. The most essential taking from this conclusion is that in order to create a successful launch of Smart energy service innovations it will be crucial to have an effective communication strategy.

7.2.6 Internet is Important to Reach the Customer in a Market Launch

The survey findings quantify that people use internet as one of the main information channels before purchasing new technological services, showed in Appendix 10. Therefore, companies will have advantages in holding official homepages that are easily accessible for the customer.

Another important discovery is that the interview objects also single out online sites as good sales channels (Onarheim 2013; Bremdal 2013; Berntzen and Ødegaard 2013; Holme 2013). However, according to Bremdal (2013) companies will also benefit from using several channels to supplement one another. Traditional information channels have to be evaluated most of all to provide background information and work as value and attitude creators, rather than for advertising. Moreover, when interviewed Bremdal (2013) claim that direct communication, without any form of obligation is pinpointed as a good channel to engage consumers. The survey findings also exhibit that many people will seek for information by looking at tests and product experience for Smart energy services (Appendix 10). In particular, for sales channels, actors that have already established a relation and channels into the customer's home, for example power suppliers, may become dominant (Berntzen and Ødegaard, 2013).

Increasingly, companies are also utilizing user communities to become more involved with customers and to understand their customers better (Osterwalder, 2010 p. 28). Several companies benefited from establishing online communities that allow users to exchange knowledge and solve each other's problems. One present example is for Smart Grid and smart meters; companies from the Netherlands came together and created a common «big blog» to include customers and get feedback (Smart Grid and AMS Conference, 2013).

In general, according to literature review people rely on internet as an information channel (Flanagin and Metzger, 2000). Furthermore, through their study, Flanagin and Metzger (2000) conclude that people consider internet information to be as credible as information from other types of media, such as radio, television and magazines. Together with the empirical findings this suggests that internet is an essential channel to reach the customer for Smart energy services. For that reason this proposition is supported; *in the launch of Smart energy services companies will benefit from using online channels to reach the customer.*

7.2.7 Customer Wishes and Service Characteristics are Important to Provide the Best Payment Models

The foundation for examining if managers should accustom the payment model around the customer; is looking at which payment models have shown to be successful. Especially they ought to consider what kind of payment models others have prospered with, that launched somewhat similar products or services to the distinctive Smart energy services. This is because findings from the interviews and the survey do not provide direct guidelines on how to handle payment models successfully for Smart energy services. Three distinctive types of payment models are evaluated for Smart energy services in order to support or reject the proposition; (1) Free and premium/advertising, (2) long tail, and (3) the lock-in payment.

There is theoretical support that using free and premium or advertising as business models is a good idea for customers that are interested in services that provide them more information (Teece, 2009; Endres, 2008). This has shown to be successful in the past and is beneficial when customers' willingness to pay is low. As pointed out in the 7.2.6 the survey results illustrate that people use internet to search for information, and according to Elberse (2008), today customers expect and are used to receiving information for free. Services such as *History statistics on personal power expenses* and *online service supporting monthly monitoring of a wide variety of home appliances* might be provided through a SmartPhone app with free and premium as a suitable business model. In the past many SmartPhone apps have generated revenues being free to download, but if you want extra features you have to pay for it. If advertisement as a payment model is implemented it should be used as a tool to influence a purchase for another services to generate income (Enders, 2008).

Second, according to Anderson (2006) long tail has shown to be a profitable payment model where targeting the most profitable customer segments for the niche items is a the best solution. This payment model match with the service *Security features for electrical home appliances* because this may require huge investments from the service providers and is probably not easy to implement for many customers at the same time.

Today, several technological launches have prospered with the lock-in principle. Apple's iTunes is a more recent payment model with the same principle. Apple essentially gave away the low-margin iTunes music to lock in purchase of the high-margin iPod (Johnson et al., 2008). Hence, this could be a good idea for services that require both software and hardware. However, when it comes to new energy services the lock-in payment model seem only suitable *for a service deal that includes both insurance and power supply* because of the nature of the service.

Overall, as exemplified here customers do not prefer to pay in one particular way, but this is situation-specific, and therefore the proposition is supported; *when launching Smart energy services companies will have greater chances to succeed if the payment model is accustomed around the customer*. Furthermore, the payment model must be closely coupled with the choice of distribution channels and pricing strategy for a successful market launch.

7.2.8 Price the Services Ensuring Early Return on Investment

The literature review on pricing strategies concluded with proposition P8, stating that "*Successful pricing strategies for Smart energy services are situation-specific; they will be adapted to customer and service characteristics.*" Addressing "situation-specific", the SPSS analysis showed that Smart energy services may be divided in four groupings, as outlined in 6.3.1. The services may be divided further in subgroups of these four. The essential point is that the internal characteristics in these service groupings are distinct from one another in terms of customer needs and preferences, payment model, and required development resources, to mention some. Consequently, the empirical data and the support of P7 indicate that the appropriate prices must be assessed for one and one service. This is discussed in two examples.

First, technical Smart Grid services such as the demand-response service *Allow energy companies to control electrical appliances in exchange for a reduced electricity price* is suitable for a skimming price strategy. A skimming strategy enhances fast return on investment (ROI), as soon as possible, before later adjusting the prices down when competitors enters the market (Calantone and di Benedetto, 2007). Services appropriate for skimming are also the one pointed out as appropriate for the long tail payment model. Another example of a service that may be suitable for this pricing strategy is the Automatic energy service *Security features for electrical home appliances*. Bremdal (2013) and Holme (2013) also signified the importance of early return on investment; the pre-launch development phases connected to these type of services includes significant infrastructural challenges and development costs in trial and error; therefore, it will be beneficial to set high prices and gain as early ROI as possible, in order to survive.

However, considering pricing, theory points out that one should always take residential consumer into consideration, and the price should always correspond to the customers' willingness to pay (Enders, 2008). The questionnaire revealed that a strong predictor for how interested a consumer is in purchasing services is energy price sensitivity. However, this does not directly imply that the services should be priced low. The questions related to this factor instead measure that the consumers wish to purchase Smart energy services in order to reduce energy related expenses. Skimming price strategies is therefore still appropriate for the Automatic energy services, capital intensive demand-response services, and other long tail-based services. Moreover, there is no competition on Smart energy services today, thereby allowing pioneers and early followers to choose the appropriate pricing strategy in a launch setting.

Second, for other services, such as the information or SmartPhone related services that correspond to an advertisement payment model, skimming is not appropriate. The customer expects a certain amount of free services, and accordingly, they ought to be delivered at that level. Based on former research, a smart pricing approach appears to be loss-leader pricing, where a service is offered at a low price to attract customers which in this process successively will be offered more profitable services, such as the long-tail services.

Accordingly, it appears that the empirical data support Indounas (2009), whom highlight that high performing companies develop holistic and multi-faceted pricing approaches that pay attention to distinguishable customer and competition related pricing objectives that are aligned to the value the customer connect to a service. This provides support to proposition P8.

7.2.9 Summary of Propositions

The proposition discussion indicates that seven of the eight theoretical propositions have support in the empirical data. Table 24 summarizes the results of each individual proposition.

No	Proposition	Status
1	Companies that develop new Smart energy services in close coordination with end customers have an increased likeliness to have success with NSD.	Supported
2	Companies that want to enter the Smart energy service market must seek to be early followers.	Supported
3	The market for Smart Energy services is heterogeneous. Recognizing different market segments for the services will help to identify and implement market launch programs that will lead to success.	Supported
4	A: Companies ought to target the innovator and early adopter segments for Smart energy services	Supported
	B: High degree of technology adoption is the behavioral factor that characterizes the people that are most likely to purchase Smart energy services.	Rejected
5	The more incremental innovation, the more likely end users will adopt a Smart energy service.	Supported
6	In the launch of Smart energy services companies will benefit from using online channels to reach the customer.	Supported
7	When launching Smart energy services companies will have greater chances to succeed if the payment model is accustomed around the customer.	Supported
8	Successful pricing strategies for Smart energy services are situation-specific; they will be adapted to customer and service characteristics."	Supported

Table 24: Summary of evaluated propositions

7.3 What Do the Numbers Imply?

Having established which propositions are supported by the empirical findings, in this section the questionnaire numbers are considered from a business perspective in order to assess what they mean for the overall business setting of these services. In particular, this study have unified several elements related to demography, behavioral factors, power consumption statistics, and launch tactics in order to better understand what will make a consumer purchase Smart energy services. However, the large amount of data may make the results difficult to follow. Therefore, what do these numbers imply? Do they give any results that provide clear indices on service potential?

7.3.1 Smart Energy Services Should Be Supplemented by an Energy Price Information Platform

The most important predictor in the stepwise multiple regression model is the factor labeled energy price curiosity. This factor stands out as an important factor for six of the eight most popular services. There is a clear positive link between people that score high on this scale and that state that they are interested in purchasing services. Investigating what energy price curiosity represent, this result shows that people would purchase Smart energy services in order to get control over and maintain predictability of their energy consumption. Moreover, residential consumers appreciate having an overview of their consumption through various information platforms, for instance a SmartPhone application or online account. This is interpreted to mean that consumers appreciate that a Smart energy service is bundled or supported by an energy information platform. This is in agreement with Onarheim's (2013) interview, who states that consumers in the beginning will want to know what they are paying for in a display.

7.3.2 People Want to Buy Smart Energy Services in Order to Save Money

Energy price sensitivity is the most significant predictor for four of the less popular services, such as *bonus point offerings based on energy efficiency* and *preset room temperature for a specified time period*. These consumers believe they have too high power prices, they change their power supplier in order to gain a lower electricity bill, and they seek to reduce their energy cost through purchasing Smart energy services. This is in accordance with the findings Accenture End-Consumer Observatory 2012, in which Accenture map the potential for demand response services in a range of different countries, including Norway (Accenture, 2012). Accenture found that Norwegians are sensitive to power prices. If Smart energy services may be advertised as consumption reducers, there may be a great market in Norwegian residential consumers. Consumers that are price sensitive are more reluctant to buy Smart energy services. It is also price incentives that have created interest among consumers in former demand-response projects (DECC, 2012).

7.3.3 Is A Green Profile Important?

The regression model shows that environmental friendliness is only particular related to the *Ability to choose origin of supply* and *Allow energy companies to control electrical appliances in exchange for a reduced electricity price* services. However, the structural equations model shows that environmental friendliness only has importance for services similar to the origin of supply choice. This is expected, as it is most likely that consumers would prefer renewable energy sources if they had a choice. This indicates that energy efficiency is not the priority of Norwegian residential consumers, and should not be a priority when identifying a target group for Smart energy services. The key features are price reduction and information, not energy efficiency or environmental friendliness. However, it was interesting to notice that people with interest in purchasing an electric car as the second car was also interested in Smart energy services. This does not however imply that consumers with a green profile are interested in Smart energy services, as economic benefits, and not environmental consideration, have shown to be a great motivation also for electric car purchases (Hildonen, 2013). However, the results on the questions from el-car interest were not included in the results, as this is outside the scope of this thesis.

7.3.4 Knowledge to Smart Grid Technology Does Not Matter

High levels of knowledge to Smart Grid technology was prior to the empirical data collection believed to be a strong predictor for service interest. It is interesting to note that this assumption is discarded by the data. There is not even a link between Smart Grid knowledge and the interest for demand-response services. This may imply that people are not interested in understanding the system that lies behind the delivery of the service; they only want to relate to an easy and user-friendly interface. These results are supported by each of the interviewees. They elaborated that people cannot relate to technical language, and stress that having simple solutions will be essential for the first launches of Smart Grid services.

7.4 Perspectives on Impending Smart Energy Service Development

The following section presents a perspective on the future development of Smart energy services based on the overall research findings. This is briefly discussed in three sections looking at (1) what is considered to characterize the companies that will succeed with market launches, (2) which services will be present in the future market, and (3) the time perspective.

7.4.1 Participating in Value Networks and Branding Energy Companies as Service Providers Will Be the Future Agenda

The Norwegian power sector is facing a substantial reduction in energy prices (Bremdal, 2013; Onarheim, 2013; Berntzen and Ødegård, 2013). This provides power suppliers with a great motivation, or requirement, to generate revenue from other sources than traditional power sale. Simultaneously, consumer services are shown to be an unrealized goldmine in the value chain. Accordingly, power suppliers are expected to develop towards more diversified technology providers with an increasing range of services.

Companies that are good at (1) establishing an interdisciplinary value network, and (2) labeling themselves as service providers will take the largest market share (Bremdal, 2013). First, the value network will be essential because services that require competences from multiple industries will set competition in motion in entirely new arenas. To understand what is meant with a value network one may draw parallels to what happened in the telecommunication industry. In telecommunications, that market drivers, such as need for globalization of capital flows and trade, created demand for new information and communication services (Wellenius & Stern, 1994). Thus, driven by technological innovation and growing demand, there was a turn-around in the structure of the telecommunication sector that resulted in liberalization and privatization (Wellenius and Stern, 1994 p.3). These major changes formed a market structure of three layers; infrastructure (products, grid), hardware, and services on the platform of the infrastructure, as illustrated in Figure 19. Now the transportation grid is partly monopolized, while the competition is free between providers of services and hardware (Gajic and Welde, 2012).

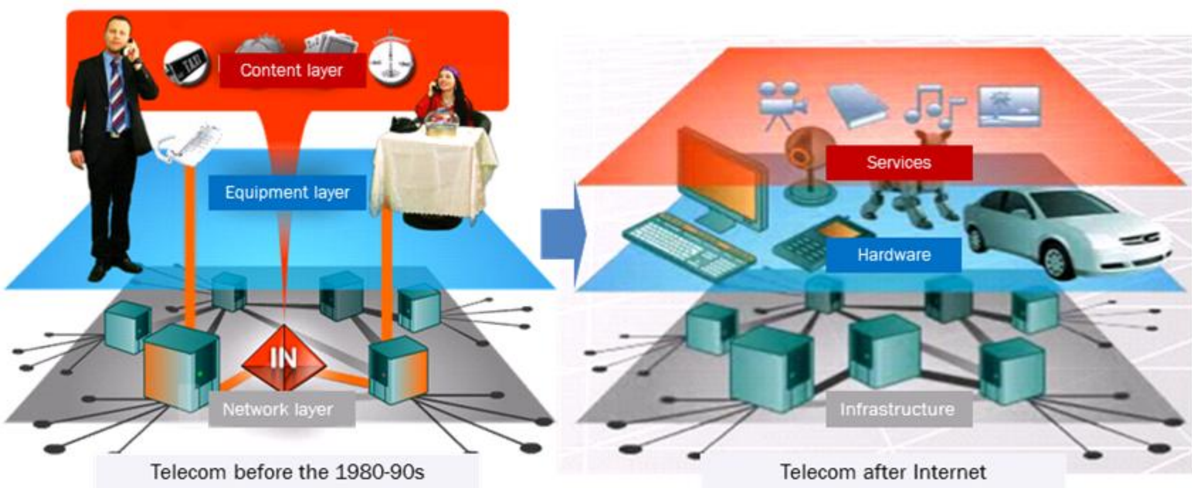


Figure 19: The transformation of the telecommunication industry. Adapted from Flydal (2011)

The power sector is in such expected to move from a traditional value chain, to a value network where the main focus is not to own the services, however to dispose the infrastructure. Thus, infrastructure owners may invite others to participate in the network within the framework of service delivery, beneficially as third party participants (Bremdal, 2013). Thus, it will be required with commitment and competence from various industries such as ICT, energy and financial institutions. This may be illustrated by regarding Lyse Energy which have both telecommunications and energy as business areas. Lyse Energy will probably be the first Norwegian energy company to launch new consumer services the fall of 2013 (Holme, 2013; Onarheim, 2013). Second, companies that are good at branding themselves as service suppliers and that have realized that effective communication is almost as important as the service offer itself will be the energy companies that succeed with new services in the long run.

Moreover, it is the power sector that will have firsthand access to consumer data through Smart Meters (Onarheim, 2013), and hence this sector is well suited to offer most Smart energy services. In general, Norwegian energy companies have a great potential to succeed with launches of Smart energy services. But in order to do so they will have to recognize the required service strategy and manage the transition that is required. To summarize, to exploit the value of the services they need to obtain an interdisciplinary commitment as well as establish and maintain close customer interaction. Moreover, they must possess competencies within innovation and ICT leading up to a launch. The power sector will probably see an increased rate of consolidation of energy companies which will facilitate innovation due to larger amount of resources. More resources will allow companies to focus on business innovation besides core competences. If this happens, they will realize the huge profit potential of launching new services (Onarheim, 2013).

7.4.2 Services of Unexpected Character Will Enter the Market

Supported by the new infrastructure, new services with an unexpected character will enter the market, providing a broad range of different customer solutions through new business models. Examples of services is bundled energy offers, such as paying for utility together with travel, health care, alarm system, telephone, or insurance. This is a likely outcome when studying the success of other bundled services in today's marked. Take SmartPhone for instance, this is a product that provides both internet and telephone through one product. Essentially, what is expected is that no one is going to pay for just kilowatthours anymore (Onarheim, 2013). Rather, customers will purchase comfort packages with different characteristics according to what fit their wishes. To define what type of packages that will arise, customer segmentation will be indispensable. Some of the examples Accenture (2012) suggest are packages for people that are environmental friendly, want to save time, or wish to live in luxury.

The first services to be launched will be incremental services. The survey results support this statement, revealing that the more incremental a service is, the more willing individuals are to purchase the service (6.2.1). Moreover, Smart Home services that already exist to some extent will be among the first services to be launched. For example, Lyse Energy is launching Smart Home services this autumn (5.5). The authors believe the results of incremental services will be decisive to when the adoption of more radical services will take place as these services will work as a gateway to enhance the interest for more complex service offers. Also, companies will have to prove itself as a good energy service provider before successfully investing in innovative services.

7.4.3 Customer Adoption of Smart Energy Services Will Accelerate Rapidly

When discussing launch timing it was highlighted that the time to move is now, as an early follower. This conclusion is based on empirical research from other industries investigated in the literature review, but also because it is expected that acceptance of Smart energy services will accelerate more rapidly than what one may predict. In accordance with earlier research on the adoption cycle of technological services (Rogers, 2003), the market adoption curve of Smart energy services is expected to follow the path of Figure 20 (Gajic and Welde, 2012). The principal learning from Figure 20 is that actors that want to participate in new services must be positioned before the industry hits position 1.

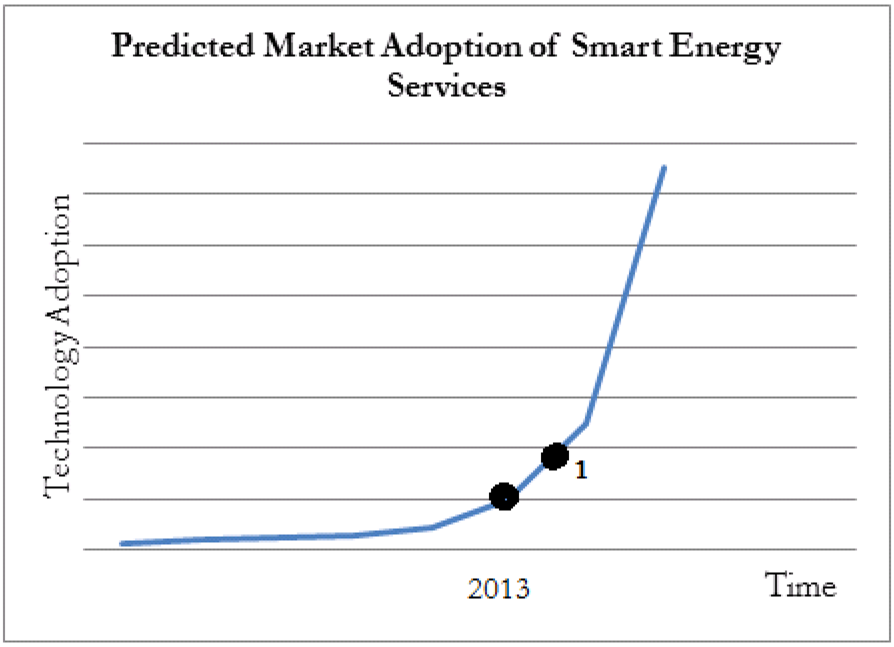


Figure 20: Predicted market adoption of Smart Energy Services

Chapter 8 - Implications

Implications

8.1 Introduction

The findings presented in this dissertation have implications for business practitioners, policy makers, and future research. In particular, this study is of importance for managers that wish to, or are in the process of launching Smart energy services. The following section will present the most important implications for stakeholders.

8.2 Implications for Management

The data collection, analysis and discussion all have a managerial approach to the problem statement, hoping to provide managers with empirical evidence of the effect of behavioral and demographic factors on the adoption of Smart energy services, and thus how to conduct a launch. It is however emphasized that launch performance is highly variable under any condition, and no particular strategy may guarantee success. However, with reference to the findings in the discussions chapter, this section highlight success criteria that will increase the likelihood for successful launches.

8.2.1 Adopt a Multi-Faceted Approach to Market Launch

First, when launching a Smart energy service, managers must ensure that the service concept is aligned with customer preferences and creates value for the customer. A shift of focus from technological solutions to also prioritize end user exploitation must be firmly rooted with top management. Well in advance of the market launch consumers should be used to identify if long-tail, advertising, or free-as-premium payment models should be used for the specific service. Second, if managers want to participate in this market, they should launch within the coming year and a half, and be an early follower after Lyse Energy. Third, the market for services is heterogeneous, thus managers should target specific market segments. Innovators and early adopters should be targeted. Not for their technology interest, however because of their ability to influence others to purchase Smart energy services. The results show that residential consumers are resilient to purchase products recommended by others, and innovators and early adopters will thus work as an entry to wide scale adoption in the mass market. Extensive communication campaign will further increase service sales. Pricing should ensure early return on investments.

It is in particular information and segmentation which is distinguished as the most essential success factors for a launch today. Thus, the management implications are elaborate for these two factors.

8.2.2 Focus on an Efficient Communication Strategy

For the situation as it is today, focusing on an efficient communication strategy is essential for maximizing the probability for success. That is, the results found that familiarity to services is very critical for the interest in purchasing services. Consequently, a proficient communication strategy when launching is necessary for ensuring that customers are knowledgeable about the benefits of the new services and that it achieves a high presence in the marketplace. The communication strategy needs to be effective in reaching and engaging consumers by building brand awareness and customer loyalty to drive sales. In particular, it is important that energy companies market themselves as proficient service suppliers since this is a new role of energy companies. This is vital in order to position the new offering, and to provide a clear message by which customers can identify the company brand as a service company. Moreover, investing in channels for communicating to the end user is essential; the results imply that product tests and online sites are the most important channels to deliver information. Basically, information and communication needs to be applied to reduce risk averse behavior related to the unfamiliarity of the services.

8.2.3 Target Specific Market Segments – Information Seekers

Second, manages need to segment the market in order to plan a suitable communication strategy. This in because segmentation leads to a better understanding of customers, allowing greater responsiveness in terms of the service offer, and more effective resource allocation. The findings reveal that the market for Smart energy services is heterogeneous, and as a result choosing which segment to target will help develop better marketing campaigns that match particular customer groups. Likewise, after segmenting, managers ought to follow a carefully planned market launch program for increasing the likelihood of success.

8.3 Implications for Policy Makers

Policy makers should set regulations that initiate innovation in the energy industry. Essentially, the directorate plays a central role in encouraging research and development and can facilitate innovation.

8.3.1 Provide Predictable Regulations and a National Strategy

In particular, it is important that NVE set the agenda and provide predictable regulations, different than what has been done for the implementation of Smart Meters. For Smart Meters the distribution systems operators were first obligated to finish the installations before 2017, but now the roll-out have been postponed to 2019. For this matter they should prioritize to create a national strategy for Smart Grid, and start defining rules and regulations. This will be of great importance because this facilitates an increased Smart Grid focus from industry actors, also to opportunities in services. Clear and distinctive long-term goals need to be determined, while at the same time avoiding strict regulations that make it difficult for companies to operate in a good way. This will enable energy companies to become more dynamic and perhaps to develop new services.

Moreover, in the case of information and data safety, precise regulations for the handling of new customer data and decisions on who will get access must be set as soon as possible. A Smart Grid is highly vulnerable to security threats. This should be managed before a full scale market launch of Smart energy services. In particular, information safety towards end customer must be prioritized, as this has shown to be one of the concerns of various stakeholders.

8.4 Implications for research

The literature that examines service launch is still fragmented. It is also an absence of quantifiable evidence about the impact of segmentation on the performance for companies.

8.4.1 Expand the Empirical Research Base on Service-Specific Launch Criteria

As a starting point for research, it is important to expand the literature on successful market launch of new services that stretches across a wide range of disciplines. Today there is a great focus on the financial and ICT sector, and more is found about product launches rather than services. The increasing role of many partners in innovation and networks makes the complexity even greater and call for further research. Thus, interdisciplinary market launches of services need to be given higher priority to help practitioners identify what strategies and business models are the most essential for a market launch.

8.4.2 Provide Empirical Research Outlining the Practical Impact of Segmentation on Launch Performance

For segmentation one of the most essential concerns is that there is a gulf between academic literature and practitioner needs because academics have different focus areas than practitioners. A small amount of research has dealt with the question of segmentation success or failure. Especially, there is an absence of quantifiable evidence about the impact of segmentation on the performance for companies. Moreover, the literature fails to consider some of the practical constraints faced by companies that seek to implement a segmentation approach. Further research is desired, particularly this should address whether and how segmentation success can be measured. This means that research delivering quantifiable evidence of the impact of segmentation and the role of success factors must be a priority for the academic study.

Chapter 9 – Concluding Remarks

Concluding Remarks

This research have collected market data and engaged industry professionals to address what energy companies should be prioritizing to conduct a successful market launch of services delivered through a Smart Grid. It has been shown that demand is highly present among Norwegian consumers, and that distinct behavioral characteristics may be used to understand, and occasionally predict, the level of interest in Smart energy services. This research may therefore provide managers with an empirical foundation that aid strategic decisions related to which factors to prioritize under a launch.

It has been shown that the power market is facing radically new opportunities for involving end users, and the trends are moving toward a more customer focused market. Moreover, the Norwegian power sector is facing a future low price market on energy, and there is an enormous incentive for energy companies to rethink power sale. Power suppliers need to understand they cannot proceed as usual with old routines and maintain the same market position as the energy market will be increasingly exposed to market fluctuations. On this accord, the data material demonstrate that there lies a great potential for Norwegian energy companies to create value through implementing new innovative solutions and services targeted on residential consumers.

To conclude, launch tactics are not is not straightforward. However, this study uncovers that recognizing different market segments for Smart energy services is essential to identify the market potential for new services and to succeed with a market launch. There will be risks involved for those wanting to participate in service delivery, however, if attractive customer groups are identified, it will be easier to target the right end users and to adjust a market launch appropriately. Thereafter, it will be beneficial to decide; when to launch, which customer channels to use, and what payment model and pricing strategy to implement. All these factors have shown to be decisive for customer adoption of Smart energy services, in addition to providing simple solutions accompanied with information that is easy to understand. Accordingly, to succeed with a launch of Smart energy service it will be crucial to significant resources to launch with an effective communication strategy.

Bibliography

Bibliography

Accenture,2012. *Actionable Insights for the New Energy Consumer, Accenture End-Consumer Observatory 2012*, [online], Available at: <http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Actionable InsightsNew-Energy-Consumer.PDF>[Accessed 21 November 2012]

Anderson, C. 2006. *The long tail: Why the future of business is selling more for less*, Hyperion.

Avlonitis, G. J. and Kostis, A. I., 2007. An empirical examination of the pricing policies and their antecedents in the services sector. *European Journal of Marketing*. Vol. 41, No. 7/8, pp. 740 764.

BCG, 2010. *Toward a Distributed-Power World: Renewables and Smart Grids Will Reshape the Energy Sector* [online] Available at: <https://www.bcgperspectives.com/content/articles/energy_environment_sustainabilit _toward_a_distributed_power_world/> [Accessed 11 March 2013]

Beard, C. & Easingwood, C. 1996. New product launch: marketing action and launch tactics for high-technology products. *Industrial Marketing Management,* Vol. 25, No 2 , pp. 87-103.

Benum, B., Sollie, A. and Solem, F., 2011. *Company lecture 1, TIØ 4265 Strategic Management.* [5.10.2011] NTNU [online] Available at: <https://www.itslearning.com/Main.aspx?CourseID=41272>[Accessed 10 October 2012].

Bergstein, H. and Estelami, H., 2002. A survey of emerging technologies for pricing new-to-the world products, *The Journal of Product and Brand Management*, Vol. 11, No. 4/5, pp. 303 318.

Berntzen, J., Ødegaard, L., 2013. *Telephone interview by authors*. Trondheim, April 29th

BKK Nett, 2001. *TRENDS AND DEVELOPMENTS IN THE NORWEGIAN POWER NETWORK SECTOR*[online] Available at: <http://www.cired.net/publications/cired2001/6_15.pdf> [Accessed 11 March 2013]

Bremdal, B. A., 2010. *Styr smart i smart grid - energieffektivisering på brukerens vilkår.* [online] Available at: <http://www.google.no/url?sa=t&rct=j&q=&esrc=s&source =web&cd=1&ved=0CC8QFjAA&url=http%3A%2F%2Fsmart energy.no%2Ffiler%2FTekna_SmartGrid_v5.ppt&ei=dUfPUKbCCan04QTuhYGQAw &usg=AFQCNE8jJdppP031M4OSQ--HbFtsRH70Q&bvm=bv.1355325884,d.bGE> [Accessed 5 December 2012]

Bremdal, B., 2013. *Telephone interview by authors*. Trondheim, April 24th

Byrne, B. M., 1998. *Structural Equation Modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications and program*. Lawrence Erlbaum Associates, Mahwah, NJ

Calantone, R. J. and Di Benedetto, C. A., 2007. Clustering product launches by price and launch strategy. *The Journal of Business & Industrial Marketing*, Vol. 22, No. 1, pp. 4-19.

CEER and ERGEG, 2010. *Smart Grids and smart regulation helps integrate climate goal objectives*. [online] Available at: <http://www.smartgridscre.fr/media/documents/regulation/10_ERGEG_Smart_regulation.pdf> [Accessed 23 November 2012]

Chesbrough, H. and Rosenbloom R., 2002. The role of business model in capturing value from innovation :evidence from Xerox Corporation's technology spin off companies. *Industrial and Corporate Change*. Vol. 11, No 3, 2002, pp. 529-555

Cleff, T. and Rennings, K., 2012. Are there any first-mover advantages for pioneering firms? *European Journal of Innovation Management*, Vol.15, No. 4, pp. 491-513.

Cohen, J, Cohen P., West, & Aiken, LS., 2003. *Applied multiple regression/correlation analysis for the behavioral sciences*, Lawrence Erlbaum Associates, London.

Comrey, AL & Lee, HB, 1992. *A first course in factor analysis*, 2nd edn, Psychology Press, East Sussex.

Cooper, R. G., 1986. Winning At New Products // Review. *Successful Executive*, Vol. 1, No. 5, pp. 59-59.

Cooper, R. G., 2008. Perspective: The Stage-Gate® Idea-to-Launch Process - Update, What's New, and NexGen Systems. *The Journal of Product Innovation Management*, Vol. 25, pp. 213 232.

De Brentani, U., 2001. Innovative versus incremental new business services: Different keys for achieving success. *The Journal of Product Innovation Management*. Vol. 18, No. 3, pp. 169 187.

DECC, 2012. *Demand Side Response in the domestic sector – a literature review of major trials* [online] Available at: <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4852/5756-demand-side-response-in-the-domesticsector-a-lit.pdf> [Accessed 13 March 2013]

Dibb, S. 1998. Market segmentation: strategies for success. *Marketing Intelligence & Planning,* Vol. 16**,** No 7, pp. 394-406.

Di Benedetto, C. A., 1999. Identifying the key success factors in new product launch. *The Journal of Product Innovation Management*, Vol. 16, No. 6, pp. 530-544.

DNV Kema 2012. *Global Inventory and Analysis of Smart Grid Demonstration Projects.* [online] Available at <http://ebookbrowse.com/dnv-kema-report-global-inventory-and-analysis-of-smart-grid-demonstration-projects-pdf-d419089565>[Accessed 30 January 2013]

Doorman, G., 2013. *Chapter 5, TET 4185 Power Markets Restructuring* [04.02.2013] NTNU [online] Available at: <https://www.itslearning.com/main.aspx?CourseID=47597> [Accessed 11 March 2013]

Easingwood, C., Moxey, S. & Capelton, H. 2006. Bringing high technology to market: successful strategies employed in the worldwide software industry. *Journal of Product Innovation Management,* Vol. 23, No. 6, pp. 498-511.

Eikemo, T. A., & Clausen, T. H., 2007. *Kvantitativ analyse med SPSS,* Tapir Akademisk Forlag, Trondheim

Elberse, A. 2008. Should you invest in the long tail? *Harvard business review,* Vol. 86, No 7/8, pp.86, 88.

Enders, A., Hungenberg, H., Denker, H. P. & Mauch, S. 2008. The long tail of social networking. Revenue models of social networking sites. *European Management Journal,* Vol. 26, No. 3, pp. 199-211.

EU-EDDP. 2008. *Developing aggregation business models* (Glossary). [online] Available at: <http://webhotel2.tut.fi/units/set/research/adine/materiaalit/EU-projekteja/EU-deep/Final%20deliverables/DEL_Deliverable9-EU-DEEP-Annex-Glossary.pdf> [Accessed 6 March 2013]

Eurelectric. 2011. *10 steps to Smart Grids*. [online] Available at: <http://congreso-smartgrids.es/wp-content/uploads/2012/03/Eurelectric-10 steps-to-Smart-Grids.pdf> [Accessed 24 February 2013]

European Commision, 2012. *The EU climate and energy package.* [online] Available at: < http://economie.fgov.be/fr/binaries/DSM_renewed_tool_tcm326-67143.pdf> [Accessed 23 November 2012]

European Technology Platform Smart Grid. 2006. A new vision for Electricity Networks. [online] Available at: <http://www.smartgrids.eu/documents/TRIPTICO%20SG.pdf> [Accessed 19 February 2013]

Field, A., 2009. *Discovering statistics using SPSS: (and sex and drugs and rock 'n' roll)*, 3rd edn, SAGE, Los Angeles.

Flanagin, A. J. & Metzger, M. J. 2000. Perceptions of Internet information credibility. *Journalism & Mass Communication Quarterly*, Vol. 77, pp. 515-540.

Flydal E., 2011. *Men ønsker vi google som strømleverandør?* [online] Available: <http://tm info.no/getfile.php/tm info.no/Presentasjoner/TM04102011/11_ Einar%20Flydal%20 Google%20som%20stromleverandor.pdf> [Accessed 10 October 2012]

Foedermayr, E. K. & Diamantopoulos, A. 2008. Market segmentation in practice: Review of empirical studies, methodological assessment, and agenda for future research. *Journal of Strategic Marketing,* Vol. 16, No. 3, pp. 223-265.

Framnes, R., Pettersen, A. and Thjømøe, H. M., 2011. *Markedsføringsledelse*. 8. edn, Universitetsforlaget, Oslo.

Gajic, I. and Welde, E. G., 2012. *Smart Grid Services*. Tapir Academic Press, Trondheim.

Hildonen, T., 2013. *Derfor kjøper vi elbil.* [online] Available at: <http://www.rb.no/bil/article6691294.ece> [Accessed 7 June 2013]

Holme, A., 2013. *Telephone interview by authors.* Trondheim, April 30th

Holstad, M. and Pettersen, F. E. L., 2011. *Hvordan reagerer strømforbruket i alminnelig forsyning på endringer i spotpris?* [online] Available at: <http://www.ssb.no/a/publikasjoner/pdf/oa_201102/holstad.pdf> [Accessed 18 March 2013]

Hox, J. J. and Bechger, T. M., 1998. An introduction to structural equation modeling, *Family Science Review*, Vol. 11, pp. 354-373.

Hultink, E. J. and Hart, S., 1998. The world's path to the better mousetrap: myth or reality? An empirical investigation into the launch strategies of high and low advantage new products, *European Journal of Innovation Management*, Vol. 1, No. 3, pp. 106-122.

Hultink, E. J. & Robben, H. S. 1999. Launch strategy and new product performance: an empirical examination in The Netherlands. *Journal of Product Innovation Management,* Vol. 16, No. 6, pp. 545-556.

IBM, 2013. *IBM Spss Statistics* [online] Available at: <http://publib.boulder.ibm.com/infocenter/spssstat/v20r0m0/index.jsp?topic=%2Fcom.ibm.spss.statistics.help%2Fcluster_choosing.htm > [Accessed 10 May 2013]

Indounas, K., 2009. Successful industrial service pricing. *The Journal of Business & Industrial Marketing*, Vol. 24, No. 2, pp. 86-97.

Jennings, J. and Haughton, L., 2001. *It's not the the BIG that eat the Small.. it's the FAST that eat the SLOW – How to Use Speed as a Competitive Tool in Business*. HaperCollines Publishers, New York, NY.

Johnson, M. W., Christensen, C. M. and Kagermann, H., 2008. Reinventing your business model. *Harvard Business Review*. Vol. 86, No. 12, pp. 50-59.

Kester, J. C. P., Burgos, M. & Parsons, J. 2010. *Smart Metering Guide: Energy Saving and the Customer.* [online] Available at: <http://www.ecn.nl/docs/library/report/2011/e11077.pdf.> [Accessed 26 February 2013]

Kirchen, D. S., 2003. IEE Transactions on power systems. Vol. 18, No. 2, pp. 520-527.

Kotler, P. (1994), *Marketing Management,* Prentice-Hall, Englewood Cliffs, NJ.

Ledwith, A. and O'Dwyer, M., 2008. Product launch, product advantage and market orientation in SMEs. *Journal of Small Business and Enterprise Development*, Vol. 15, No. 1, pp. 96-110.

Lieberman, M. B. and Montogmery, D. B., 1988. FIRST-MOVER ADVANTAGES. *Strategic Management Journal (1986-1998)*, Vol. 9, No. 5, pp. 41-41.

Magretta, J., 2002. Why business models matter. *Harvard Business Review*, Issue May.

Markides, C. C. and Geroski, P. A., 2005. *Fast second. How Smart Companies Bypass Radical Innovation to Enter and Dominate New Markets*. Jossey-Bass, San Fransisco, CA.

Matting, J., Sandén, B. and Edvardsson, B., 2004. New service development: learning from and with customers. *International Journal of Service Research*. Vol. 8, No. 1, pp. 3-17.

Mcdonald, M. & Dunbar, I. 2000. Using structured processes and systems to help managers develop strategic segmentation. *Journal of Targeting, Measurement and Analysis for Marketing,* Vol. 9, No. 2, pp. 109-127.

McKinsey & Company, 2010. *McKinsey on Smart Grid* [online] Available at: <http://publicleadershipusa.org/clientservice/electricpowernaturalgas/downloads/MoG_Full_Book_Smart_Grid_VF.pdf> [Accessed 11 March 2013]

Min, S., Kalwani, M. U. and Robinson, W. T., 2006. Market Pioneer and Early Follower Survival Risks: A Contingency Analysis of Really New Versus Incrementally New Product Markets. *Journal of Marketing*, Vol. 70, No. 1, pp. 15-33.

Montoya-Weiss, M. M. & Calantone, R. 1994. Determinants of new product performance: A review and meta-analysis, *The Journal of Product Innovation Management*, Vol. 11, No. 5, pp. 397-397.

Moore, G. A. 1991. *Crossing the chasm.* Harper Business, New York

Nilsson, H., 2007. *Demand Side Management (DSM) – A renewed tool for sustainable development in the 21st century* [online] Available at: <http://economie.fgov.be/fr/binaries/DSM_renewed_tool_tcm326-67143.pdf> [Accessed 9 March 2013]

Norusis M.J.,2003. *SPSS 12.0 Statistical Procedures Companion*, Prentice-Hall, Upper Saddle River, NJ, 2003.

Nunnally, JC. 1978, *Psychometric Theory*, 2nd edn, McGraw-Hill, New York.

NVE, 2000. *Reports on Results 2000* [online] Available at: <http://www.ieadsm.org/Files/EXCO%20File%20Library/Country%20Publications/VEENG.pdf> [Accessed 15 March 2013]

NVE, 2010. *Nettselskapenes planer for AMS* [online] Available: <http://www.nve.no/no/Kraftmarked/Sluttbrukermarkedet/AMS/> [Accessed 23 November 2012]

NVE, 2013. *About NVE.* [online] Available at: < http://www.nve.no/en/About-NVE/> [Accessed 13 March 2013]

Onarheim, J., 2013. *Interview by authors*. Trondheim, April 16th

Osterwalder, A., 2010. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. John Wiley and Sons, New Jersey

Pallant J., 2011. *SPSS survival manual,* 4th edn. Open university Press, New York

Powel 2011. *Powel on Smart Grid* [Accessed 23 February 2013]

Prasad, B., 1997. Analysis of pricing strategies for new product introduction. *Pricing Strategy & Practice*, Vol. 5, No. 4, pp. 132-141.

Robinson, W. T. and Fornell, C., 1985. Sources of market pioneer advantages in consumer goods industries. *Journal of Marketing Research*, Vol. 22, No. 3, pp. 305-317.

Robinson, W. T. and Min, S., 2002. Is the first to market first to fail? Empirical evidence for industrial goods business. *Journal of Marketing Research*, Vol. 39, No. 1, pp. 120-128.

Rogers, E., 1995. *Diffusion of innovations*. 4th edn, Free Press, New York

Rogers, E., 2003. *Diffusion of innovations*. 5th edn, Free Press, New York

Sandberg, B., 2002. Creating the market for disruptive innovation: Market proactiveness at the launch stage. *Journal of Targeting, Measurement and Analysis for Marketing,* Vol. 11, No. 2, pp. 184-196.

Sand, K. (ed.) 2011. *SmartGrid- Hva er det og hvorfor blir dette viktig* [online] Available: <http://www.energinorge.no/getfile.php/FILER/KALENDER/Foredrag%202011/SmartGrid/Temadag-EnergiNorge_2011_02-03.pdf >Gardermoen [Accessed 15 February 2013]

Shipley, D. D., 1981. Integrative pricing via the pricing wheel. *Industrial Marketing Management,* Vol. 29, No. 4, pp. 429-443.

Slater, S. F., Hult, G. T. M. & Olson, E. M. 2007. On the importance of matching strategic behavior and target market selection to business strategy in high-tech markets. *Journal of the Academy of Marketing Science,* Vol. 35, No. 1, pp. 5-17.

Smart Grid and AMS Conference, 2013. *Smart Grid og AMS Studietur til Nederkand 2013.* Industry conference [Attended 30-31 January 2013]

Smart Grid Conference, 2012. Smartgridkonferanse 2012. Industry conference [Attended 12 September 2012].

Smith, W. R. 1956. Product differentiation and market segmentation as alternative marketing strategies. *The Journal of Marketing,* Vol. 21, No. 1, pp. 3-8.

Sprenger, M. 2013. Smarte strømmålere utsatt til 2019. *Teknisk Ukeblad.* 18th February [online] Available at: < http://www.tu.no/energi/2013/02/18/smarte-strommalere-utsatt-til-2019> [Accessed 25 February 2013]

Statkraft Smart Grid- Value propositions. [PowerPoint slides]Given access from Statkraft [Accessed 15 February 2013]

Statnett, 2010. *Statnett og Smart Grid – et studentprosjekt* . [online] Available at: <http://www.statnett.no/Documents/Jobb_og_karriere/Studenter/SmartGrid%20og 20Stanett.pdf> [Accessed 29 November 2012]

Suarez, F. and Lanzolla, G., 2005. The Half-Truth of First-Mover Advantage. *Harvard Business Review*, Vol. 37, No. 2, pp.65-75

Sæle, H., 2013. *Smart Grid – Focusing on demand response and smart metering* [28.01.2013] NTNU [online] Available at: <https://www.itslearning.com/main.aspx?CourseID=47597> [Accessed 11 March 2013].

Taher, A.and Hanan El, B. 2006. Heterogeneity of consumer demand: opportunities for pricing of services. *The Journal of Product and Brand Management*, Vol. 15, No. 5, pp. 331-340.

Teece, D., 2010. Business models, business strategy and innovation. *Long Range Planning.* Vol. 43, pp. 172–194.

Wangensteen, I., 2012. *Power system economics - the Nordic Electricity Market*, 2edn. Tapir Academic Press, Trondheim.

Wellenius, Bjorn; Stern, Peter A., 1994. *Implementing Reforms in the Telecommunications Sector.* World Bank, Washington, D.C.

Wind, Y. 1978. Issues and advances in segmentation research. *Journal of marketing research*, pp. 317 337.

Yin, R. K., 2009. *Case Study Research: Design and Methods*. 4th edn, Sage Publications

Zinbarg, RE, Revelle, W, Yovel, I & Li, W 2005. 'Cronbach's α, Revelle's β, and McDonalds, ωH: Their relations with each other, and two alternative conceptualizations of reliability', *Psychometrika*, Vol. 70, No. 1, pp. 123-133.

Appendix

Appendix 1– Examples of Smart Energy Services

Category	Example of Services	Customer Value Proposition (CVP)	Profit formula/ Revenue Streams	Key Resources (Reequired to deliver the CVP)	Key processes (Activities, rules, culture, norms)
Smart Home	▪ Control of temperature , light, sun shed, TV, door control ▪ Insights and control apparatus according to power prices ▪ Regulation of the house by SmartPhones, computers ▪ One controller for each room	▪ Monitoring and control ▪ Automation	▪ Monthly payments	▪ People ▪ Customer linking ▪ ICT knowledge ▪ Capital	▪ Development methodologies
Bundling (Lock-In)	▪ Power agreements with bonuses - I.e. discount on hotels, travel and so on. ▪ Power packages: - I.e. paying a fixed price instead of kWh, el-car and kWh usage in home as one payment ▪ Power Bonus Bank	▪ Several solutions in one package	▪ Secure sale of power ▪ Create customer needs	▪ People ▪ ICT knowledge ▪ Dynamic capabilities: Customer linking and market sensing	▪ Development methodologies ▪ Routines
Free choice of supplier	▪ Know the origins of the consumed power: - I.e. only consume renewable energy ▪ Price robots: automatic change of supplier to get the lowest price	▪ Freedom to choose based on preferences ▪ Price/origin insights easily	▪ Percentage based ▪ Margin requirements for investment, credit terms, lead times, supplier terms	▪ ICT knowledge ▪ People ▪ Market sensing	▪ Development methodologies
Social media	▪ Official information on power consumption ▪ Advertising, promotion	▪ Personal branding	▪ Free marketing ▪ Company branding	▪ People ▪ Market sensing ▪ Customer linking ▪ ICT knowledge	▪ Market research ▪ Development methodologies

Security	▪ Alarm: fire alarm, burglar alarm ▪ Power delivery assurance: - Prioritizing the power supply to the most important machines to avoid power outage - machine automatically turned off when fire danger appears	▪ Professional support for emergencies ▪ Safety assurance ▪ Customer relationship based on trust	▪ Less wedge expenses because of power security	▪ People ▪ ICT knowledge ▪ Customer linking ▪ Market sensing ▪ Service culture	▪ Development methodologies ▪ Routines ▪ Training
Public services	▪ Sensor technology: alarm systems connected to for instance hospitals ▪ Services similar to that of Smart Home services adjusted to older people with special needs	▪ Health care offerings ▪ Safety assurance ▪ Customer relationship based on trust	▪ Less stress on the public health care system	▪ People ▪ ICT knowledge ▪ Customer linking ▪ Market sensing	▪ Development methodologies ▪ Routines ▪ Training ▪ Knowledge sharing
Aggregation	▪ Power Trading ▪ Private aggregation: Purchase power from the neighbor ▪ Sell power to the energy company ▪ Dynamic grids and power products based on tariffs	▪ System for managing own power generation based on aggregator ▪ Value for a specific customer segment with industry interest	▪ Perhaps percentage based ▪ Buffer in peak periods ▪ Less loss in the distribution network	▪ People ▪ ICT knowledge ▪ Customer linking ▪ Market sensing ▪ Capital	▪ Training ▪ Development methodologies ▪ Knowledge sharing
Consulting	▪ Energy consulting providing: price overview, feedback, analysis, recommendation, detailed statistics on current usage, optimization ▪ Service center informing about Smartgrid	▪ Quality expert advices gained	▪ Pricing based on time, service sale, direct customer interaction ▪ Branding to gain trust	▪ People ▪ Channels ▪ Information ▪ Market knowledge ▪ Market sensing	▪ Training ▪ Development methodologies ▪ Knowledge sharing

Table 1: Examples of Smart energy services

Appendix 2– Smart Grid Survey

1. Ditt fødselsår (fire siffer): ____________

2. Kjønn:
   - Kvinne
   - Mann

2. I hvilket fylke bor du? [1]

3. Hvordan vil du klassifisere ditt bosted?
   - By/tettsted med mer enn 100 000 innbyggere
   - By/tettsted med 50 000 - 100 000 innbyggere
   - By/tettsted med 20 000 - 50 000 innbyggere
   - By/tettsted med 10 000 - 20 000 innbyggere
   - Distrikt/spredt bebyggelse

[1] Nedtrekkliste - standardoppsett av fylkene i Norge

4. Hva er din høyeste fullførte/pågående utdanning?
   - Grunnskole/ungdomsskole
   - Videregående skole/fagskole
   - Universitet/høyskole, inntil tre år
   - Universitet/høyskole, mer enn tre år

5. Hva er din primære arbeidssituasjon?
   - Heltidsansatt
   - Deltidsansatt
   - Selvstendig næringsdrivende
   - Student
   - Pensjonist
   - Ikke i arbeid
   - Annet (vennligst spesifiser):

6. Ta stilling til hvor godt følgende påstander stemmer for deg.

	Uenig		Nøytral				Helt enig
Jeg anser meg selv som teknologiinteressert	1	2	3	4	5	6	7
Jeg pleier å være blant de første til å kjøpe ny teknologi	1	2	3	4	5	6	7
I forhold til folk flest liker jeg å ta sjanser	1	2	3	4	5	6	7
Jeg tenker på miljøet når jeg handler	1	2	3	4	5	6	7
Strømabonnement er et produkt jeg ikke har oversikten over	1	2	3	4	5	6	7
Jeg synes det er lett å sette seg inn i ny teknologi	1	2	3	4	5	6	7
Miljø og klimaspørsmål er viktig for meg	1	2	3	4	5	6	7

7. Betaler du strømregningen selv?
   - o Ja (helt eller delvis)
   - o Nei (for eksempel inkludert i husleia)

8. Hvilken type strømabonnement har din husstand?
   - o Fastpris
   - o Variabel pris
   - o Spotpris
   - o Vet ikke

9. Omtrent hvor stor gjennomsnittlig strømregning har din husstand per måned?
   - o Inkludert i leie
   - o 0-800 kr
   - o 800-1200 kr
   - o 1200-1500 kr
   - o 1501-1800 kr
   - o 1801-2200 kr
   - o 2201-2600 kr
   - o 2601-3000 kr
   - o Mer enn 3001 kr
   - o Vet ikke

10. Sammenligner du eget strømforbruk fra år til år?

- o Ja
- o Nei

11. Hvor interessert ville du vært i følgende informasjon om eget strømforbruk?

	Ikke interessant		Nøytral				Svært interessant
Sammenligning av egen strømkostnad med strømkostnaden i andre husstander av samme størrelse	1	2	3	4	5	6	7
Utvikling av egen strømkostnad (sammenligning av egen strømkostnad over tid)	1	2	3	4	5	6	7
Oversikt over egen strømkostnad gjennom nettside eller e-post	1	2	3	4	5	6	7
Oversikt på en skjerm som forteller deg hvor mye strøm du forbruker i øyeblikket og hvor mye det koster deg	1	2	3	4	5	6	7
Oversikt over egen strømkostnad gjennom applikasjon til SmartPhone/tablet	1	2	3	4	5	6	7

12. Ta stilling til hvor godt følgende påstander stemmer for deg.

	Uenig		Nøytral				Helt enig
Jeg mener strømprisen i Norge er for høy	1	2	3	4	5	6	7
Jeg betaler for høy strømregning	1	2	3	4	5	6	7
Jeg vil gjerne endre forbruksvanene mine for å oppnå en lavere strømpris	1	2	3	4	5	6	7

13. Har du byttet strømleverandør de siste fem årene?

- o Ja
- o Nei

14. Vurderer du å bytte strømleverandør? Velg kun en av følgende:

- o Ja
- o Nei
- o Vet ikke

15. Hvis du svarte ja på spørsmål 15/16, hvorfor byttet du eller vurderer du å bytte strømleverandør?

	Uenig		Nøytral				Helt enig
For høy pris	1	2	3	4	5	6	7
Service	1	2	3	4	5	6	7
Jeg ønsker en mer forutsigbar strømregning	1	2	3	4	5	6	7
Omdømme til strømleverandør	1	2	3	4	5	6	7
Miljøprofil til strømleverandør	1	2	3	4	5	6	7

Annet (vennligst spesifiser): ______________________________

16. Benytter husstanden din noen av følgende produkter eller tjenester?
- ☐ Nattsenkning av temperatur
- ☐ Automatiske styring av lysbrytere
- ☐ Varmepumpe
- ☐ Passivhus
- ☐ Varmestyringsanlegg
- ☐ Vet ikke/ingen av delene

17. Hvilke typer energikilder benytter din husstand i tillegg til elektrisitet?
- ☐ Vedfyring
- ☐ Fjernvarme
- ☐ Solcellepanel
- ☐ Oljekjel
- ☐ Egen kraftproduksjon
- ☐ Pelletskjel
- ☐ Annet (vennligst spesifiser): ______________________________

AMS står for Avanserte Måle- og Styringssystemer og innbærer at strømforbruket leses av automatisk hver time og sendes til din strømleverandør en gang i døgnet. AMS skal innføres i alle norske hustander innen 2017.

18. Har din husstand en AMS?
- o Ja
- o Nei
- o Vet ikke

19. Hvilket av følgende utsagn beskriver ditt kunnskapsnivå om Smarte nett (Smart Grid) best?
- o Mye kunnskap
- o Noe kunnskap
- o Har hørt om begrepet
- o Aldri hørt om begrepet

20. Hva assosierer du med Smarte nett? Vennligst fyll inn, alle tanker er velkommen:

Informering

Smarte nett (eller Smart Grid) er standardordet for å beskrive intelligente eller smarte strømnett. Kort om Smarte Nett:

- Forklares gjerne som en fusjon av kraftnett og internett
- Navn på framtidens system for sikker strømforsyning
- Utnytter toveis kommunikasjon og nye sensorteknologier
- Et system hvor alle anlegg og apparater kan observeres og styres via internett

21. Hvor aktuelt ville det være for deg å kjøpe følgende Smart nett-tjenester?

	Ikke aktuelt		Nøytral				Svært aktuelt
Lokal trådløs styring av lys, varme eller elektriske apparater i hjemmet	1	2	3	4	5	6	7
Fjernstyring fra distanse av lys, varme eller elektriske apparater (eksempelvis skru på oppvarming av hytten fra langt hold)	1	2	3	4	5	6	7
Muligheten for å tjene opp bonuspoeng hos energiselskap (på bakgrunn av energieffektivt energiforbruk), som kan benyttes til andre produkter som flybilletter eller hotellopphold	1	2	3	4	5	6	7
Fast forhåndsinnstilt romtemperatur gjennom hele året eller periodevis til avtalt pris	1	2	3	4	5	6	7
Et system som støtter egenproduksjon av elektrisitet, og eventuelt salg av strøm til nærområdet via en tredjepart	1	2	3	4	5	6	7
Tidsinnstilling på oppvarming	1	2	3	4	5	6	7
Tidsinnstilling på elektriske apparater i huset (for eksempel oppvaskmaskin eller vaskemaskin) som slås på når strømmen er billigst	1	2	3	4	5	6	7

En pakkeløsning som inkluderer forsikring og strømavtale i samme kontrakt	1	2	3	4	5	6	7
SmartPhone tilbehør/leketøy for å ha morsomt med lyd, lys, oppvarming og annet utstyr i hjemme	1	2	3	4	5	6	7
Et system hvor alle apparater og anlegg i huset kan observeres via internett for månedlig oversikt og historikk	1	2	3	4	5	6	7
Automatisk sikkerhetsstyring av elektriske apparater	1	2	3	4	5	6	7
Mulighetene til å redusere energiforbruk eller strømregningen ved å la nettselskaper styre elektriske apparater (for eksempel varmtvannstank/oppvarming) eksternt	1	2	3	4	5	6	7
Opprinnelsesgaranti på produksjon av elektrisitet (for eksempel å vite at strømmen man forbruker kommer fra fornybar energi)	1	2	3	4	5	6	7
Statistikk over historisk strømkostnad	1	2	3	4	5	6	7
Forsikringspremie som verner mot høye strømpriser	1	2	3	4	5	6	7

22. Hvor mye ville du være villig å betale i en engangsinvestering for å kunne benytte de fleste av tjenestene nevnt ovenfor?
    - o 0-1000 kr
    - o 1000-2000 kr
    - o 2000-3000 kr
    - o 3000-5000 kr
    - Mer enn 5000 kr, gjerne spesifiser:

23. Hvilke faktorer ville gjøre deg interessert i å kjøpe Smart nett-tjenester?

	Ikke interessant		Nøytral				Svært interessant
Muligheten til å automatisere hjemmet	1	2	3	4	5	6	7
Miljøvennlighet	1	2	3	4	5	6	7
Interessant med ny teknologi	1	2	3	4	5	6	7

Muligheten til å spare penger	1	2	3	4	5	6	7
Ha kontroll over strømforbruk	1	2	3	4	5	6	7
Det virker morsomt og underholdende	1	2	3	4	5	6	7
Muligheten til å produsere egen energi/selge energi	1	2	3	4	5	6	7

24. Dersom du skulle kjøpe noen av disse tjenestene, hvor viktig ville følgende egenskaper ved bruken av tjenesten være for deg?

	Ikke viktig		Nøytral				Svært viktig
Brukervennlighet	1	2	3	4	5	6	7
At tjenesten gir meg tidsbesparelse i hverdagen	1	2	3	4	5	6	7
Forutsigbarhet	1	2	3	4	5	6	7
At jeg kan ha det samme forbruksmønsteret som før	1	2	3	4	5	6	7
Reduserte kostnader	1	2	3	4	5	6	7
Servicetilbud for hjelp med tjenestebruk	1	2	3	4	5	6	7

25. Ta stilling til hvor godt følgende påstander stemmer for deg.

	Uenig		Nøytral				Helt enig
Jeg har full tillit til at energiselskaper ikke vil spre min kundeinformasjon	1	2	3	4	5	6	7
I perioder med høy belastning i strømnettet vil jeg være villig til å la strømleverandøren min skru av eller redusere bruken av varmtvannstank, vaskemaskin eller andre strømkrevende apparater	1	2	3	4	5	6	7
Jeg er bekymret for at eksterne aktører skal kunne kontrollere elektriske apparater i hjemmet mitt	1	2	3	4	5	6	7
Generelt mener jeg at kundedata	1	2	3	4	5	6	7

misbrukes							
Jeg er villig til å la energileverandøren min styre enkelte elektriske apparater i hjemmet mitt mot å få lavere strømregning	1	2	3	4	5	6	7
I en kuldeperiode vil jeg akseptere at en strømleverandør senker min innetemperatur for å kunne forsikre strømleveranse	1	2	3	4	5	6	7
Jeg er villig til å la energileverandøren min styre enkelte elektriske apparater i hjemmet mitt mot å få økt sikkerhet i hjemmet	1	2	3	4	5	6	7

26. Ta stilling til hvor godt følgende påstander stemmer for deg.

	Uenig		Nøytral				Helt enig
Jeg innser at jeg har behov for det	1	2	3	4	5	6	7
Jeg leser om det nye produktet i media	1	2	3	4	5	6	7
Jeg har undersøkt produktet nøye på forhånd	1	2	3	4	5	6	7
En venn har produktet, og jeg kan teste det	1	2	3	4	5	6	7
Noen jeg kjenner anbefaler produktet	1	2	3	4	5	6	7

27. Dersom du skulle anskaffe Smart nett-tjenester, hvilke informasjonskanaler ville du benyttet?

	Ikke aktuelt		Nøytral				Svært aktuelt
Internettforum	1	2	3	4	5	6	7
Hjemmesider til energiselskap	1	2	3	4	5	6	7
Aviser /nettaviser	1	2	3	4	5	6	7
Tekniske - /forskningsmagasiner	1	2	3	4	5	6	7
Søknadsmotor på internett	1	2	3	4	5	6	7
Tester/produkterfaring	1	2	3	4	5	6	7
IT-selskap	1	2	3	4	5	6	7

Energiinstitutter	1	2	3	4	5	6	7
Venner/bekjente	1	2	3	4	5	6	7
Tjenesteprodusentens hjemmesider	1	2	3	4	5	6	7
Reklame	1	2	3	4	5	6	7
Personale hos tjenesteleverandør	1	2	3	4	5	6	7

28. Hvem har du tillit til for sikker og profesjonell behandling av kundedata og personvern?

	Stoler ikke på		Nøytral				Stoler svært mye på
Forbrukerrådet / Datatilsynet	1	2	3	4	5	6	7
Bank	1	2	3	4	5	6	7
Forsikringsselskap	1	2	3	4	5	6	7
Strømleverandører	1	2	3	4	5	6	7
IT-bedrifter	1	2	3	4	5	6	7
Skatteetaten	1	2	3	4	5	6	7

29. Hvis du skulle kjøpt deg ny hovedbil, hvor aktuelt ville det vært å kjøpe elbil?
   - o Helt uaktuelt
   - o Ikke aktuelt
   - o Nøytralt
   - o Litt aktuelt
   - o Aktuelt
   - o Svært aktuelt

30. Hvis du skulle kjøpt deg ny bil nummer 2, hvor aktuelt ville det vært å kjøpe elbil?
   - o Helt uaktuelt
   - o Ikke aktuelt
   - o Nøytralt
   - o Litt aktuelt
   - o Aktuelt
   - o Svært aktuelt

31. Hvis du hadde anskaffet elbil, hvor aktuelt ville det vært for deg å la strømleverandøren

kontrollere når elbilen ble ladet for å utnytte billigst mulig strøm/mest energieffektiv strøm?

- Helt uaktuelt
- Ikke aktuelt
- Nøytralt
- Litt aktuelt
- Aktuelt
- Svært aktuelt

32. Hvilken type bosituasjon stemmer for deg?
    - Enebolig
    - Rekkehus
    - Leilighet
    - Hybel
    - Bokollektiv
    - Annet (vennligst spesifiser):______________________________________

33. Hvor mange bor i din husstand inkludert deg selv?
    - 1
    - 2
    - 3
    - 4
    - 5
    - 6
    - Flere enn 7

34. Hvor mange hjemmeboende barn har du?
    - Ingen
    - 1
    - 2
    - 3
    - 4
    - Flere enn 4

35. Hva er husstandens samlede brutto årsinntekt? Med husstand menes personer som bor sammen og har felles økonomi.
    - Under 200 000 kr
    - 201 000 - 500 000 kr.
    - 501 000 - 750 000 kr.
    - 751 000 - 1 500 000 kr.
    - Mer enn 1 501 000 kr

Appendix 3– Interview Guide

Introduksjon
1. Kan du kort presentere din organisasjons kjernevirksomhet?
2. Hva gjør organisasjonen relatert til Smart Grid?

Tjenester
3. Hvilke typer tjenester vil du definere som SmartGrid-tjenester rettet mot sluttkunde?
4. Hvilken kjernekompetanse mener du vil være svært viktig for *utvikling* av nye SmartGrid-tjenester?
5. Hvilke faktorer mener du er essensiell for suksess i *lansering* av denne typen tjenester?
6. Mener du at det er fordeler ved å være tidlig ute med SmartGrid-tjenester?
7. Hvilken rolle mener du innføring av AMS vil ha for utvikling på dette området?

Etterspørsel
8. Har din organisasjon interesse for å lansere tjenester direkte til sluttkunden?
9. Hvilke bedrifter tror du vil stille sterkt i å lansere nye SmartGrid-tjenester til sluttkunder? Når tror du dette kan skje i Norge?
10. Hva mener du man må gjøre for å forstå kundeperspektivet i kraftbransjen og involvere kunden i innovasjon? Hva gjør din organisasjon for å forstå kundesiden?
11. Hvilke kundekanaler mener du vil være essensielle i utviklingen av denne type tjenester?

Eksterne faktorer
12. Hva er de største driverne og barrierene for SmartGrid-tjenester i Norge?
13. Hvilken rolle mener du kraftleverandører kommer til å ha i fremtidens energimarked?
14. Mange mener at monopolreguleringen av energibransjen er en stor barriere mot satsing på kommersielle tjenester, hva er din mening om dette? Gir dette IT-selskaper noen fortrinn?
15. Hvilken rolle vil staten spille i utviklingen av SmartGrid-tjenester?

- Hva mener du er det store spørsmålet i debatten og diskusjon rundt denne typen tjenester?

APPENDIX 4– BACKGROUND INFORMATION FOR THE INTERVIEWS

Jan Onarheim
Jan Onarheim has been the leader for the The Norwegian SmartGrid center the last year. It is a national center for Smart Grid activities including research, teaching, testing, and demonstration projects, in addition to business development and commercialization. The center was established to build a competence base on Smart Grid for its members, and to support Norwegian energy companies to focus on business development within the Smart Grid framework.

Bernt Bremdal
Bremdal has a background from the ITC-sector, and has worked within the energy sector for more than 25 years, with everything from oil and gas to electric power. Today, he divides his time between academics and business activities and operations. He has a professorship, and currently, he is a research coordinator and part of the project management team at NCE Smart Energy Markets in Halden. NCE Halden is one of 12 NCE projects in Norway, with focus on the energy markets, and Bremdal work with Smart Grid in this context.

Tieto
Tieto is the largest Nordic IT services company providing a wide spectrum of primarily business-to-business services. Consulting services, IT applications, IT services, Big Data, project management and process automation are some examples of what Tieto delivers to different industries. There is a focus on Nordic companies and a great emphasis on Energy and Utility. Moreover, Tieto offers solutions to companies related to Smart Metering, such as helping to prepare for Smart Meter implementation, verifying, doing quality analysis of measurement and more, however the company do not sell Smart Meters. In Norway, Tieto participate in two Smart Grid R&D projects; DeVid and in "Manage Smart in Smart Grid", where the company also is the initiative taker. Also, Tieto is a member of The Norwegian Smartgrid centre in addition to having activities in Finland and Sweden.

Lyse Energy
Lyse Energy was originally an energy company, but has during the last 10-15 years developed and is today both and energy- and telecommunication company located in Stavanger. The company works with fiber optic broadband and other telecommunication services, as well as, district heating, natural gas distribution, burglar alarms, retailing and installation services. The focus is to find out how to use the different parts from Lyse Energy in order to develop new business areas. Lyse Smart was established to develop products for controlling heat, light, alarm and other essential features of the home at the intersection of energy and telecommunications. Lyse Smart will focus on how to use both of those competences to launch new services and value streams. When it comes to Smart Grid, Lyse Energy has started the roll-out of AMS, introduced Smart Gateway that is an infrastructure providing intelligence into the homes. Thus Lyse Energy has established services related to Smart Grid like load control and surveillance for faults in the grid.

Appendix 5- Pearson Correlation between Interests of Different Services

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	.495**	1													
3	.442**	.464**	1												
4	.517**	.536**	.554**	1											
5	.448**	.543**	.450**	.506**	1										
6	.560**	.554**	.538**	.649**	.625**	1									
7	.383**	.492**	.521**	.525**	.468**	.489**	1								
8	.429**	.407**	.461**	.581**	.563**	.684**	.448**	1							
9	.376**	.415**	.366**	.440**	.278**	.288**	.322**	.281**	1						
10	.362**	.264**	.280**	.404**	.283**	.442**	.365**	.402**	.310**	1					
11	.432**	.488**	.338**	.444**	.397**	.487**	.429**	.399**	.371**	.406**	1				
12	.229**	.369**	.297**	.378**	.321**	.399**	.464**	.295**	.255**	.335**	.429**	1			
13	.234**	.331**	.340**	.329**	.347**	.356**	.369**	.372**	.381**	.278**	.343**	.302**	1		
14	.358**	.302**	.255**	.296**	.279**	.401**	.273**	.337**	.358**	.502**	.439**	.310**	.323**	1	
15	.304**	.304**	.234**	.343**	.304**	.419**	.342**	.352**	.370**	.476**	.439**	.350**	.372**	.678**	1

Tabel 2: Correlation between interest in services
****. Correlation is significant at the 0.01 level (2-tailed).**

Appendix 6– Correlation Matrix with All Correlations Included

Pearson Correlation Matrix																	
Service no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	A	B
Demography																	
Birth year	.174**	.223**	.151**	.333**	.272**	.266**	.156**	.371**	.222**	.199**	.161**	.010	.262**	.087	.098*	.304**	.154**
Education	.060	.126**	.022	.126**	.082	.038	.054	-.006	.080	-.017	-.040	-.033	-.003	-.059	-.034	.057	-.038
Annual household income	.065	.030	.063	-.060	.041	.009	.004	-.029	-.081	-.059	.000	.072	-.087	-.083	-.073	.034	-.086
Behavioral Criteria																	
Technology adoption	.289**	.224**	.331**	.361**	.379**	.418**	.326**	.515**	.134**	.245**	.277**	.283**	.321**	.231**	.280**	.482**	.304**
Environmental friendliness	.262**	.345**	.269**	.340**	.163**	.178**	.267**	.118*	.653**	.129**	.217**	.234**	.279**	.203**	.222**	.303**	.226**
Knowledge to Smart Grid	-.008	-.115*	-.126**	-.092*	-.105*	-.063	-.142**	-.111*	.068	.091*	.024	-.119**	-.022	.126**	.024	.116**	-.094*
Energy price sensitivity	.338**	.279**	.318**	.226**	.350**	.409**	.242**	.302**	.136	.341**	.395**	.104	.245**	.476**	.334**	.470**	.462**
Energy price curiosity	.433**	.482**	.612**	.613**	.498**	.567**	.476**	.568**	.415**	.360**	.408**	.333**	.371**	.346**	.334**	.692**	.429**
External control approval	.186**	.288**	.211**	.288**	.192**	.263**	.410**	.189**	.205**	.243**	.333**	.578**	.181**	.149**	.202**	.355**	.238**
Customer data[1]	.321**	.233**	.221**	.375**	.199**	.326**	.247**	.217**	.138**	.220**	.149**	.258**	-.015	.094*	.124**	.327**	.175**
Electric car[2]	.198**	.252**	.215**	.249**	.255**	.149**	.246**	.186**	.293**	.059	.159**	.107*	.190**	-.024	.010	.294**	.031

Table 3: Correlation Matrix between demographical- and behavioral factors and interest in purchasing services
Sign. ** $p < 0.05$, * $p < 0.10$.
[1] Confidence in professional customer data treatment
[2] Interest in buying an electric car as car no

Appendix 7– Structural Equation Modeling AMOS 20

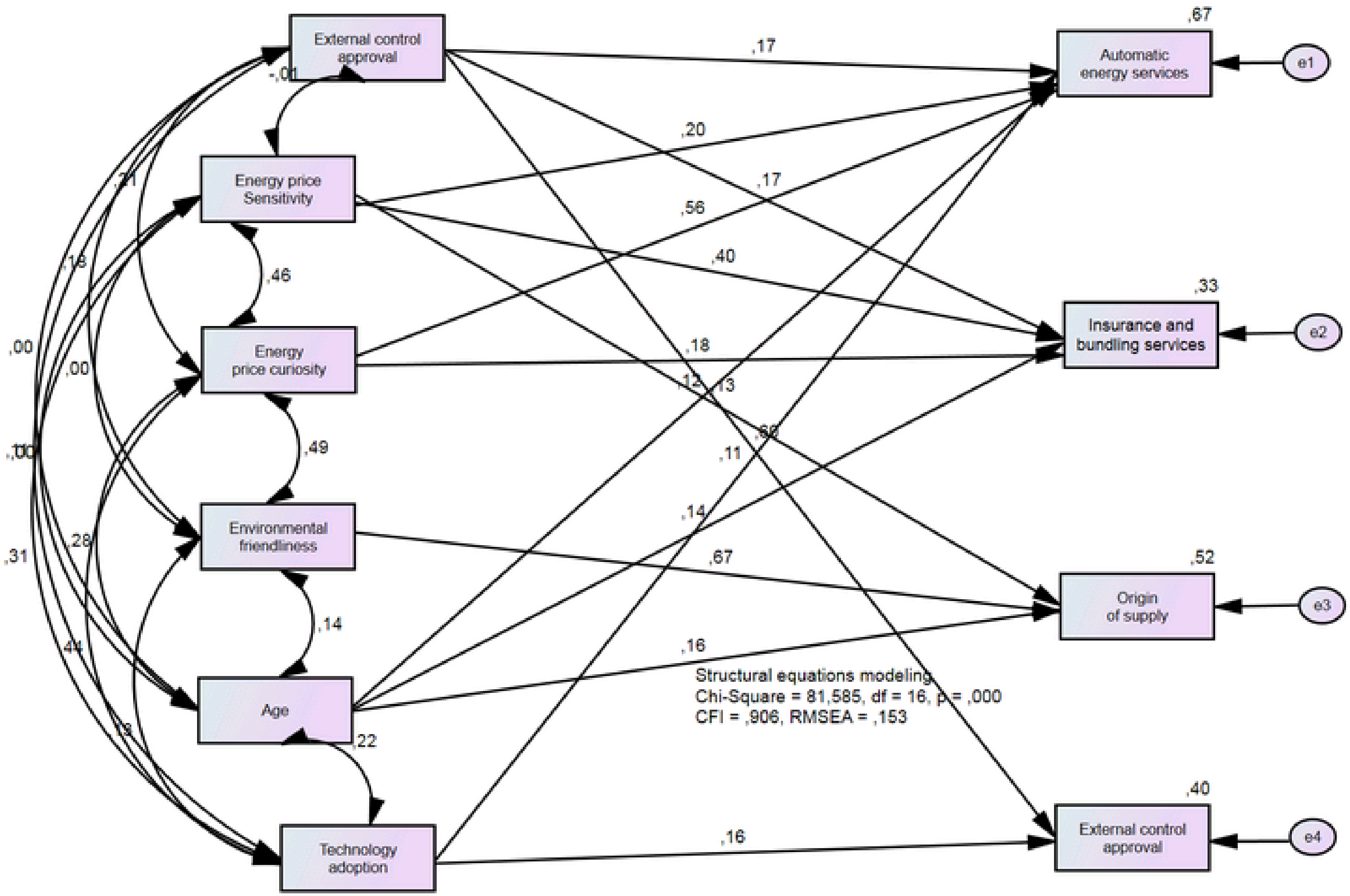


Figure 1: Structural equation modeling AMOS 20

Appendix 8– Cluster Characteristics

Table 2 illustrates the mean values of interest to purchase different types of Smart energy services for the four clusters, which are labeled as "low", "medium" and "high" in the result chapter.

Cluster Number	1 N=98	2 N=128	3 N=158	4 N=107	F
Final Cluster Centers Illustrating the Mean Interest					
Automatic services	4.25	3.00	4.32	5.40	105.635
Insurance and bundling services	3.30	2.19	3.31	4.67	93.762
Let energy companies control electrical appliances in exchange for a reduced electricity price	1.89	1.50	3.74	5.31	373.007
Ability to choose origin of power supply	5.26	2.02	2.77	5.23	306.350

Table 2: Final cluster centers illustrating the mean interest

Distances between Final Cluster Centers				
1	1	2	3	4
2	3.667			
3	3.105	2.930		
4	3.862	6.066	3.401	

Table 4: Distances between final cluster centers

Cluster Statistics – Demographics and Behavioral Criteria												
Cluster no	1			2			3			4		
Descriptive parameters	Mean	Std. deviation	N	Mean	Std. deviation	N	Mean	Std. deviation	N	Mean	Std. deviation	N
Demography												
Birth year	1974.03	15.889	97	1964.47	15.082	121	1970.06	15.815	155	1973.44	14.915	103
Education	3.13	1.272	97	2.97	1.397	128	2.76	1.392	157	2.96	1.352	106
Annual household income	2.61	1.160	95	3.03	1.021	116	2.99	1.226	148	2.93	1.194	101
Behavioral criteria												
Technology adoption	3.67	1.069	98	3.54	1.100	120	3.93	1.090	143	4.51	1.222	104
Environmental friendliness	5.09	1.026	98	3.36	1.086	120	3.79	1.155	148	4.93	1.131	103
Knowledge to Smart Grid	1.78	.891	98	1.91	.967	128	2.11	1.000	157	1.94	.888	107
Energy price sensitivity	4.86	1.072	51	4.57	1.078	50	4.75	1.162	54	5.22	1.029	51
Energy price curiosity	4.92	1.072	94	3.81	1.214	117	4.64	.967	147	5.54	.887	99
External control approval	2.693	1.034	97	2.244	.996	119	3.391	1.132	149	3.842	1.123	104
Customer data[1]	4.30	1.119	96	3.93	1.078	113	4.52	1.078	146	4.76	1.187	98
Electric car[2]	4.02	1.227	98	3.18	1.528	118	3.51	1.336	147	4.03	1.245	101

Table 5: Demographics and behavioral criteria of the distinctive clusters

[1] Confidence in professional customer data treatment

[2] Interest in buying an electric car as car no 2

Appendix 9– Why the distinctive Clusters are Purchasing New Technology

Cluster Statistics – What Influence the Purchase of New Technology												
Cluster no		**1**			**2**			**3**			**4**	
Descriptive parameters	Mean	Std. deviation	N	Mean	Std. deviation	N	Mean	Std. deviation	N	Mean	Std. deviation	N
When do you buy a new technological product?												
I realize I need it	5.54	1.132	98	5.14	1.267	118	4.95	1.147	149	5.49	1.207	99
I read about it in media	3.63	1.402	97	3.36	1.272	118	3.85	1.238	149	4.40	1.206	100
I have investigated it advance	5.10	1.271	97	4.51	1.362	117	4.77	1.246	148	5.26	1.197	101
A friend have it and I can test it	4.41	1.463	97	3.78	1.445	117	4.18	1.380	148	4.78	1.481	101
Someone I know recommend it	4.35	1.299	97	3.74	1.323	118	4.30	1.302	149	5.05	1.290	100

Table 6: What influence the purchase of new technology

Cluster Statistics – Service Characteristics and Qualities												
Cluster no	**1**			**2**			**3**			**4**		
Descriptive parameters	Mean	Std. deviation	N	Mean	Std. deviation	N	Mean	Std. deviation	N	Mean	Std. deviation	N
Desired Characteristics and Qualities of Smart Energy Services												
User-friendliness	5.73	1.263	97	4.97	1.670	119	5.15	1.416	151	6.09	1.020	103
Time saving in everyday life	4.30	1.600	98	3.57	1.587	119	4.27	1.469	151	5.34	1.370	104
Predictability	5.22	1.374	98	4.28	1.620	119	4.74	1.288	151	5.78	1.084	103
Sustaining the same pattern of consumption as before	3.90	1.578	97	3.68	1.438	119	3.85	1.394	150	4.58	1.648	103
Cost reductions	5.54	1.203	98	4.82	1.523	118	5.20	1.327	151	5.99	1.057	104
A good service support system backing up the service	4.63	1.523	97	3.77	1.664	119	4.22	1.341	151	5.25	1.385	104

Table 7: Desired Characteristics and Qualities of Smart energy services

APPENDIX 10– INFORMATION CHANNELS

Table 7 shows the mean value of what degree the different clusters would use the listed information channels, whereas Figure 1 illustrates which information channels are most favored and least favored by the overall survey sample.

	1 (N=98)			2 (N=128)			3 (N=158)			4 (N=107)		
	Mean	Std. deviation	N	Mean	Std. deviation	N	Mean	Std. deviation	N	Mean	Std. deviation	N
To which degree the respondents agree that they would use these information channels for new energy services												
Internet forum	4.18	1.479	97	3.46	1.632	117	3.82	1.375	148	4.55	1.459	100
Homepages of energy companies	4.34	1.406	97	3.85	1.584	116	4.18	1.300	149	4.77	1.362	100
Papers /online sites	4.01	1.342	97	3.76	1.519	116	3.96	1.283	149	4.41	1.379	100
Technical - /research magazines	3.96	1.717	98	3.65	1.704	117	4.02	1.440	147	4.27	1.618	101
Surfing the internet	4.67	1.592	97	4.10	1.663	117	4.49	1.411	147	5.01	1.375	101
Tests/Product experience	5.06	1.336	96	4.38	1.414	118	4.76	1.327	148	5.46	1.137	99
IT companies	3.03	1.254	97	2.68	1.173	117	3.19	1.176	146	3.85	1.513	101
Energy Institutions	3.48	1.570	95	3.06	1.452	116	3.34	1.287	149	3.94	1.660	101
Friends/acquaintance	4.94	1.338	98	4.04	1.506	116	4.55	1.256	147	5.23	1.168	99
Homepages of service suppliers	4.39	1.454	96	3.94	1.526	118	4.30	1.244	149	4.82	1.366	100
Advertisements	3.12	1.466	98	2.46	1.312	118	3.07	1.281	148	3.37	1.426	100
Customer service of service suppliers	3.80	1.512	96	3.17	1.464	118	3.56	1.270	149	4.10	1.567	100

Table 7: Information channels for Smart energy services

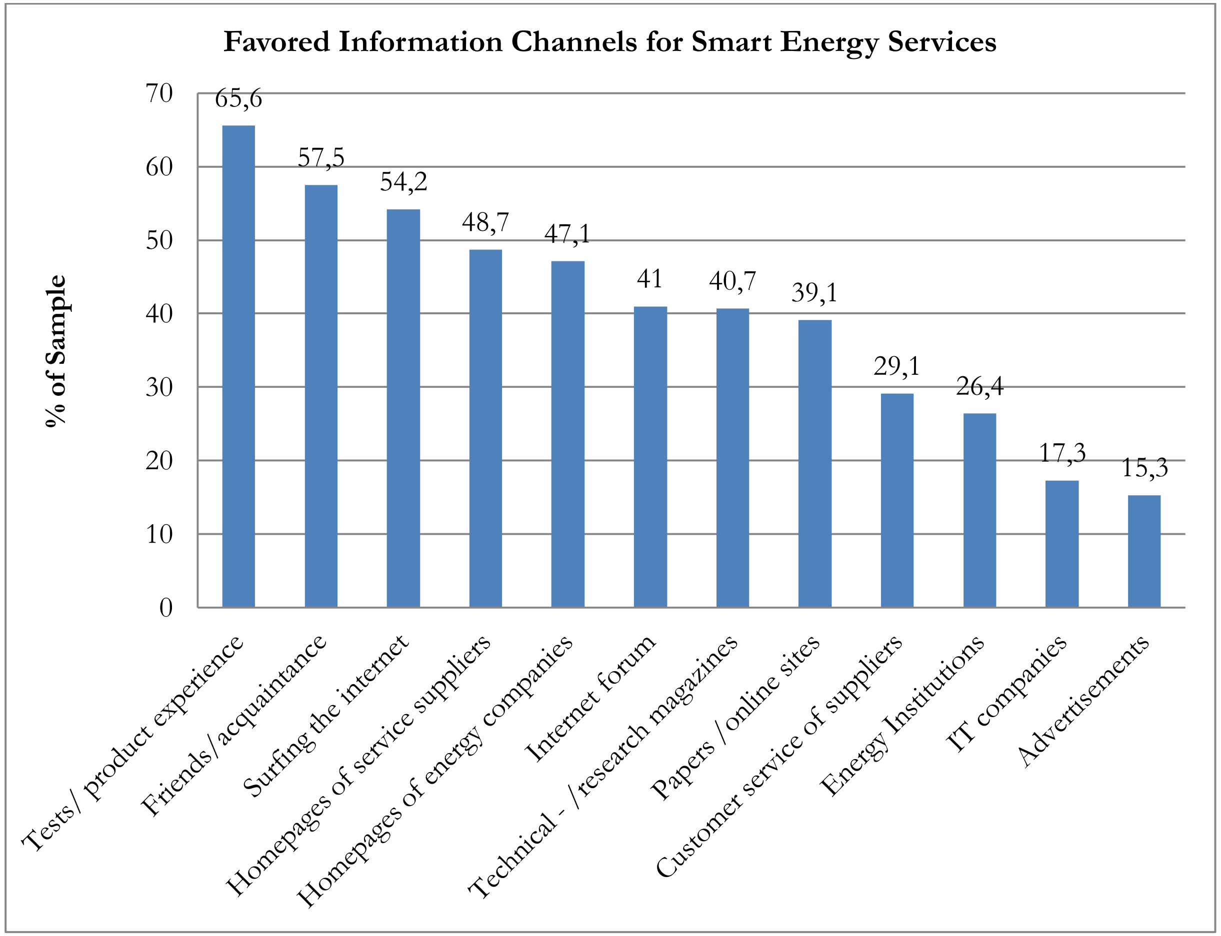


Figure 2: Favored information channels for Smart energy services