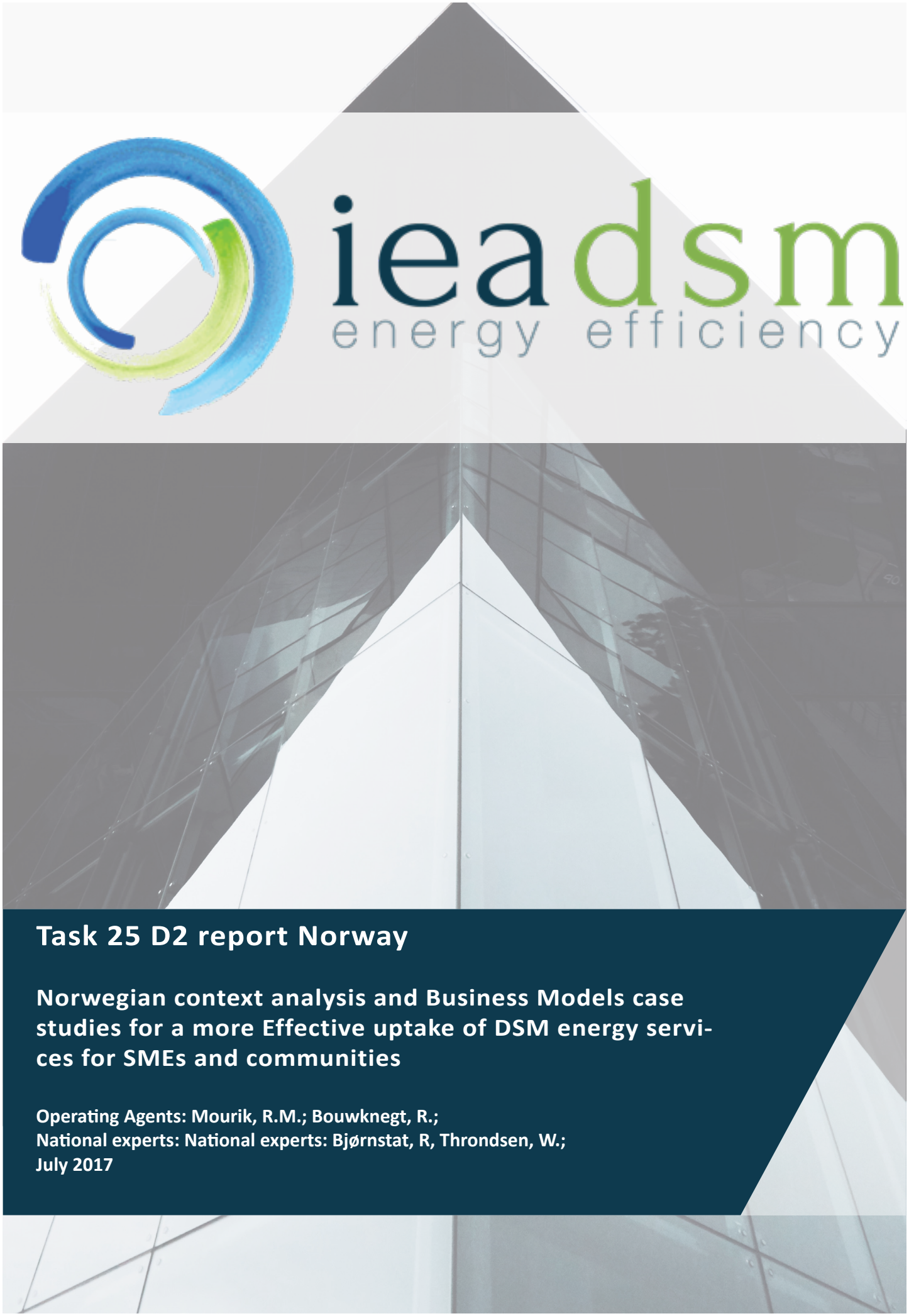

Task 25 D2 report Norway

Norwegian context analysis and Business Models case studies for a more Effective uptake of DSM energy services for SMEs and communities

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Introducing Task 25

In November 2014 Task 25 started under the umbrella of the International Energy Agency Demand Side Management Technology Initiative. A Task focused on business models underpinning Energy Efficiency services. This introduction provides the basics about the task and its core views and goals.

Why this Task is important and necessary

Task 25 is trying to understand what can be done to stimulate the market uptake of Energy Efficiency. The premises behind this question is that the current system (the established system) is technocratic and push oriented and that a more user centered approach will be more effective. In order to find out what works when, where and why we have to understand the system at the level of the proposition and the business model, at the level of the entrepreneur and his skills and at the level of all the actors in the system. Also, we have to understand interaction and exchange of various types of value.

We fully acknowledge that the current climate and energy policies reflect the interests of established stakeholders and potentially allow for low-hanging fruit type of changes and inhibit more radical type of changes. In this Task we work towards an understanding of this tension between the established regime and new business models and propositions that aim to transform the system. We have found that there is no canon yet in relevant literature on how and at which level such processes of shifts should come about, or how to make them come about. And we are convinced that these questions are essential as part of a "theory of policy" for a true green transformation. The energy efficiency market still is being defined in terms of -for example- technological, subsidiary or legal possibilities. These descriptions not only influence the way business models are being created, but also the way they are being studied (as for example, technical or contractual constructions) and being reviewed by, for example, policy makers. We think this is an exponent of what is called 'the tech-push perspective. In this perspective, the basis of economic activity is the making and distribution of goods (output). The main goal of a firm is then is to maximise profit margins through efficient production and distribution.

Consequently, in this perspective, the user has a passive (consuming) role and service is an ad-on, with the main purpose to increase the output of goods.

The task thus has a very explicit strategic framing and we do explicitly work with and towards a framework that reflects these strategic questions, with the sociotechnical transitions methodology and value flow model complementing the more individual proposition and business model focused methodology of the business model canvas analysis. For a more thorough discussion of these frameworks and models please take a look at our work plan to be found on our task website.

We decided to focus exclusively on Energy Efficiency services (by this, we exclude production like solar, biomass etc.). Based on typologies found in all countries we decided to focus on Energy Efficiency propositions offering:

1. Retrofitting (product or service included)
2. Smart (home) management systems (product or service included)
3. Renewable waste energy (product or service included)
4. Lighting (product or service included)
5. Total solutions

Subtask 2: Identify proven and potential business models for energy services

The Task is divided in 4 subtasks. Subtask 1 is about management. Subtask 3 is about training relevant stakeholders based on findings in Subtask 2. Subtask 4 is the dissemination task. Subtask 2 is the focus of this report.

There are many energy service business models "out there" and often they are closely linked to existing market structures and policies. In other words, business models are often country and context specific. The subtask is focused on performing an inventory of different existing business models, both in the participating countries and also including global examples of successful business models. In the different participating countries we analyse what business models exist, and what frameworks (market and policy) accompany them.

Subtask objectives

1. Identifying country specific suppliers, clients, and their stakeholder networks and trying to establish national advisory expert networks to continue working with throughout the task.
2. Narrowing down the focus of both services, target groups and typology of business models in close cooperation with national experts and other relevant stakeholders.
3. Clarifying how the different parameters of success of business models and services will relate to each other in the analysis – economic profitability, scale of impact and real savings, business creation, growth rate, synergies with other values, adoption rate etc.
4. Developing a task specific typology or categorisation of business models and services for EE.
5. Developing an overview of existing energy service business models in the participating countries and their frameworks/ecosystems and how they meet and incorporate client needs.

a. Longlist overview of existing services and business models

b. Shortlist overview of services to be focused on in more detail.

6. Reviewing global existing business models and their frameworks/ecosystems with a clear focus on quantifying and qualifying effectiveness.
7. In-depth comparative analysis of around 4 similar business models in different countries and around 12 per country. Determining patterns, drivers and pitfalls.
8. Identifying key factors that make services (and their vendors) succeed in the participating countries through an in-depth analysis of country specific markets and policies for energy services and their influences on business models.
9. Organising country workshops with service providers and clients.

Subtask 2 and Norway

Together with the national experts, we first drew up a longlist of interesting Energy Efficiency propositions in the participating countries. The selected propositions are interesting because they are more or less successful, effective and often fit the existing system well for some reason but still manage to create real uptake of energy efficiency (fit propositions), or they are interesting because they are 'unconventional, innovative' and focus on the high hanging fruit and real transformations of the system, we call these the stretch propositions.

Based on initial information collected in this longlist and based on the categorization of 5 types of energy efficiency propositions we made a selection of propositions that would be further analysed to understand their business model, and the interaction with the context and existing system. The selection will allow for comparison of similar propositions, with sometimes different outcomes, and operating in different political, institutional, technological, socio-cultural contexts. In a parallel movement we started fleshing out the business model canvas for each of the propositions on the shortlist. The canvas however is a snapshot, while the underlying business is a very dynamic and complex entity which operates in a system, which is also very complex, with its own dynamics. Therefore, we investigated the entrepreneur's journey for each of the propositions as well, which is a description of the business and how it has evolved over time. Also, we identify how the system influenced this development. In order to collect our data we interviewed all these entrepreneurs both on their business, their skills and their perspective on the system they operate in.

Once these individual case studies were performed and a national context analysis was conducted we entered the next stage of the task: the comparative analysis. For an extensive overview of the methodologies used see Annex 1.

Reader's guide

This country report is the Norwegian Subtask 2 final deliverable for Task 25. The report first provides a short description of the analysis framework for the Norwegian context and cases. Then the analysis of the Norwegian context is discussed and finally the different business models and services selected for the deeper analysis are described. For the comparative analysis of cases, including the Norwegian cases we refer to Deliverable 4 of Task 25.

Three levels of analysis: business model, entrepreneurial capabilities and context

This task focuses on three issues that are of key importance in the successful delivery of energy efficiency services. Sustainable business models can benefit from taking a user-centred approach. This is directly related to the fact that service value is being co-created with the end user. No user means no service.

Business models and energy services focusing on the customer perspective and their unique buying reasons for energy efficiency are therefore the next step in creating a mass market for energy efficiency. These new types of business models

and energy services are arguably much more effective than the so far rather technocratic and technology push approach

A second element of importance to delivering effective energy efficiency services is the ability and skills of entrepreneurs and providers of services to focus on this customer perspective and tailor their services. This is becoming increasingly important in creating future competitive market strategies. This certainly applies to the changing customer market for energy companies and utilities and other suppliers, which are in dire need for new business models and effective energy services. These skills include customising and co- creation, contextualising, orchestrating, stretching and scaling,

A third element of relevance to understanding how to deliver more effective energy efficiency is context. A business model design is strongly influenced by context, e.g. existing legislation and available subsidies, other bottlenecks and constraints, and various players within the current energy production and consumption system. The creation of the business model and value proposition, the context in which the business model and service is deployed and finally the capabilities of the entrepreneur/enterprise in navigating the context and user related issues are at the core of our analysis of the country specific cases.

Introducing the transition from only product to also service and user needs orientation in the EE market

A different perspective then the technology push perspective is what could be defined as a service logic. [Vargo and Lusch, 2004] In this perspective, the service is the fundamental basis of exchange.

This implicates that not goods, but knowledge and skills are the fundamental source of competitive advantage and therefore are the main drivers of value. One of the characteristics of services is that their value is experienced in use. The main goal of a firm is therefore to facilitate outcomes the user wishes for and values. From this perspective, the user has a dominant role in the creation of value as well as in the creation of the business model.

In reaction to the lack of uptake of energy efficiency products many businesses and utilities are (intuitively) changing their business and turning towards a more service oriented model. We are witnessing a transition from a focus on delivering the physical goods needed to achieve energy efficiency to a focus on offering solutions including both goods and services. A recent

Transition!

ieadsm energy efficiency

study on North-American and European utilities (Bigliani, R. et al., 2015) for example demonstrates that utilities are facing many challenges and in addition also face new competition for (the wallets of) their customers from nonutility players (including ICT companies, consumer electronics and energy equipment manufacturers, telecom). These new players offer richer customer experience with new services and new business models and force utilities to start discussing new business models (IRENA 2014). In Europe new business models tops the strategy agenda of European utility executives (Bigliani, R. et al. 2015). North-America is following, as a survey amongst stakeholders demonstrate, where new business models were seen as the most important challenge by 2% of respondents in 2014 to 34% of the respondents in 2015 (Bigliani, R. et al. 2015). And of these business models, the service model, including PV charging, HVAC services, rooftop solar, Bundles home services, community energy, data management) is most appealing to utilities that are forward-looking, with even plans to decouple the service from the sale of a commodity supply contract (Bigliani, R. et al. 2015).

Examples of emerging energy efficiency services include integrated or one-stop shop or bundled offerings around retrofitting, smart (grid) services, lighting-as-a-service, heating-as-a-service, smart energy management as a service and the more common ESCo's and EPC contracts.
The Cambridge Service Alliance, a leading research-industry cooperation states that in many sectors we are indeed facing a transition from a system consisting of products, outputs, elements suppliers and transactions to a system consisting of solutions, outcomes, relationships, network partners and ecosystems, packaged as services.

Necessary Entrepreneurial capabilities

By now we know that a (new) service is composed of several different elements, closely linked to the dimensions of the business canvas (Janssen, 2015) (Janssen & Hertog 2016 forthcoming). For these elements to work well together, the service provider needs several dynamic capabilities that have to do with the ability of the company to realize new solutions and respond to changes in the environment where they operate (Janssen et al, 2015). Four sets of capabilities turn out to be particularly significant.

1. Sensing user needs and (technological) options: this capability is about engaging in a meaningful interaction with users and other stakeholders to extract relevant information for fitting the service to the expressed needs. This interaction can be about co-learning, by sharing knowledge from both sides, or about contextualizing, by making efforts to match service offerings with actual needs.
2. Conceptualizing: engaging in service provision often means that the companies experience frequent interactions with users and stakeholders. Yet, the same companies might not always be able to take a step back and uncover general patterns in the rich variety of context-dependent needs. Service providers able to conceptualize have strong induction capabilities and they are engaged in innovation on a regular basis.
3. Co-producing and orchestrating: services often require the alignment of several different actors as they bridge for instance several physical inputs providers to create the end experience. Companies able to co-produce have developed capabilities for working together seamlessly with different partners, have strategies on how to create consistency and smooth procedures for interaction, particularly in the case of diverging incentives.
4. Scaling and stretching: a final key capability relates to the marketing skills of service providers and their ability to package their offerings in a way that large user groups will recognize the value of those offerings. This capability is about finding and promoting a general formula for value creation.

Context

The national regulatory and political frameworks in many countries are not favourable towards service oriented business models and can hinder the development of an energy service market. The current frameworks in many countries in Europe are very much product focused/technology-push business model oriented, hindering service oriented business model (i.e. financing schemes favour the delivery and innovation on products instead of services).

If we want to create markets for energy efficiency services we need to consider current energy markets infrastructures, regulation and support mechanisms in place (both for old and new technologies) since these directly influence the business model opportunities in a country (Huijben and Verbong, 2013). In addition, business models are part of or embedded in a socio-technical system or ecosystem (Johnson and Suskewicz, 2009), and these systems are fast changing and complex environments. Because of these continuous changes and complexity, learning and experimentation are of main importance for business model development (McGrath, 2010; Chesbrough, 2010).

A business model design is thus strongly influenced by context, e.g. existing legislation and available subsidies, other bottlenecks and constraints, and various players within the current energy production and consumption system and consequently some type of business models are encouraged, others are hindered (Bidmon and Knab, 2014; Provance, Donnelly, and Cara Yannis, 2011; Geels and Schot 2010; Huijben and Verbong 2013 Mormann 2014). Business models thus reflect and reproduce the social and political organisation of state and market action, ideas about energy (as a resource or as service), interpretations of public and private space and responsibility and ideas about the role of consumers and providers in constituting demand (Shove, eceee 2015). These institutions not only influence the way business models are being created, but also the way they are being studied, monitored and evaluated (by, for example, policy makers).

In this Task we explicitly focus on this shift from product orientation to also service orientation in the Energy Efficiency field. For a much more detailed description of this paradigm shift, the role of entrepreneurial skills and the role of context see our Deliverable 4 report.

Norway – context analysis

A short energy history of Norway

In order to describe the context for energy efficiency in Norway, we choose to start with a review of near history. Norway is large in area relative its population, and a wide range of energy resources are available. A long coastline gives potentials for wind, wave and tidal energy, while the inland adds waterfall and biomass resources. Substantial off-shore oil and gas resources complement the energy endowment. The energy sector in Norway is dominated by two main policy areas, hydropower and oil/gas.

Hydropower

The utilization of hydropower has developed through the 20th century and with an increased focus after WW2. This laid the foundation for the power-intensive industry within metals, chemicals, fertilizers etc., brought industrial development to the nation, including in many "remote" communities, and created the foundation for the modern Norwegian energy system. Important institutional principles, such as the concession system with the reversion principle (ownership of waterfall resources returns to the Norwegian state after the concession period) and the system of concession power, ensuring direct economic benefits to municipalities "giving up" waterfall resources, were established in this period.

The big expansion in hydropower capacity took place during the 1950 – 1990 period. In addition to supplying energy to the expanding heavy industry, thus driving the modernization of the nation, it also made available cheap and reliable energy for other sectors of society. This opened the way to an expansion in the use of electric equipment and appliances in these other sectors, and it also resulted in a widespread use of direct electrical heating systems in the building sector. Such heating systems are inflexible in terms of energy carriers, and this dependence on electric energy has become a major issue regarding energy security in Norway. The fact that Norway is second only to Iceland in terms of per capita electricity consumption, illustrates this dependence on electric energy.

Through most of the 20th century the production and distribution of electric energy was mostly publicly owned, and as an effect of the strategic role of this sector in the industrial sector after WWI, it was also heavily regulated through a complex of legislation. Local monopolies, differences in investment strategies, etc. had led to an inefficient energy system. With the new energy law (1991) Norway became one of the first countries in Europe to deregulate the electricity market and establish market principles as the basis for energy production, trade and investments. The separation of electricity generation from distribution activities (the latter regulated as natural geographical monopolies), and the introduction of a common Nordic spot market for electricity are effects of this legislation. Most low-hanging hydro resources are utilized by now, remaining potential large scale projects in general have too high environmental costs to be developed. Realistic potential new hydropower projects are therefore mostly related to smaller scale and local developments.

Oil and gass

The second main energy political area in Norway, is the oil and gas sector. This industry developed from the 1970s on, primarily off the shores of southern/western Norway. During this period the country became among the largest global exporters of oil and gas. Related supply industries and technology development followed the expansion of the offshore industry, and became important parts of the general industry structure of the country. In addition, the fiscal revenues accruing from exports of oil and gas became very important in the state finances. A large proportion of this public income stream has been set aside in a designated investment fund (The Government Pension Fund Global). The political discussion related to the future development of this industry reflects the uncertainties introduced with the climate issue, and the key question is whether to expand and continue developing this industry, possibly into the risky waters of the Arctic, or to downscale and leave most of the remaining resources in the ground.

Other market developments

A common Swedish-Norwegian green certificate system was introduced in 2012, designed to add 28 TWh new renewable electricity into the system by 2020 (this volume represents around 10 % of the current normal year's production in the two countries). Most projects are realized as wind and CHP projects in Sweden, and as new hydro power in Norway. The short term effect of this instrument is to increase the surplus of electricity in the Scandinavian system, and thus to maintain the low spot market price of electricity that has been observed the last years.

Bioenergy resources, used as traditional firewood, in central heating systems, or as biofuels, are not utilized near their potentials today.

As a broad "landscape overview" we may therefore conclude that Norway is a country rich in energy resources, it is a large exporter of oil and gas and with a domestic energy system built around a plentiful supply of cheap and clean electric energy. We will return to the question of how energy efficiency is motivated within such a context.

Political and economic context

Norway is party to the European Economic Area (EEA) agreement, therefore all EU directives regarding energy apply in Norwegian energy policy. The country is part of the EU Emission Trading System. Norway has signed the Paris Agreement and reported an INDC with a commitment to reduce absolute greenhouse gas emissions by at least 40 % by 2030 compared to the 1990 level.

Energy policy

The national energy policy further rests on two fundamental documents: first, there is the "Climate agreement", a consensus document endorsed by a majority of the political parties represented in the Norwegian parliament, recognizing the challenge of climate change and specifying climate goals. Second, a White paper published in 2016 on energy policy toward 2030 (reference) both reinforces and adjusts the main lines in national energy policy. The paper specifies four main goals for energy policy:

(i) Enhanced security of supply, (ii) Efficient production of renewables, (iii) More efficient and climate- friendly use of energy, and (iv) Economic growth and value creation through efficient use of profitable renewable resources.

The electricity production in the Norwegian energy system is, as mentioned, already mostly renewable (97 % from hydro and some wind power). Reducing GHG emissions from electricity generation is therefore not the major motivation for energy efficiency, although exported surpluses may replace fossil fuels based electricity generation in the European market. On the other hand, development of both hydro and wind power installations will have negative local and regional environmental effects, and most new projects are controversial on these grounds. Avoiding the need of some of these potential projects is therefore desirable. Energy efficiency is therefore considered a general tool for strengthening both the economic and the environmental sustainability of the energy system.

The goal of enhanced security of supply reflects challenges inherent in the basic design of the Norwegian electricity system. It partly reflects an energy availability issue. The amount of energy available in a hydropower system is determined by the reservoir filling. This is a function of the weather and precipitation patterns in the preceding months. There is some degree of variability in snow- and rainfall, and in years with low precipitation the total availability of energy may be low.

A more pressing issue, however, is related to the load profile of the energy system. The locked-in dependence on electric energy, also for heating, poses a challenge in terms of power capacity. Furthermore, the typical morning and afternoon power peaks are not expected to be dampened as the number of induction tops and EVs continues to increase. In addition, in periods with cold weather, the need for (electricity based) space heating causes a further lift of the power demand. "Security of supply" therefore is mostly a matter of managing the power needs in this context. Energy efficiency (i.e. load reduction), load shifting and conversion to non-electricity based heating systems are principal measures for improving security of supply.

The last of the energy-political goals poses a more strategic challenge. The long term fate of the oil and gas industry is becoming more uncertain, seen in light of the climate issue and the Paris agreement. If the large national incomes generated in this sector should be drastically reduced, and the current level of national welfare be maintained, it would be necessary to replace this income shortfall by value added generated in other sectors of the economy. Given the low energy intensity in the creation of economic value in the oil and gas sector, this transition would imply a need for a substantial increase in electricity generation. The need for energy efficiency is obvious in this scenario.

Economic conditions

In addition to the energy political framework, the more general economic conditions are also important part of the context of energy efficiency. Norway has experienced a strong economic development during the last few decades. Between 1990 and 2015 the disposable per capita income increased 89 %, and by the end of the 2000s it had become the one member of the OECD countries with the highest per capita income. The oil and gas exports have been an important engine in this development. High employment rates, a positive development of real wage rates and private consumption, a relatively equal distribution of economic wealth, strong public finances combined with a well-developed welfare state, are all characteristics of this prosperous period. The period seems to have

come to a temporary halt with the drop in the oil price that was experienced in 2015, which resulted in lower activity and layoffs in the oil sector, and with some effects also in other sectors. Increasing international instability also add to the uncertainty regarding future development. (Source: Økonomiske analyser 1/2016). The home ownership rate among Norwegian households is high, and the home is the primary object of investment for a majority of households. Only 4,4 % of disposable household income is spent on electricity and fuels (Forbruksundersøkelsen Tabell: 10236), reflecting the low energy prices. It follows that the general consciousness on energy use and energy efficiency is rather weak. This relative lack of focus on energy use and efficiency is reflected in other sectors of the society, and large potentials of energy savings are identified across most sectors.

Potentials for energy efficiency

A few examples illustrate these potentials for energy efficiency. One prominent example is the practice of gas flaring and venting in oil production. At offshore installations and refineries gas is often burned (flared) or vented to the atmosphere for operational efficiency and security reasons. Technologies exist that make it possible to collect this wasted energy and avoid the GHG emissions that follow. Large potentials for energy and climate efficiency exist here, however the incentives for the operators to make these investments are too weak. Also in the more general industry sector we find large savings potentials, some at very low cost, that could be harvested. A range of barriers, from organizational and cultural to technical and economic, exists. Process improvements motivated by competitive forces, and which have positive effects on both energy use and GHG emissions, are observed in many industrial sectors. However, potentials are still large.

The built environment – existing building stock – is a large potential source of energy efficiency measures. A major challenge in this sector is the indirect character of energy demand. Energy use is interwoven with people's lives and activities in a complex manner that represent many kinds of barriers relative the technical potentials for energy efficiency. The passive qualities of the building stock (insulation level and air tightness of climate shell) together with technical installations are keys in energy use in this sector, although the behavioural aspects of the user of the building also matters significantly. The buildings sector is central in the analysis of energy efficiency in this project. And, as illustrated by the figure below (based on household measurements), space heating (64 %) represents the one dominating end use of electric energy in the household sector. This reflects both the cold Nordic climate and the characteristics of the energy system, discussed above. Addressing the use of direct electrical heating in buildings therefore is one of the priorities of Norwegian energy policy in an energy efficiency context.

Energy agency – Enova SF

A dedicated energy agency (Enova) has been in operation since the early 2000s offering an increasingly broad portfolio of programs designed to reduce the different barriers for energy efficiency. Enova offers investment subsidies for efficiency measures, new renewable production, and conversions of heating systems from electricity to alternative (renewable) energy carriers. These programs cover most stationary energy use, and are designed to induce permanent market changes where the more energy efficient solutions become the preferred ones.

Enova is owned by the Ministry of Petroleum and Energy, which is responsible for execution of the policies toward the oil and electricity sectors. Building and regional planning policies are under the responsibility of the Ministry of Local Government and Modernisation, while climate policy belongs to the Ministry of Climate and Environment. All these policy areas are of importance to energy efficiency, potentially with conflicting interests, and Enova tries to find a position in this landscape that represents a good balance between the different interests.

Over time, and with changing political constellations in the Parliament, there seems to be a relatively stable support of the current course of Norwegian energy policy.

Context analysis

Industry structures	*Key players:* • Energy retailers • Energy agencies • ESCOs • Umbrella organisation DECA • Political bodies *Target groups:* • Industry: lack of information about EE, financial barriers • Utilities: 140electricity and more than 30 gas suppliers on the market • Big enterprises: audit or EMS • 560.000 SMEs in Austria – no obligation, but great potential • Private households: 25% of final energy consumption • Public bodies: contracting
Policy context	• EED directive leading the way • Austrian Energy Efficiency Law: energy audits and EMS, monitoring centre • Austrian Law for Electricity: smart meters by 2019
Market and User practicees	• Energy Efficiency itself is not appealing • Energy costs not perceived as painful or high; does not create urgency • Lack of trust and transparency in businesses: these are key-values that firms should communicate
Technology and Infrastructure	• R&D still plays a role, especially for smart services • Roll-out of the smart meter decisive as well as IT based services and products
Culture	• Comprising mentality – delay in decision making and cautious, restraint approaches • Climate change seen as serious problem • Lack of confidence in energy efficiency services
Scientific knowledge	• Research shows big interest in the field of energy efficiency • Especially the topics of smart meter, smart grid and energy services are well represented.

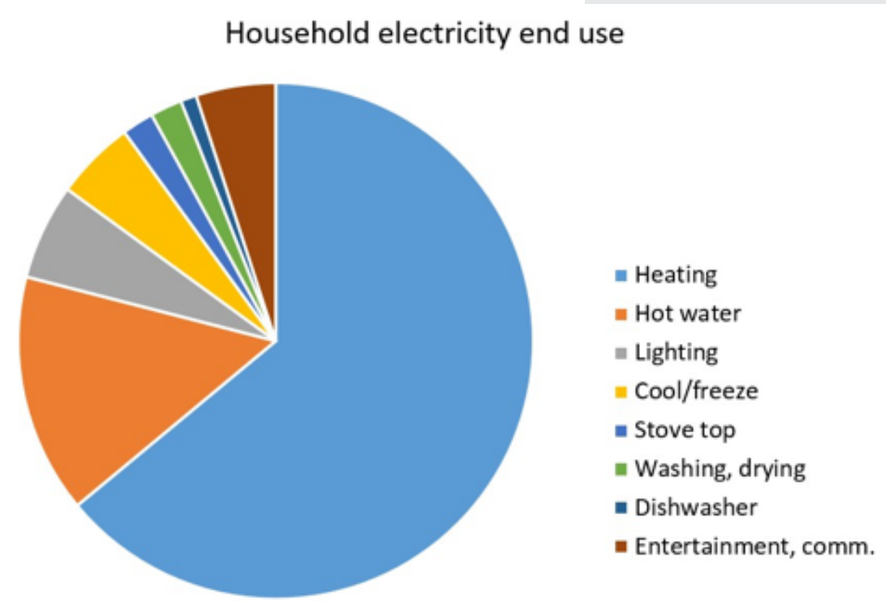


Figure 1: household electricity end use, source: REMODECE project

Context analysis Energy Efficiency Market [1]

"Energy efficiency" is a concept with a certain degree of abstractness, and it is an unobservable entity. Above we have described some of the substantial technical potentials for energy efficiency that are observed in the Norwegian society today. It is, however, important to mention that significant energy efficiency gains in terms of energy intensities have been and are achieved over time as results of improvements in technologies, product standards and building regulations. As an example, the average stationary energy use in Norwegian households has shown a decreasing trend during the last decade, partly due to technical improvements. (SSB: Energibruk i husholdningene, statistikkbanken)
The national energy agency Enova operates within a contractual structure with the Ministry of Petroleum and Energy. This model for operationalizing the energy efficiency policy covers the major areas of energy use, and it includes a quantitative goal for energy savings and new production to be achieved for the agency. As a consequence of this chosen model the energy suppliers have no quantified energy efficiency obligations, and a great deal of the energy efficiency market activities relate to the programs offered by this agency. Although this model is considered successful – it has achieved an energy result in the order of 20 TWh since 2001 – there is a long term goal to achieve a market transformation that renders economic subsidies for energy efficiency measures superfluous.

Describing the Energy Efficiency Market

So, how can we characterize the market for energy efficiency in Norway? In defining this market we lean on a consulting report commissioned by IEE (footnote: an interest group for energy efficiency within the electro trade association) in which the characteristics of the energy efficiency market is discussed (Adapt Consulting 2015). This report points at three areas (our interpretation) that are considered "drivers" for energy efficiency within our context. These are (i) building regulations and standards. New building standards imply increasingly stricter demands on the passive quality of the new buildings, over time reducing the heating needs in the building stock. As indicated above, focus is on insulation and air tightness of the building envelope. Building principles, choice of materials, and quality of workmanship are crucial in achieving this. The Passive house concept and BREEAM certification are important parts of this development, which increases building quality and energy consciousness among building contractors. Over time, energy efficiency is improved as an added value to this development.
Further, the report points to (ii) a general improvement in energy efficiency in technical ("active") installations, notably heating/cooling systems, ventilation systems, and lighting. The diffusion of high COP heat pump systems, ventilation systems with high rates of heat recovery, and LED lighting systems are examples of such technology improvements. The efficiency of these systems/technologies is further enhanced by increasingly intelligent energy management technologies. With the smart technologies, enabled by AMS and communication technologies, the scope for smart energy management is expanded from the building to the electricity grid level, thus comprising both energy and load "security" issues.
For these two first points, energy efficiency is an implied effect. The third point, which is interpreted as
(iii) development of new business models, is more explicitly addressing energy efficiency. The report points at "green" rental agreements, energy performance contracting and added sales in renovation projects, as examples of new approaches to energy efficiency. Bundling and coordination of different streams of the value chain is a key in these concepts, as the transaction costs for a building/home owner of an energy efficiency project may be prohibitive.
The report, in its definition of the "energy efficiency market", does not include efficiency gains from tighter building standards or improved "standard" technologies. For the purposes of this task, and in the Norwegian context, we may apply the report's definition of the energy efficiency as
The explicit demand for products/services in the building contractor market that are motivated by the customer's desire to reduce energy consumption or energy costs. (p. 10, our translation).
Given the specific characteristics of the Norwegian energy system discussed here, combined with the objectives if the IEA DSM Task 25, we highlight the following two as the most relevant parts of the market for energy efficiency: energy performance of existing buildings and smart energy management.

The energy performance of existing buildings

As the energy performance of new buildings/ homes are taken care of by the building regulations, a main focus must be on existing buildings. As pointed out in the buildings directive, the time when a building is subjected to a major rehabilitation represents a window of opportunity also to make an energy upgrade of the building. When doing an otherwise necessary rehabilitation, the marginal costs of upgrading the climate shell and climate systems may be relatively low. Moreover, once an ordinary rehabilitation without an energy upgrade) is completed, the old (lower) energy performance is locked in, and the potentials for efficiency gains largely lost for the coming decades.

This window of opportunity represents an important potential market for energy efficiency. It includes passive measures such as additional insulation of walls, loft and cellar, low energy windows, and improved tightness of the construction. A range of efficient ventilation, heating and cooling technologies exist, together with lighting and other technical installations with better performance than standard technologies.

A recent study showed that when Norwegian homes are subjected to a major rehabilitation, only in around half of the cases are the rehabilitation measures complemented by energy upgrading measures. This illustrates the strategic importance of policy measures and market developments in this sector. Enova therefore has subsidy programs that address several of the value chains and barriers involved in this market. A long term goal is to be able to terminate these programs and count on market actors to fill this market space.

Smart energy management

The second main market area for energy efficiency is related to the introduction of smart technologies. The mandatory rollout of smart metering infrastructure is to be completed by 2019, effectively creating the necessary prerequisite for the diffusion of smart solutions. As mentioned in the introduction, grid bottlenecks and power limitations at different levels in the grid is the most pressing current issue regarding security of supply. Improved energy management is an alternative to investments in grid expansion in this case. Looking forward, it is expected that an increase in intermittent generation capacity (wind, solar), parts of it distributed, will add to the demands of smart energy management. From an end user's perspective, the smart grid will enable various types of beneficial activities. These include energy savings (through increased awareness of electricity consumption enabled by various feedback technologies), load management (shifting high loads in time, enabled by dynamic pricing schemes or technical control systems, and micro-generation (household-based generation of electricity from renewable energy sources, e.g. solar power or small wind turbines).

A survey has identified three central "smart energy" projects: Demo Steinkjer, Smart Energy Hvaler and Demo Lyse. The Demo Steinkjer and Smart Energy Hvaler projects have a broad focus on different smart grid solutions (electricity saving, load management, micro-generation and power balancing capacity) as well as different areas of household consumption. Both projects, which are still in their initial phases, are characterised by being based within a specific geographical area (the town of Hvaler and the area of Trøndelag) and have a specific focus on smart meters and their potential use for developing smart grid solutions. Demo Steinkjer and Smart Energy Hvaler are subprojects of the DeVID (Demonstration and Verification of Intelligent Distribution grids) project, which is a demonstration project with the aim of providing knowledge and experience for the planning of the coming roll-out of smart meters in Norway.

The third project, Demo Lyse, focuses on the potential for combining smart meters with new ICT infrastructures like fiber optics and new devices like tablets etc. Energy-related aspects like load management or energy saving are not the primary focus of this project, which instead focuses on the potential of new technologies for home automation (like controlling appliances or heating and lighting) and developing new welfare services like tele-medicine. Thus, this project exemplifies the diversity of ideas and solutions that is often associated with the smart grid concept.

1 EEF is a trade organisation for companies selling energy efficiency in Sweden where also ESCO-companies are members.

The Norwegian case studies

Summary

10 cases were analysed and 10 entrepreneurs were interviewed.
The table below highlights the selected cases based on how they were categorized.

- Retrofitting (Otovo and Bolig Enøk)
- Total Solutions (Filago and Hvaler)
- Smart service solutions: (HyttaMi, Sikom, Serinus, Tiny Mesh, Futurehome and Meshcrafts)

Category of Energy Efficiency service	Name of business	Strategy	Type
Retrofitting cases	Otovo	smart matcher	2
	Bolig Enøk	smart matcher	2-3
Total solutions	Filago	aware changer	4
	Hvaler	aware changer	4
Smart service solutions	Hytta Mi	smart matcher	2-3
	Sikom	smart matcher	2-3
	Tiny Mesh	stealth changer	3
	Meshcraft	aware changer	4
	Serinus	stealth changer	3
	Futurehome	smart matcher	2

Figure 2: categories of energy effiency services

Retrofitting cases

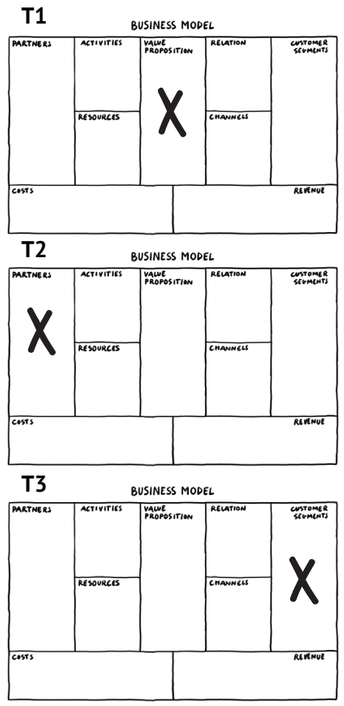
The Story of Bolig Enøk

Bolig Enøk is a firm specialized in energy upgrading of housing. Their mother, Glava, is Norway's market leader in the production of insulation materials.

Bolig Enøk is also a partner of Enova in offering Energy Efficiency audits for private homes. These audits are subsidized, that is, when an audit is conducted, 50 % of the costs are subsidized. Also, the home owner can get subsidies for the execution of the measures, improve the energy efficiency of the homes and get a new label for their improved home.

The entrepeneur's journey

Originally, Bolig Enøk only performed the energy audits of the houses. They position themselves as a consultancy agency for energy efficient upgrading. The actual implementation of measures was / is performed by contractors/ constructors. This market is very fragmented and hard to get grip on from a home owners' perspective. Also, a large amount of Norwegian homes is of the same type (typical detached homes from the 70's and earlier) and need to be modernized. Most of the people who obtain these kind of houses will do so before they move in. In other words, there is a lot of activity in the upgrading-of-houses- market, be it not aimed at energy upgrading, but at modernizing a house.



What changed?

A "chain concept" is under consideration:

- Expand the existing service to include also the complete contracting part
- Package and market this product in a wider geographical as a "one stop chain" concept

Necessary to have control over most of the value chain, specifically to build a system that includes the contractor (building company).

What caused the change?

- Fragmentation of contractor market
- High cost of upgrading
- Experience from the initial concept of energy audits.

Figure 3: the entrepeneurial journey of Bolig Enøk

Their position (being a partner of Enova, training others to perform the audits and being part of the Glava company) as well as the presence of the subsidies and the growing activity in the upgrading of houses market, motivated the company to become active in the market of implementing the measures themselves. The audit is the starting point for the customer. This way, they become a trusted partner to assist the customer in the blurry process of making retrofitting decisions by providing simple, standardized and therefore cheaper solutions for upgrading their homes. The user buys a modern, upgraded home (good living), and on top of that he benefits from lower energy costs and a better energy label

Capabilities

Bolig Enøk didn't actively do research to understand their client's needs. However, performing many energy audits provided them with a lot of users' knowledge. Also by training contractors and constructors to perform audits they learned a lot about the suppliers' side of the market. They meet the home owner in his early plan making stage, which makes them understand the buying process of their client (the customer buying journey) and they do know how to conceptualize this into a more comprehensive offer. They've sensed two pains in the upgrading of housing journey: the incomprehensive, blurry process of choosing the right contractor, deciphering the quotes

and not knowing if the work is done correctly. By taking the role of advisor, the user can trust the suggested report and the standardized measures.The other pain is the low interest in energy efficiency. By providing total retrofit solutions at relatively low costs (by standardizing) the customer is helped with a simple and clear process, a retrofitted house, which is energy efficient as an extra benefit. Orchestration: The process of modernizing a house is a complex and frustrating journey to many home-owners or house-buyers. By offering a solution that is a more coherent, pleasant experience indicates that the orchestration capability is well developed. Because this proposition is still very young, there is not much knowledge if the user will perceive this solution as smooth and pleasant. Bolig Enøk focusses on the performing of the measures, and the subsequent registration of the house in order to receive an update housing label. After this, the interaction with the user stops and. The concept of standardizing the measures suggest an ambition to target a larger group with a fair priced solution. Bolig Enøk seems to take a 'good' position in the service orientation. They're already in the business, have a patient 'mother' which gives them time to grow and learn in the market.

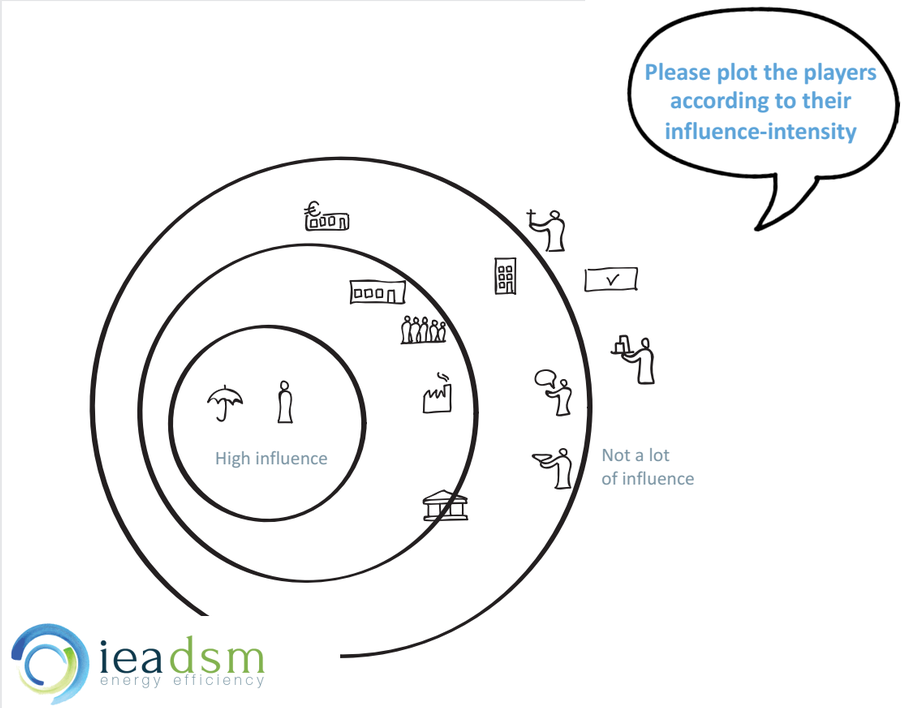


Figure 4: the context of Bolig Enøk

Analysis

Context

Several context elements 'helped' Bolig Enøk:

Policy objective: increase energy efficiency by increasing the rate of energy upgrading. Subsidy scheme for ambitious energy upgrades is introduced.

Building regulation: stricter energy requirements (new buildings), spill-over to older buildings?

Stable and low energy prices again after some periods with higher and more variable prices some years ago the fragmented market of constructors was turned into a business opportunity.

Bolig Enøk can be described as a smart matcher, which means that they know how to anticipate to current market situations (under the umbrella of a patient mother). They're still offering a one off solution and don't integrate the customer use phase in their offering.

Type 2

Bolig Enøk is a type 2 business model. They offer a solution until transaction and do not support the use phase. Also, they target their market with standardizing the offer.

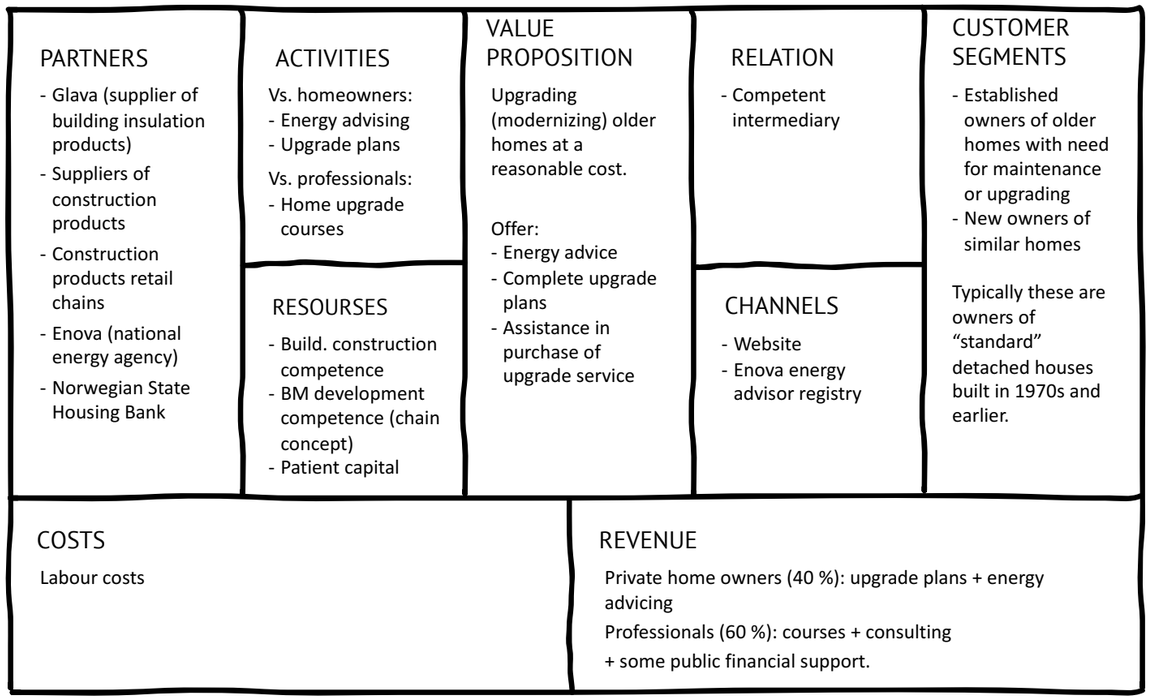


Figure 5: the business model canvas for Bolig Enøk. The canvas is based on the canvas developed by Ostelderwalder & Pigneur 2010.

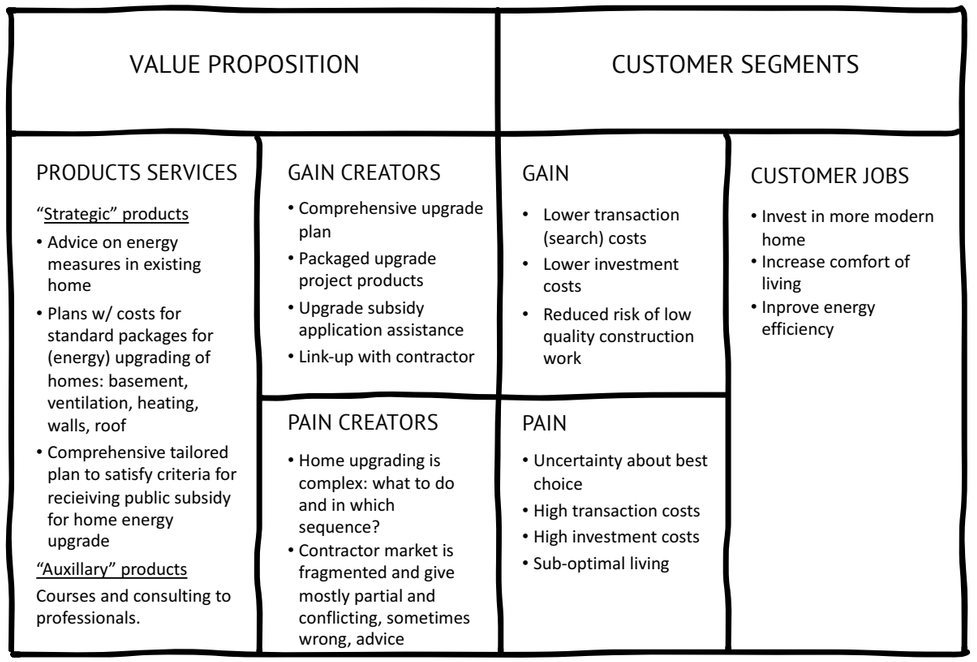


Figure 6: the customer value canvas for Bolig Enøk. The canvas is based on the canvas developed by Ostelderwalder & Pigneur 2010.

The Story of Otovo

The entrepeneur's journey

Otovo is a company which provide solar PV to private customers without the customer having to engage in any of the hard work, and the installation is leased by the customer for X years. The idea behind this start-up came when one of the entrepreneurs himself was planning to install solar PV on his roof. This proved to be an extremely arduous process, as there were no one offering complete prospects. This meant that as a customer one would have to plan and put together a prospect for themselves from scratch. Needless to say, this is a great hurdle for solar PV market proliferation. The basic idea behind Otovo then is to make solar PV available for most people, simple and affordable. The goal was 100 houses within 2016, and this was reachable. After that the goal is to increase volume to decrease cost.

At the moment Otovo have been working on customer journey for PV interested customers, as well as work on their value chain to reduce installing costs. They are coordinating installers, quality checking their offers, seeking subsidies, seek municipal approval, etc. They have already established partnerships with some solar panel installers and electricians

Business model canvas

Resources: Proprietary planning software for calculating amount of solar yield a specific roof can absorb with a specific PV system, and what kind of energy cost will result for the customer, based on publicly available data.

Value proposition – product service: The main proposition is complete prospecting and financing of PV systems. This reduces barriers for regular people, who don't have skills or knowledge about these systems. All the customer needs to do is provide their address, and Otovo does the rest. Allows people to produce their own power, which is lucrative in a prospect of ever rising el-cost.

The gains related to this is of course that it is per today very difficult for individual private actors to put together solar systems without knowledge and skill. For anyone doing this, employing regular installers at one-off basis is very costly, and Otovo's proposal utilizes economies of scale. There is also a "Plus-customer framework" entering the energy system in 2017, which will allow any customer producing below 100 kW to freely feed energy back onto the grid, for a small compensation. This allows Otovo to actually prospect less detailed/tailor-made setups, because eventual surplus at the customer side can be sold and "you can afford to miss the goal a few days a year". Also, solar panels are in general standardized, so the planning and installation is like "Tetris". Some final drivers are the ministry has saying they would like to see higher spot market costs. There are also prospects of removing coal, gas and nuclear from the mix, which removes a large part of the existing supply. The cost of energy is also quite weather dependent, and people dislike the fluctuations, even though they even out across the year, the increases still hurt. Another component is that the grid cost will increase, as the grid suffers from a development lag (€12-14 bn). El-tax will continue to increase steadily, and it is not a politically controversial issue.

On the pain side, regulation is important and keeping up with it is demanding, in order to provide long term stability for customer base. E.g. in Spain and state of Nevada, established actors have stood in the way of allowing prosumers in the market to protect their own interests. The market is thus somewhat uncertain, as the viability of prosumption still has not been actually tested in the market

Customer relations pertain to leasing of solar PV systems. They also report a "fan based" customer base, all the customers have come to Otovo on their own. Other relations are the tender relations with installers, who place bids for the amount of PV systems to be installed. Also they have face time with customers during install and maintenance. Other important channels are word of mouth. Digital channels, like social media, all accrue zero marketing cost. Customer responses shape software development, which is used for planning the shape of installations.
Costs relate to financing, install cost, operation of installation (20 yr. guarantee)

Customer segments – customer jobs:
Customers need long term perspectives, and include everyone interested in technology and environmentally concerned. They often already have hi-tech homes and are conscious about how their lifestyles impact society, and they own an EV. People who are worried about future cost of electricity. Gains for customer includes zero planning, no installation effort, no need to finance (i.e. zero payoff time), economies of scale make product cheaper. They can produce their own power, and sell surplus power through the "plus-customer framework". Some pain is related to the fact that surplus power is not worth as much as the one you purchase. Using own electricity is much better than selling it, because you avoid tariffs, grid cost, tax and VAT. Surplus power only redeems the tariff.
Revenue
Leasing fees, subsidies

Capabilities

Sensing: The Otovo-company is based on a key user insight and a strong sense of the context issue that the buying process is a frustrating process. As they are still quite 'young' it is hard to tell if they develop this sensing into a core capability.
Contextualizing: as the plus customer solution shows, Otovo is able to anticipate on contextual issues that could inhibit them. Also, they seem to live up to their promise to make the buying process simple.

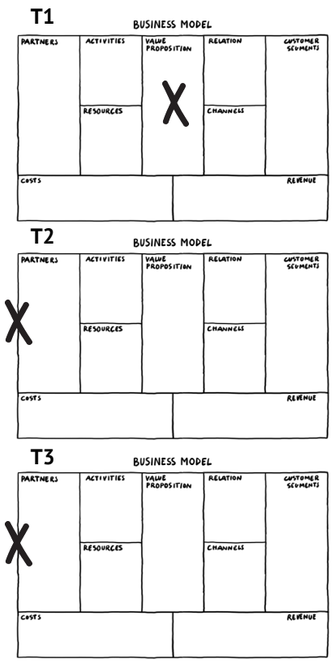


Figure 7: the entrepeneurial journey of Otovo

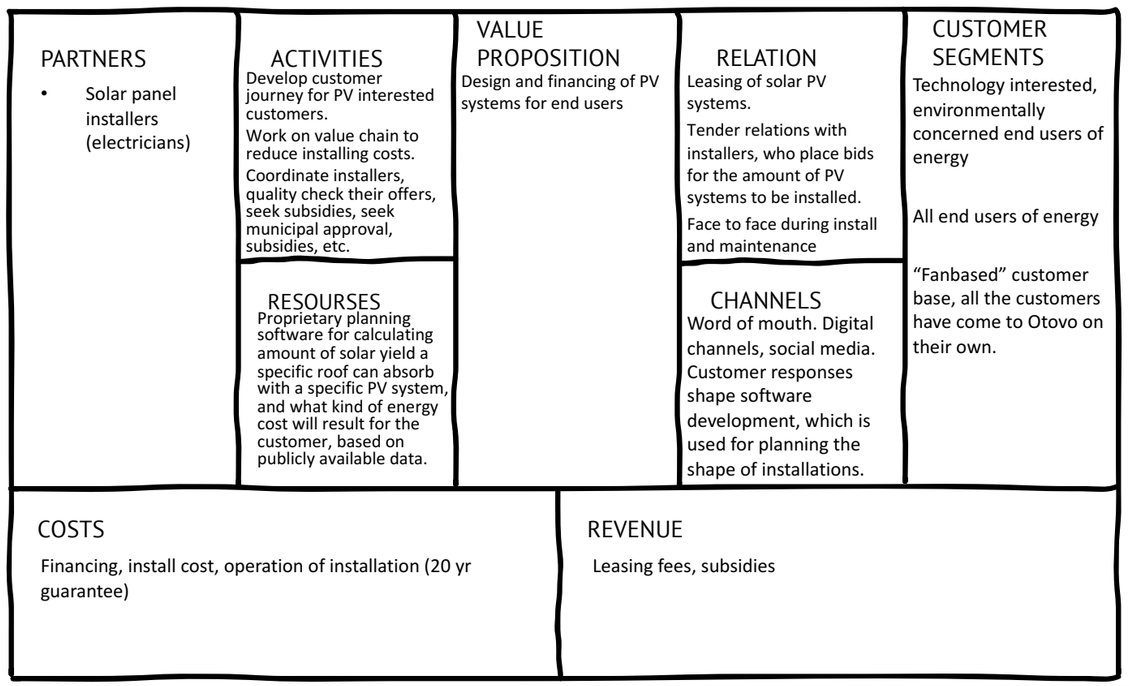


Figure 8: business model canvas of Otovo

Orchestrating. They've managed to orchestrate the buying process and try to also integrate the use phase by offering an app that visualized the production.

Analysis

Context

Otovo has dealt with context by conceptualizing and turning barriers into opportunities. Their focus on the buying side mainly is, considering the fact that they do not have a big investor as a patient mother, is probably a sensible strategy. This way, they will build a client base and a reputation and time develop and integrate the use phase. This makes them a smart matcher.

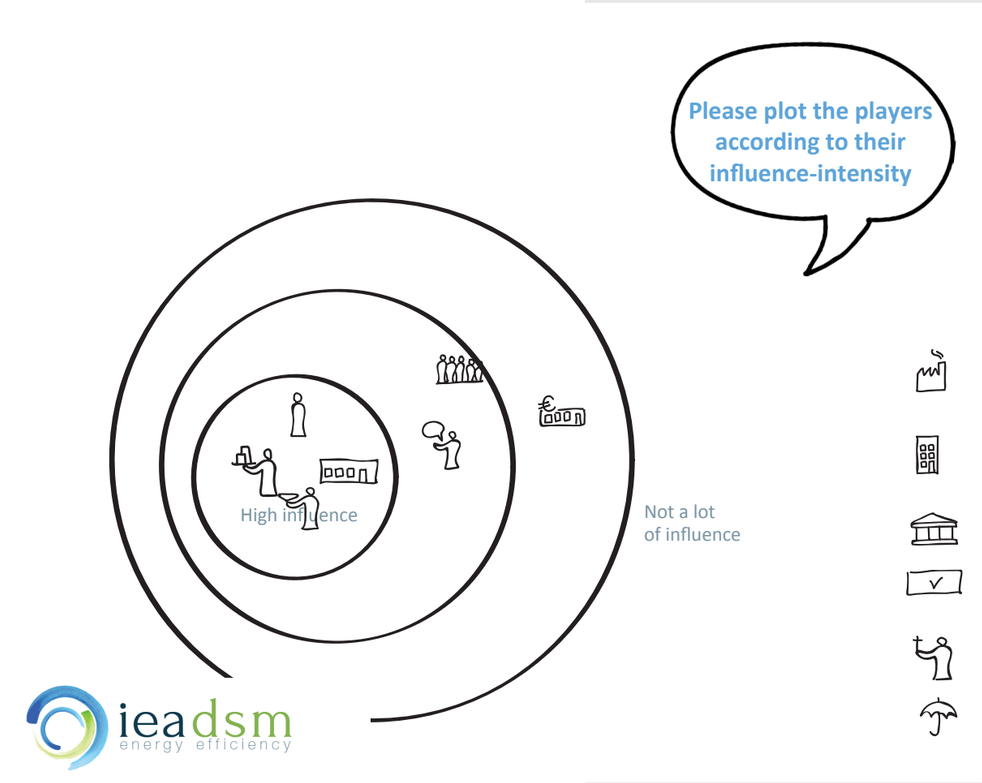


Figure 10: context of Otovo

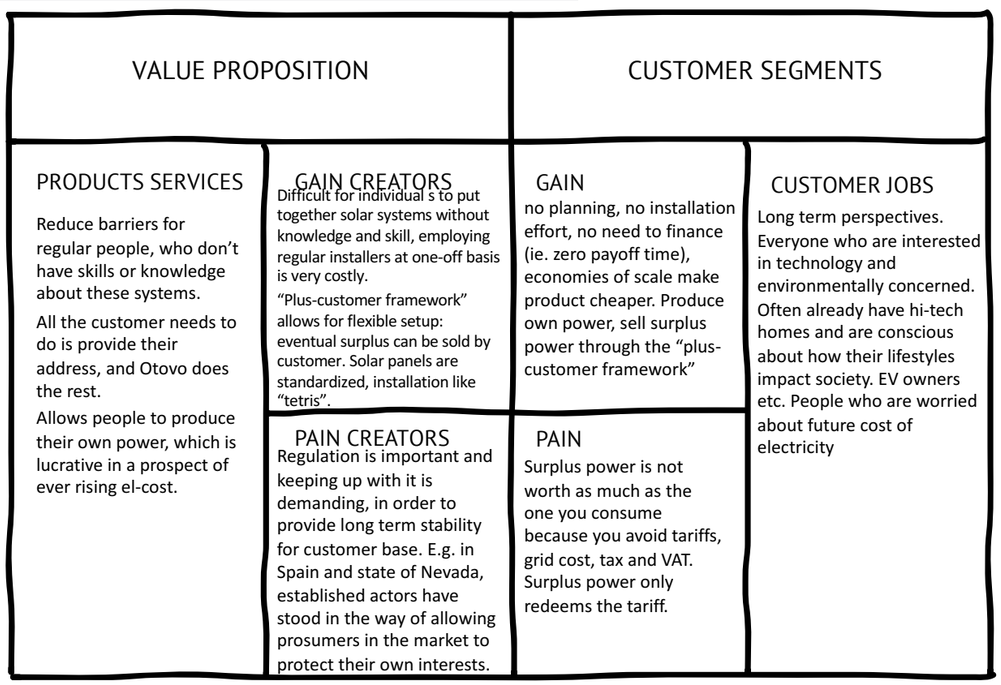


Figure 9: the customer value canvas for Otovo.

Figure 11: where do Otovo and her stakeholders stand in the product versus service paradigm?

The Story of Filago AS

Vision: “Making sustainable living accessible.”
Filago’s idea is to contribute to the birth of a new standard (norm) for sustainable property development. It aims to bridge the gap between the concepts of “sustainable village” and “intentional communities” by performing the function as “place maker”.

Entrepeneur's journey

The key actors in Filago have a background in property development, construction, architecture, etc., and thus the main motivation is to make a business in this emerging market. The fact that they have identified a “market segment” of people looking to realize a more ecological, back to nature, sustainable lifestyle, and who have a willingness to pay for it, illustrates this. However, the interview conveys an impression of a strong value orientation toward ecology and sustainable architecture and building concepts. This value basis is a necessary condition for (potential) success in this “market”, the profit motive alone is not sufficient. From their communication concept: “Unless you stand for something, you don’t stand out”. (Quote from Jones, Olins).

Established 2012
Interview on 15. April 2016 with:
- manager (CEO) Trygve Harder Strand
- chairman of board Pål Lund-Roland
Both were present at the interview, mr. Lund-Roland being the most active.

A key insight behind their philosophy is that sustainability runs across all aspects of modern life. In addition to living in and with nature in a geographical sense, it is also necessary to address the structures we live within. Therefore the Aktivhus concept, seeking a construction concept with as minimal a carbon footprint as possible, is part of Filago’s solution. The building concept is their “hardware hard core”.

Business model canvas

Value proposition: Filago offers a life in a sustainable ecovillage, with climate- and energy friendly buildings, installations and infrastructure.

Customer segments: Filago’s customers are people with a purpose in life. They are the forerunners of a small footprint way of life, understanding the anticipated shift to a “slower” life of lower consumption and sustainability. They are conscious and resourceful persons, although not necessarily in an economic sense. Customers represent most age groups.

Work mode: From the interview it appears that Filago is engaged in two main activities, one mainly commercial activity and another related to concept development.

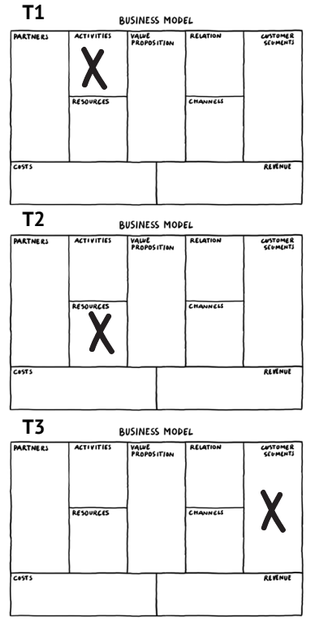
The commercial activity: The firm identifies and acquires land areas that are suitable for development of an eco-village. These lots are mostly in rural areas, where land area is acquired at lower costs. Rural lands are also better suited for the lifestyle expected form living in an eco-village. However, the eco-village concept is not necessarily restricted to a rural setting.
There are two important barriers to address in the commercial activity:
- Municipal land use
It is the local municipality that is responsible for the local plan for land use. This plan contains a zoning plan, regulating in a relatively detailed manner how the land can be used. Zoning plans reflect the standard mode of property development, and the concept of an eco-village is not familiar to the local planners. Getting the proper building permits therefore can be difficult and take time, not necessarily due to ill will by the municipalities, but more as a result of lack of competence. Filago therefore invests in the dialogue with municipal planners to work out zoning solutions that accommodate development of an eco-village. This process may take some time to complete.

External financiering: The eco-village concept is not well understood or accepted among traditional commercial banks and other financial institutions. Developments not located in the central geographical areas and with the unfamiliar eco-village label are considered too risky. Financing through traditional channels have therefore proven more difficult than for ordinary development projects.

Filago aims to establish a reference portfolio of 10 eco societies, consisting of around 2.000 housing units, within 10 years. It aims to develop a supply system with a capacity of 400 homes per year.

Concept development activity

Filago wishes to offer a broad spectrum of eco-living solutions, from the small “eco-square” (block) of buildings (5-20 homes), via the “hamlet” (20-50 homes) to the “village” (more than 50 homes). Also the “town” concept, solutions in cities or suburbs, is included in the concept. Community buildings, public squares, area for gardening/



What changed?

Development of a concept for building construction (“Aktivhus”) – a wood construction based on mostly standardized elements.

What caused the change?

The need for a cost efficient building concept with a small carbon footprint.

Figure 12: the entrepeneurial journey of Filago AS..

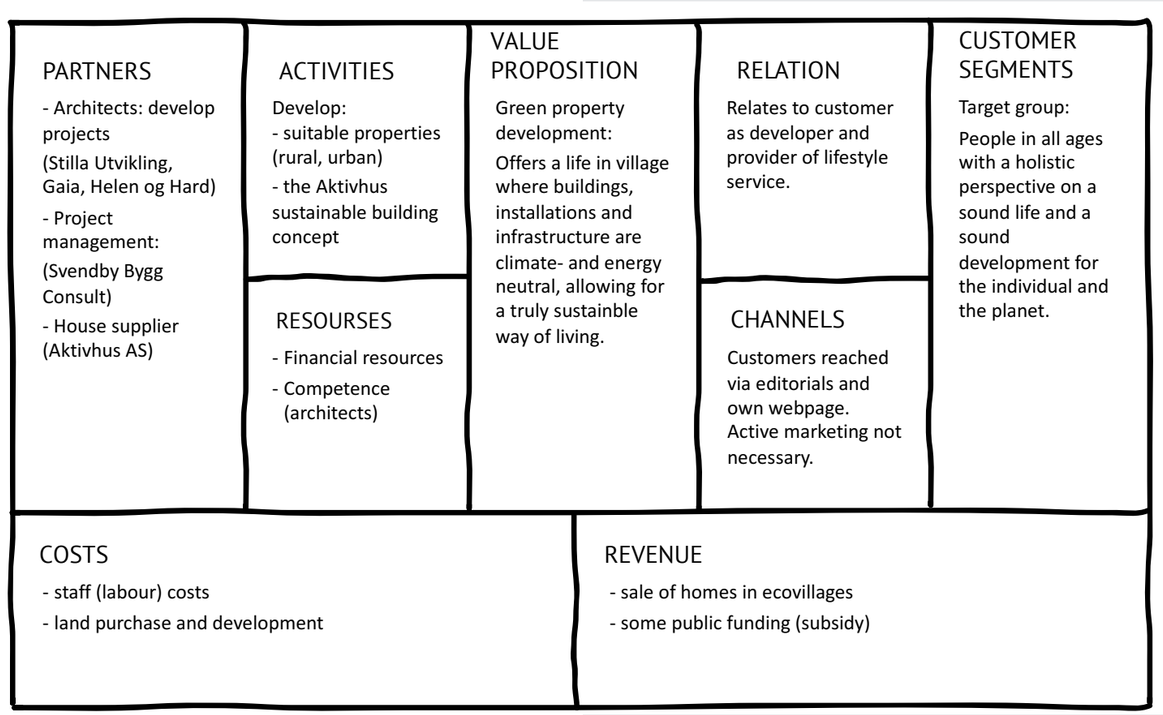


Figure 13: the business model canvas for Filago AS.

agriculture, etc. are included in the different solutions.

The core of the concept is the Aktivhus, a building solution with a small ecological footprint. These houses/buildings are constructed with natural and environmentally sound materials, with natural ventilation for a healthy indoor climate, with bio and solar based energy supply within an energy efficient wood fiber insulated building shell, and an area efficient construction plan.

The goal of the Aktivhus building solution is to develop a fully integrated value chain "from timber to building" with an aim to be the most efficient and ecologically friendly supplier of "green development projects". The Aktivhus aims to become the standard/reference for eco building. This development and innovation activity contains both a design-, production- and supply chain strategy. The Aktivhus building concept is continuously tested and implemented in Filago projects.

Partners: Filago has close to ten owners, the largest is Mamatoto AS (40,2 %), where the chairman of Filago's board is a majority owner. Mamatoto AS is a patient owner.

Aktivhus AS, where the development of the technical building solutions take place, is owned in majority by two "Gaia" architects, with Filago being a minority owner (4 %).

In addition to the activities of Aktivhus AS, Filago cooperates with other architect and development service suppliers:

- Stilla Utvikling
- Helen og Hard

On site project management

- Svendby Bygg Consult

Owner structure Filago

Name	Number of shares	%
Mamatoto AS	92704	40.18%
Hlr Invest AS	33176	14.38%
Rinus Invest AS	32631	14.14%
Ulven Investment AS	24870	10.78%
+ 5 smaller owners		

Revenue: The main financing is from a patient investor/owner capital. Some project/concept development financing has been awarded by Enova (to Aktivhus), however only marginal. As projects are completed and sold, profits may be reinvested in new projects.

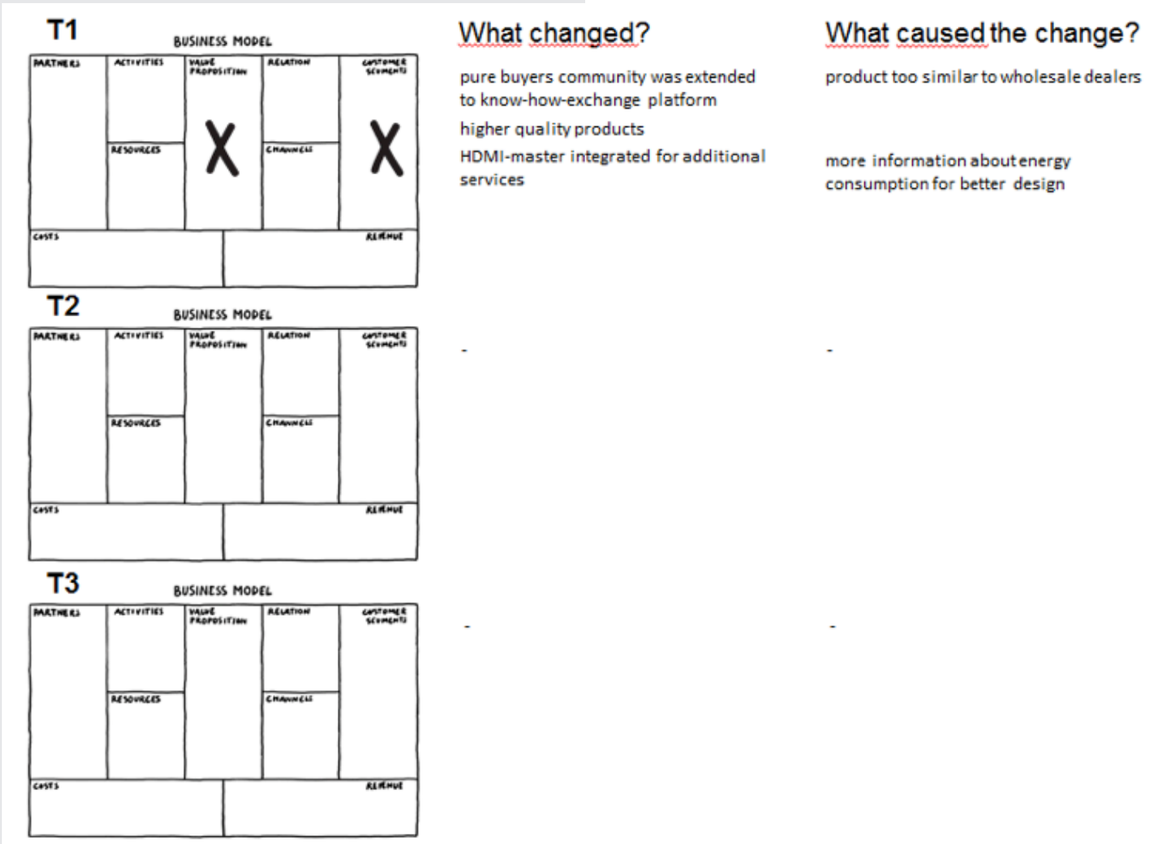


Figure 14: the entrepreneurial journey of Filago AS

According to partnerships, a network could be a good description. Yes, there is formal and informal interaction between Filago's partners. Partners are involved in their fields of expertise in solving problems that may arise in the development of the village.

Capabilities

Sensing: the whole concept is based on a key user insight and a niche target group. Filago co-creates with context players.

Scaling: slowly, but surely, and mainly with the stealth changer strategy. Having everyone in the right gear, they move on to the next stage in the project.

Orchestration: well developed. There are many partners involved and still they seem to be able to pick the right partners as well as manage to all serve the same goal: a eco lifestyle village.

Conceptualising skill seems to be very well developed, as they show to be able to customize the Filago concept to the wishes of the community.

Scaling: is too early to tell. They do work with more municipalities to make their Filago concept happen.

Analysis

Context

In Hurdal Eco Village, the only project under actual construction so far, there is one person living in the village who is the Filago representative and who should be considered the idealistic driving force of the concept as well as the village. He has been working to realize the Hurdal Eco Village for close to a decade before Filago entered the picture. He is in lots of different dialogues with other residents sorting out all minor, practical issues and even major problems that appear in the current phase of the project. And there are many problems to address in the intersection between green idealism and business. Some of the residents are disappointed due to the deviation between the sales prospect and the actual situation in the village.

The ambitions are clearly stated, but the experiences with the first village indicate that the "roll-out" is not straight forward. They are in the process of acquiring suitable properties, however my impression is that the marketing and construction of these projects is still uncertain. However, many errors and problems from the first project provide learning and improvement for the next

It could be added that the municipal administration (planning office) also becomes some kind of partner in the municipalities where Filago wishes to develop a project. The municipality, so far usually rural, typically welcomes the project, since it generates local activity and potential new inhabitants in the

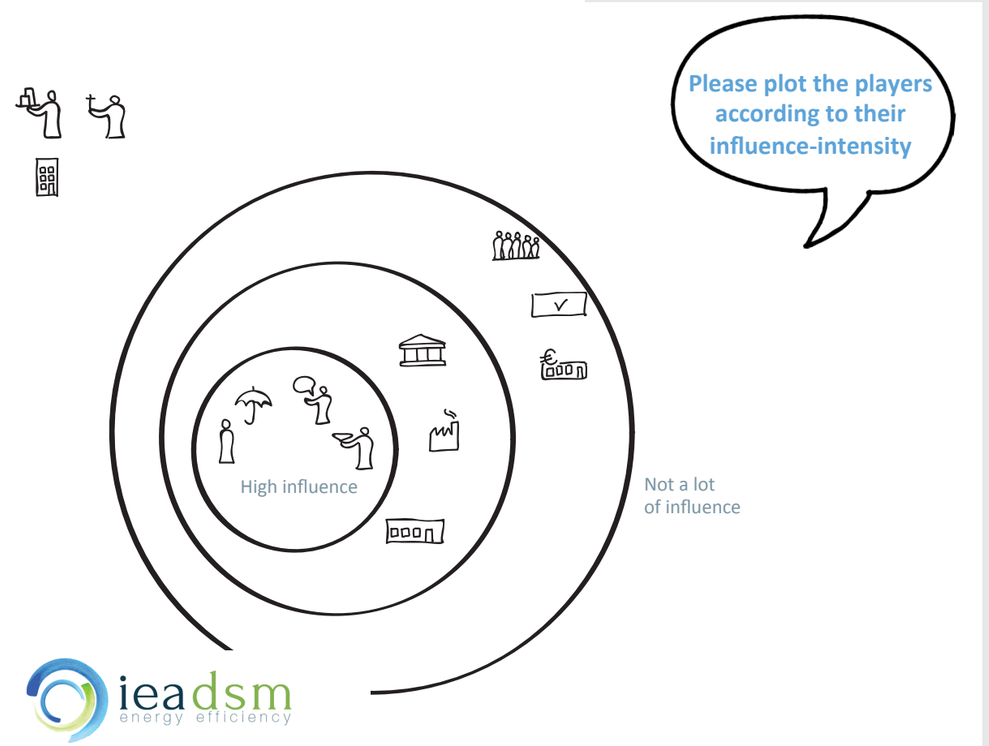


Figure 15: where does Filago AS and her stakeholders stand in the product versus service paradigm?

community. Finding a good solution to the zoning issue thus is in the interest of the municipality also.

Type 4
Although the core of Filago is property development, they offer a lifestyle concept more than anything else. They are among their first clients, and target a group who more or less devote their lives to an eco-lifestyle. They target a niche with a tailored, customized offer (a new life!)

Strategy
Aware changer. They cooperate with communities (and take the lead in development) in order to bend rules and adjust regulations, with a strong focus on lifting the community 'up'.

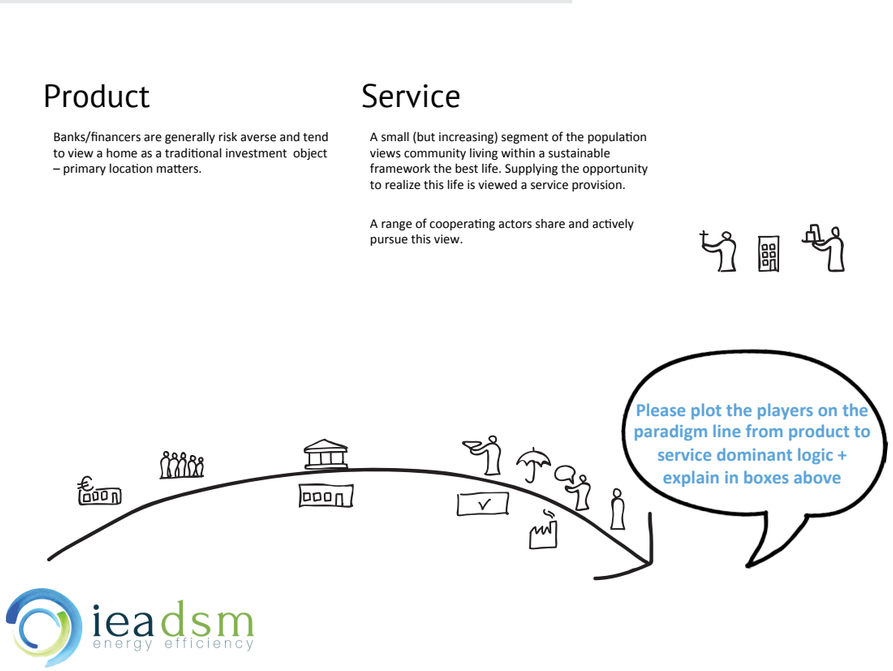


Figure 16: where do Filago AS and her stakeholders stand in the product versus service paradigm?

The Story of Smart Energi Hvaler

Entrepeneur's Journey
This case is actually not a company, but rather a framework program which has been going on for 6 years, a collaboration of energy utility, a local Norwegian Centre of Excellence for smart energy markets at a local university college, as well as the municipality of Hvaler (triple helix). The joint mission is to shape "the energy markets of the future", and doing so by employing demo technology and solutions in the small island municipality of Hvaler.

SEH started out as an attempt at delaying the refitting of about 2000 failing meters in 2010, right at the time when they knew that smart metering was about to be introduced (the meter regulation was announced to be revised in 2011). There was thus a need for comprehensive forward thinking in order to avoid the entire refitting to become obsolete just one year later.

One of the main activities in the pilot now aside from electricity retail is developing market for private PV installations (~3-5000 kwh/yr., 2, 3 and 3,1 kW). They are also introducing an Internet gateway for monitoring and control of end use consumption. The focus on consumers is on load shifting away from peak hours for network benefits. Hvaler also has national park status, a lot of tourism in summer, and would thus like to reduce consumption instead of expanding grid and increasing tariffs.

Business model canvas
Activities: When the solar project started a year ago, neither customers nor SEH realized what needs would surface. Installing the panels created a need for developing some form of visualization on the customer side, which then became a priority. Introducing panels also sparked an interest in micro wind. Another event saw the municipal regulation (four year planning document) come up for review, where municipal plans focused on environmental goals like sustainable waste management created a good climate for introducing ambitions about more wind power as it was along the same sentiment. Future plans are made for deploying neighbourhood wind, micro generation, where 6-8 houses each can share one big windmill. A lot of time has gone into waiting for technology to get cheaper.

Resources: There is AMI installed at customer base. R&D setup, collaboration leads to EU project grants etc. On site pilot capability. Solar panels, wind energy, automation, visualization (gateway technology for showing real time consumption). Municipal cooperation, triple helix in general. Municipal goodwill, avoid enforcing "unnecessary regulation". In return, the municipality has gained skills and knowledge, and increased their renown as forward leaning.

Value proposition – Product services:
Make better use of Norwegian green energy surplus to benefit export/import situation and

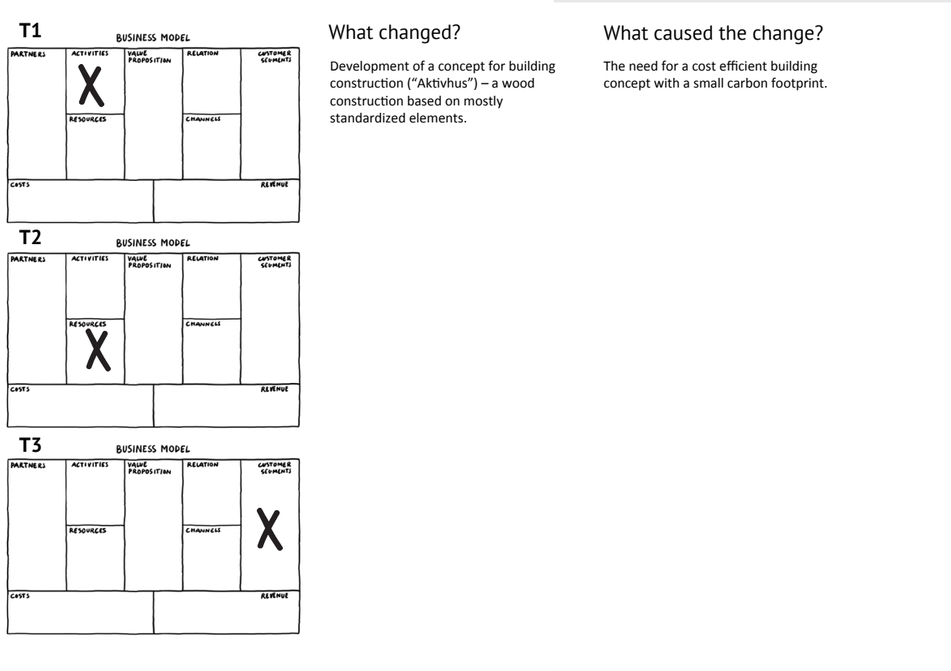


Figure 17: the entrepeneurial journey for Smart Energi Hvaler.

contribute to sustainability. For customers the goals of saving energy, maintaining comfort levels, and ability to contribute to the green shift is central. They deliver to the customer a packet solution, tailored solar PV for own energy production. If a customer wants to invest in solar energy, all they need to know is how much (2, 3 or 3,1 kW) and they fix the rest. They also deliver an internet gateway for comparing produced energy and consumption, control capabilities.

Some central gains are: first of all, neighbourhood value effects. The community experiences increased interest when neighbours install PV. Also, the municipality is a major player with interest and support. In return they get a major knowledge and competence gain. Municipality also acts heavily as "door opener", esp. reg. customer applications for installing PV. There are also some municipal subsidies for customers buying solar PV in place.

Some of the pains relate to the visualization of energy for customers and control/management services, since it is hard to tell what customers want before they want it. When solar was installed, the customer requested visualization tools to go along, so they could manage energy and see the effects. This requires more effort from SEH. Secondly the energy sector is a traditional industry culture, and customer already has high degree of dependency (typical energy industry issues).

The relationships with the customers are typically long term and quite personal. Elsewise it is a traditional customer-utility relationship. Due to the aid of the municipality they have achieved a speedy application process for private solar PV installations.

Main channels to the customers consist of the neighbourhood effect. They also engage in customer research (focus on customer needs). Personal relationships are important in this small community, and the informant from the energy utility knew about 85% of solar panel customers by first name, they would often call her directly when they had questions. Public meetings (folk meetings) with attendance of local community leaders such as the local mayor, has been adding weight to this endeavour. In general, the customer relationship is characterized by face to face meetings, emphasis on dialogue, and in general based on a level of trust. Customer research has been centred on actual needs of solar energy for customers, cost benefit analysis, and price sensitivity, down payment duration tolerance, etc.

The costs entailed in this endeavour are mostly contained by each individual/entity man-hours. The utility pays a lot for own activity. Also, operating costs of >300K shared equally by partners (media company, web page, community meetings, div. activity).

Customer segments – customer jobs: The project includes some of the most «forward leaning» private energy customers in Norway, as was evidenced by an Enova competition which elected the domicile of a customer here "Norway's smartest house" (good PR). Of experience, the most interested customers are - maybe a bit contra intuitively – older segments. Area has largest buyer group of solar panels in country last year, average age was 60 (oldest 87). This could relate to the rather cost intensive approach, the cheapest PV setup at Hvaler was around €2000 (most expensive €12 500). This indicates PVs in Norway appeal to a rather grown up, mature buyer group with money. In addition this generation remembers the over consumption meter, which they grew up with, and taught them the virtue of conserving, adding a cultural component to this analysis. In general this age group state that they are concerned about contributing towards handing over the planet in a decent condition to their kids, and tend to not carry concern only about economic incentives.

Gains for the customer is constituted in some energy savings, an added overview and better relation to personal consumption, energy knowledge, a tailored and ready-made solar PV setup in packet solution, something which is very difficult to do for independent users in the current market for PV.

Some relevant pains are the fact that solar PV is quite cost demanding, and provides long term benefits only.

Revenue streams: No revenue, as it is not a company. Specific projects are paid for sometimes by R&D money. The informant referred to the importance of considering unquantifiable gains like reputation, skills, knowledge, and market development factors. There is certainly some amount of work going in to justifying this kind of activity at the utility, which answer to a corporate board.

Capabilities

The community of Hvaler are users as well as providers, at least to some extent. User can –with help- create their own EE solutions. Sensing and user interaction is therefore well developed.

Also, they chose a selected group of users (the community as lean forward customers, who can be considered as critical champions.

Because of this really close relation with clients, the conceptualizing capability also is very well

PARTNERS	ACTIVITIES	VALUE PROPOSITION	RELATION	CUSTOMER SEGMENTS
• - Fredrikstad energy • - Hvaler municipality, • - NCE Smart Energy Markets • - Enova («Smarte målere, smarte forbrukere»)	Electricity retail, private PV, Internet gateway for monitoring and control of consumption. RESOURSES AMI installed, R&D setup, EU project grants, pilot capability, solar PV, wind, automation tech, municipal goodwill	Norwegian green energy surplus to benefit and contribute to sustainability. Saving energy, maintaining comfort levels. Reducing consumption instead of expanding grid capacity	Long term, quite personal. Traditional customer-utility relationship. Speedy application process. CHANNELS "The neighborhood effect", cust. research, pers. relationships, public meetings w/ attendance of public leaders e.g. mayor	"The most interested customers are older segments." Largest buyer group of solar panels last year. Average age was 60 (oldest 87). "Grown up, mature buyer group with money." This generation remembers the over consumption meter

COSTS	REVENUE
Own-hours/man-hours. The utility pays a lot for their own activity. Also, operating costs of >300K shared equally by partners (media company, web page, community meetings, div. activity)	No revenue, as it is not a company. Specific projects are paid for by R&D money. Unquantifiable gains like reputation, skills, knowledge and market development factors are taken back to justify activity at the utility.

Figure 18: the business model canvas of Smart Energi Hvaler

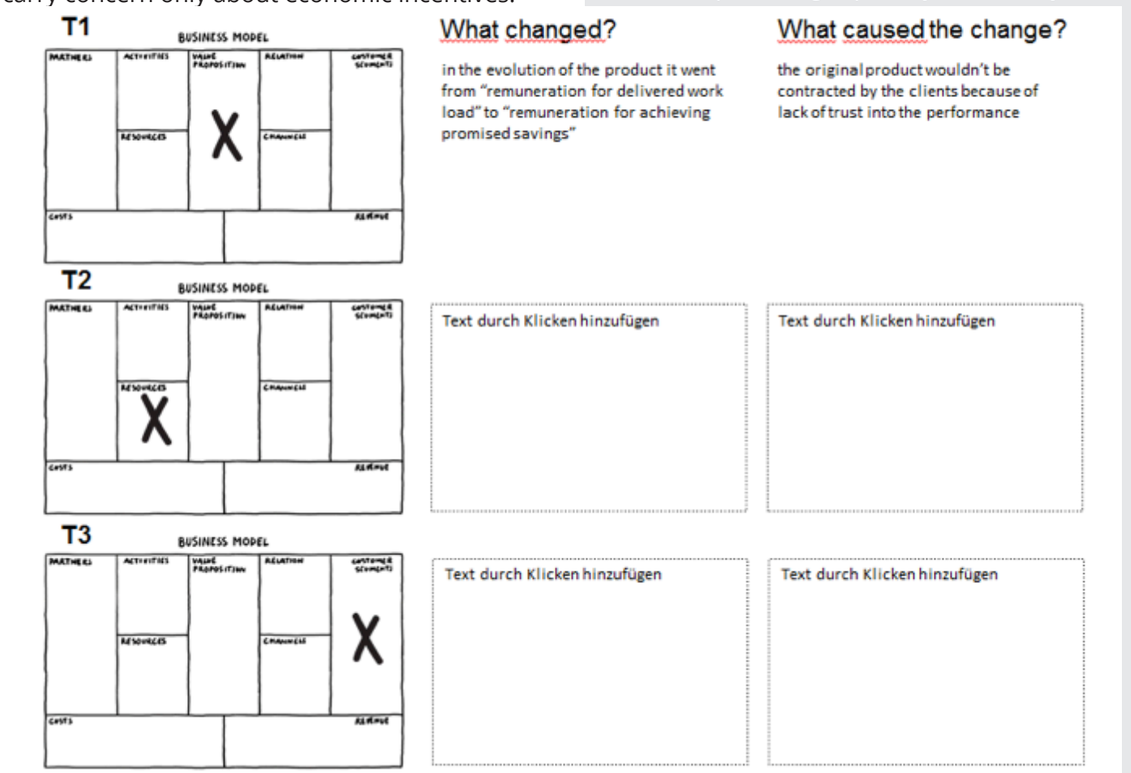


Figure 19: the customer value canvas of Smart Energi Hvaler

developed, demands from customers are met with new, tailored solutions.

Analysis

Context

Smart Energi Hvaler is an aware changer. Even more, Smart Energi Hvaler is created as an experiment and therefore a bit of a stranger in our research. However, the object of Smart Energi Hvaler, shape the energy markets of the future, is done in close cooperation with clients and all stakeholders out there.

BM type 4

Benefits like wellbeing considered as valuable. Not technology but customers' needs are in focus and leading the Business Model. Although Smart Energi Hvaler is both a long term experiment and a commercial offer. The business model is developing according to facts on the ground. The facts on the ground are what are determined by the uptake of the customers of RE/PV. The more PV they get, the more flexibility they assume will be available to put into morphing the business model. I would say they are one to watch these days, as they are constantly developing their BM the success is the result of intensive co creation between several partners and the Hvaler inhabitants.

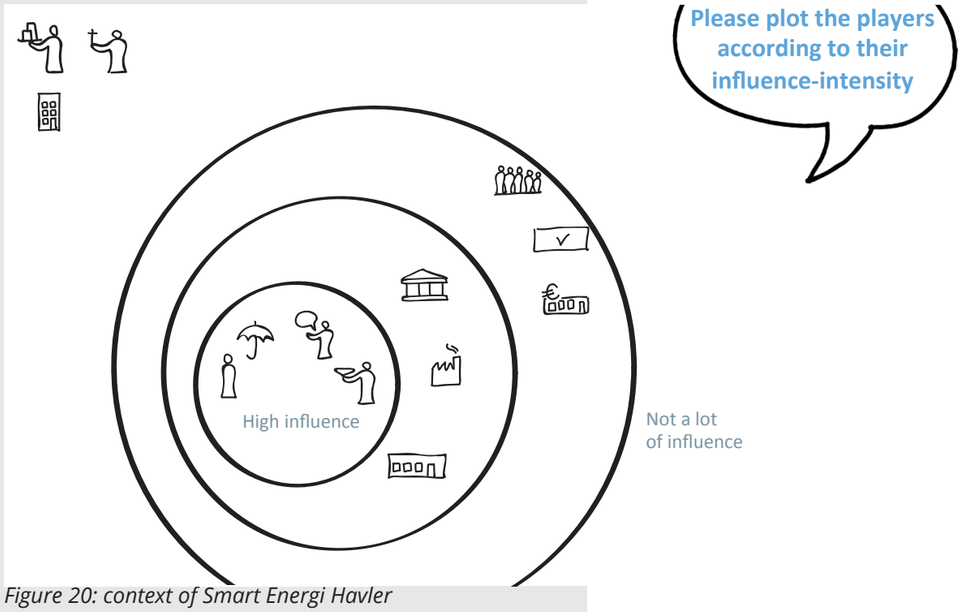


Figure 20: context of Smart Energi Havler

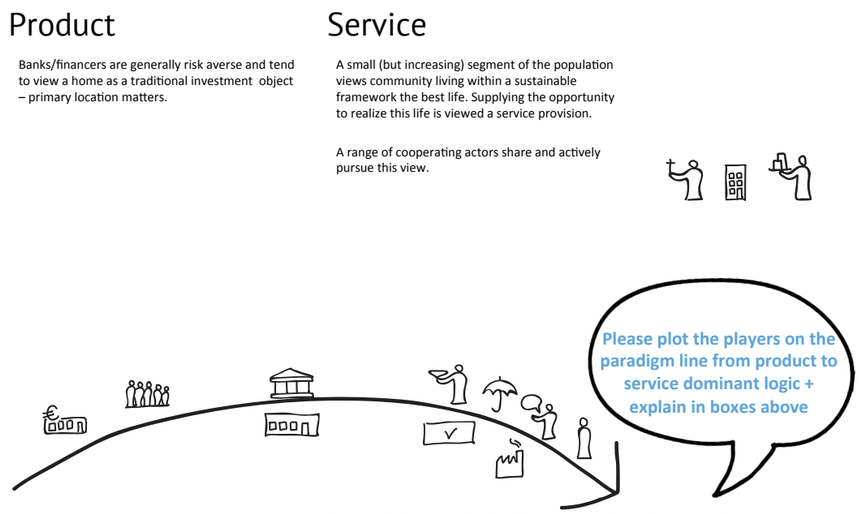


Figure 21: where does Smart Energi Havler and her stakeholders stand in the product versus service paradigm?

Smart service solutions

The Story of DEFA HyattaMi

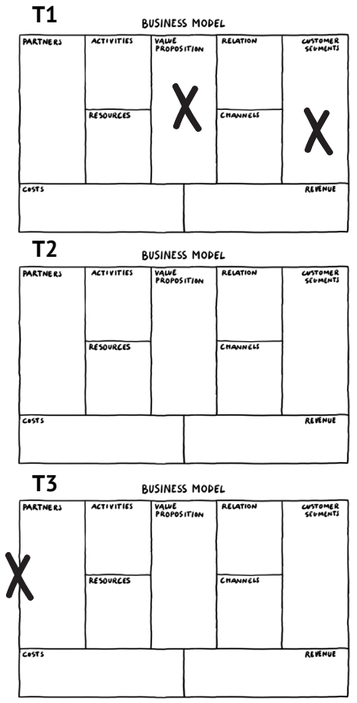
Entrepeneur's Journey

DEFA HyttaMi (MyCabin) is a Norwegian leader for a technological setup which allows customers to control their cabin or holiday home with regards to energy consumption and temperatures both when away from the cabin, and allowing preheating of cabins before arrival. This venture started in the late 90's-early 00's with Short Message Service mobile technology to track and control units which in turn could manage and control I/O units and thermostats remotely. It was a technology which was quite smart, but unfortunately not that easy to sell because the command interface (over SMS) was very complicated and required extensive technological skill to operate. The HyttaMi concept was developed to use with a goal of making this technology simpler to use, based simply on the idea of creating an easy to use UI for this instead. They thus connected producers of this technology with the UI business model, and then DEFA came along in 2006 and bought it. DEFA has been a long standing supplier of engine heating technology (for avoiding cold starting cars). Since then HyttaMi have produced their own equipment as well as developing the UI.

Business model canvas

Activities: ongoing activities consist of continually developing the user interface and cloud services in order to keep the customer, not purely for acquiring new ones. There is also a lot of testing and research going on related to the interface technology (A/B testing) in addition to the support-desk activities and sales. Future plans consist of looking into for instance smart metering and smart housing, offices and commercial buildings, but the technology is thus far still in a stage of maturation. They are also continually developing their main "franchise", the subscription model that ties the customers to their products and which is paid annually. They were considering if it could be possible to do something along the lines of Netflix and Spotify etc. which are based on a small, "insignificant" monthly fee.

The partnerships that HyttaMi have are mainly the producers of equipment, which produce the stuff they sell their customers according to their own design specifications. Other partners are local electricians, which are incentivized by their ability to sell DEFA products with a small profit margin and charge customers for the hours of installing. The customer then is tied by the purchase of the physical equipment to HyttaMi based on a subscription for the service of being connected to the gadgets.



What changed?

The original product was based on SMS, control based on sending complicated commands with SMS. Moved on to control technology with a smarter user interface in

What caused the change?

Connected producers of this technology with the UI business model, and then DEFA came along in 2006 and bought it. DEFA has been a long standing and renowned supplier of engine heating technology (to avoid cold starting cars etc). Since then they have produced their own equipment as well as developing the UI.

Figure 22: the entrepeneurial journey of DEFA HyattiMi.

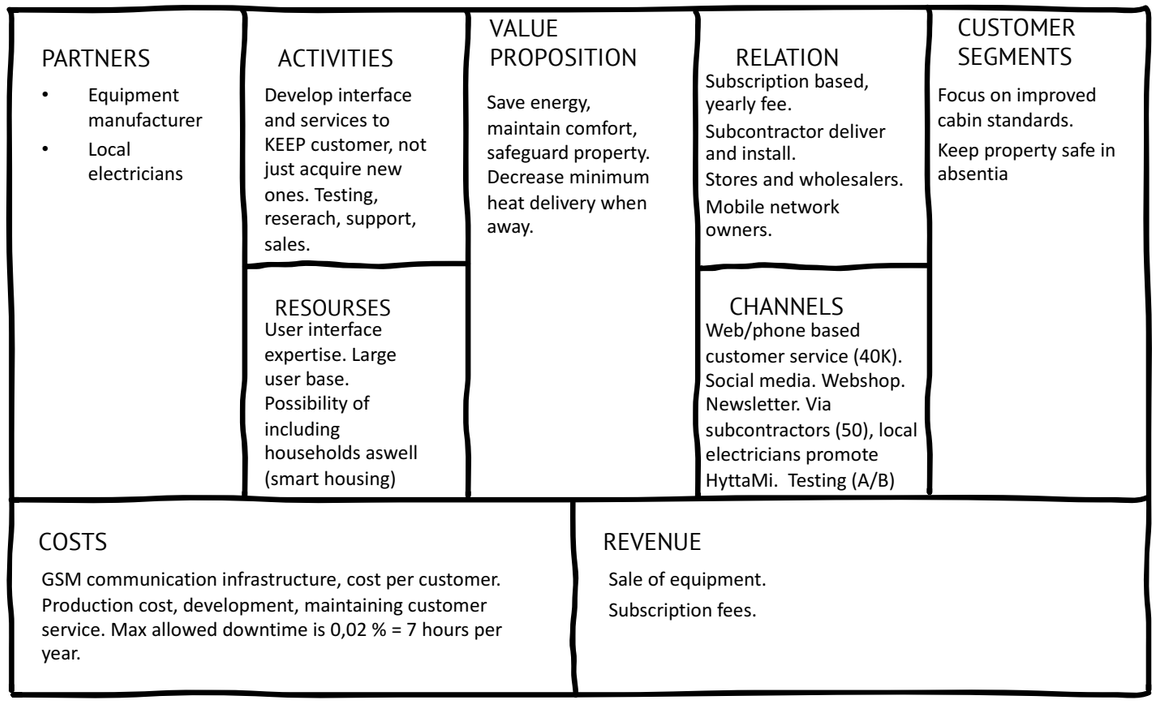


Figure 23: the business model canvas of DEFA HyattiMi

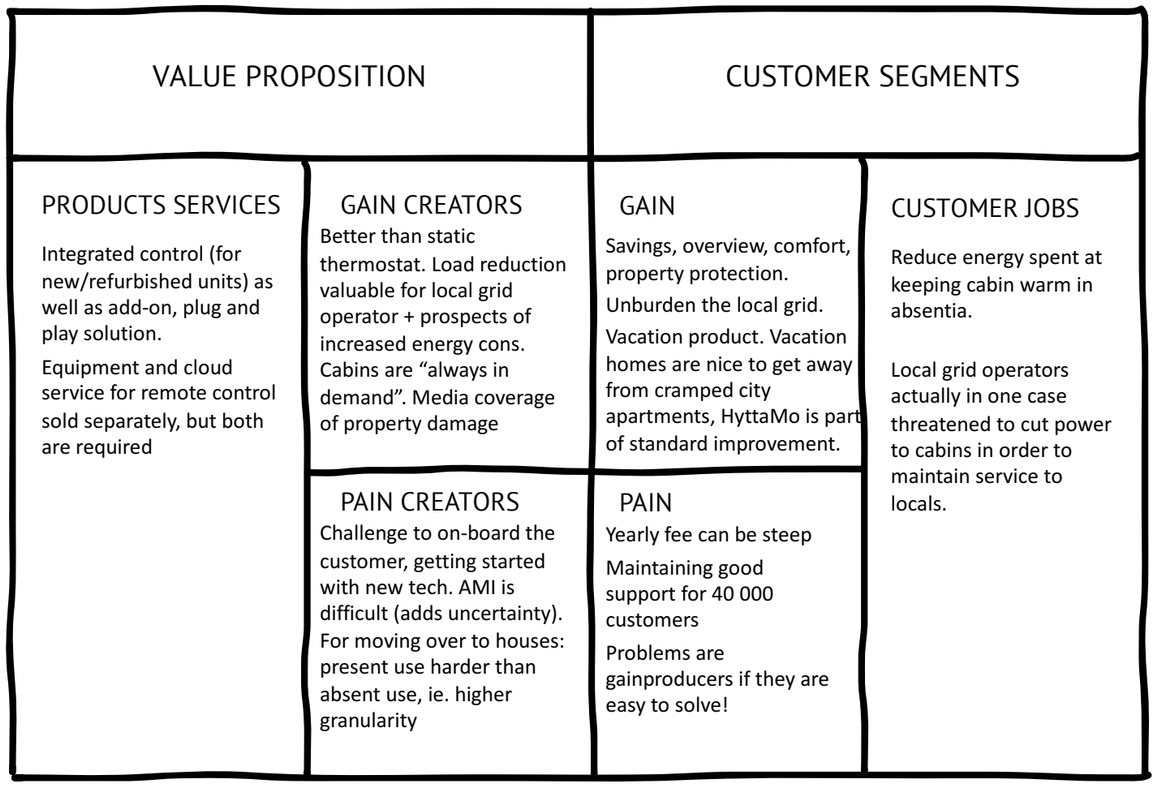


Figure 24: the customer value canvas of DEFA HyattiMi

Resources : Resources involve extensive user interface developing expertise as well as a large user base. Possibility of increasing customer base to include households as well (smart housing).

Value proposition canvas - Product services: The main idea is to help customers save energy in their vacation homes, and help increase comfort and safeguard property. This is managed by an app based remote control and monitoring service which allows customers to decrease minimum heat delivery when away, as it can match the outer conditions and indoor needs. This is opposed to before installation, where a flat 10 or 15-degree thermostat solution throughout the cabin would be required in order to avoid winter freeze. The system delivers advanced control capabilities with easy to use interface (a lot of vacation homes are older) along two models: one integrated (for new/ refurbished) and one add-on, plug and play (for as-is installation). Equipment and control service are sold separately, but you need both. The price range of an entire cabin with ovens is around €2200.

The gains involved in this are that vacation homes are often inherited, and younger generations push increased demand for modern technology. Load reduction is also very valuable for local energy authorities (which actually also lead to cooperation with Smart Energi Hvaler, as there is a large number of holiday homes on Hvaler). There are also prospects of ever increased energy demand, in addition to the fact that cabins are always in demand and always being built, independent of the economy: “there is always someone with the money for a cabin”. In regards to housing (not for cabins) there is also the possibility of some subsidies from (Enova) when energy efficiency increases can be documented. Media coverage on customer issues like property damages, theft etc., drives sales heavily.

Some pains involve the always present challenge of what is called to “on-board” the customer, or allow for the customer to get started in an as good and pain free manner as possible. It is difficult to develop new solutions in tandem with smart meters, as network companies are not very forward (slows down new developments). Transitioning from holiday homes to normal homes is also very different in terms of developing services for present use as opposed to absent use, from longer horizons to shorter, and higher granularity, more activity etc. Customer needs must be at the base of any installation, and they range in questions regarding for instance what type of control? Which rooms/zones? Smoke alarm? Fridge control? Alarm systems? Etc.

Relationships with customers are mostly subscription based, on yearly fee. There are also some relationships with subcontractors who deliver and install their gadgets, in additions to stores and wholesale actors. They also have a direct sale option to customers (with DIY solutions) via webstore. There are also some relations with mobile network owners which makes their communications solutions work.

The channels for communicating with customers involve internet/phone based customer service (around 40 000 customers). Additionally, there are social media connections, newsletters, word from customers via sub-contractors, and the electricians themselves (about 40-50). Local electricians sell HyttaMi equipment and promote their business idea for them. There is also a neighbour effect, and the service sometimes sells itself. Electricians are also supported by the support desk. Test panel for UI research (A/B testing) on customers as well as for electricians (what is the standard settings etc.).

The costs are related to GSM communication cost per customer. Production cost, development, and especially operation as maintaining customer service for entire user base is very costly. Max allowed downtime is 0.02 % = 7 hours of the year.

Customer segment - customer jobs: Vacation is free time. Many people apparently want to have nice vacation homes to get away from their cramped inner city apartments, and gather large parts of family at once. Cabin owners have improved cabin standard drastically recent years. This has had major implications for security of value etc. Other “customer” interests pertain to the fact that local network companies are interested in load reduction. In Sirdal the utility had threatened with cutting power to cabins in order to service permanent population. Gains for customers pertain mostly to easy control, energy savings, comfort, and property protection. There are some pains as well, like the yearly fee.

Revenue streams: Sales of equipment, subscription fees on a monthly basis, which means a use phase supporting revenue model.

Note: This technology may have helped increase cabin use in population. Increased distance from home to cabin from 1 to 2 ½ hours.

Capabilities

Obviously a lot of the need-sensing comes from knowing how and what needs is involved with owning a cabin or holiday home. Also they meet customers daily in their help-desk, and this entails problem solving. Their statement: if you help a customer solve a problem, it's not a problem but a service, and constitutes a strengthened customer relationship and a net gain for business.

However, there still is room for improvement, especially with conceptualizing the offer into new, innovative and user centric solutions, especially in the use phase. The base of HyttaMi is tech driven, users are hardly involved as real human beings.

Orchestration is not a problem as long as the key partners (electricians) are offered the commission and work autonomous.

Analysis

Context

The patient mother is DEFA. The guys in HyttaMi have been working on this concept for a long time initially under the name Hyttevokteren (cabin guard). The brand was carried into the cooperation with DEFA and added instead of assimilated.

Hyttami has to deal with slow network operators, which are inhibiting elements. They don't seem to undertake much to change this or adjust their business model accordingly. Note that there are two network operators here, the one for GSM and the one for power. The problem is the one for power. But their lethargy also encourages customers to buy hyttami-solutions as is (because they are slow to expand grid/introduce capacity efficiency measures), and so it is a double edged sword. It sells products, but slows innovation. Electricity grid operators own and develop this infrastructure, so these cases would have to simply respond to developments as they mature. This is still in early development though, and time will tell if these companies choose to facilitate integration of their devices with smart metering or if they will wait until someone else does. Both paths are possible, but obviously the latter entails risking market shares forfeiture to competition. HyttaMi can be described as a smart matcher.

Type 2 BM

The interesting thing with HyttaMi (as well as Sikom, the next case) is that the Value proposition is more about control and safety than Energy Efficiency. They do have a large client base, but have trouble conceptualizing (developing new and relevant solutions). They capitalize on their client relations by offering them new products, however, the solution is still quite traditional and standardized.

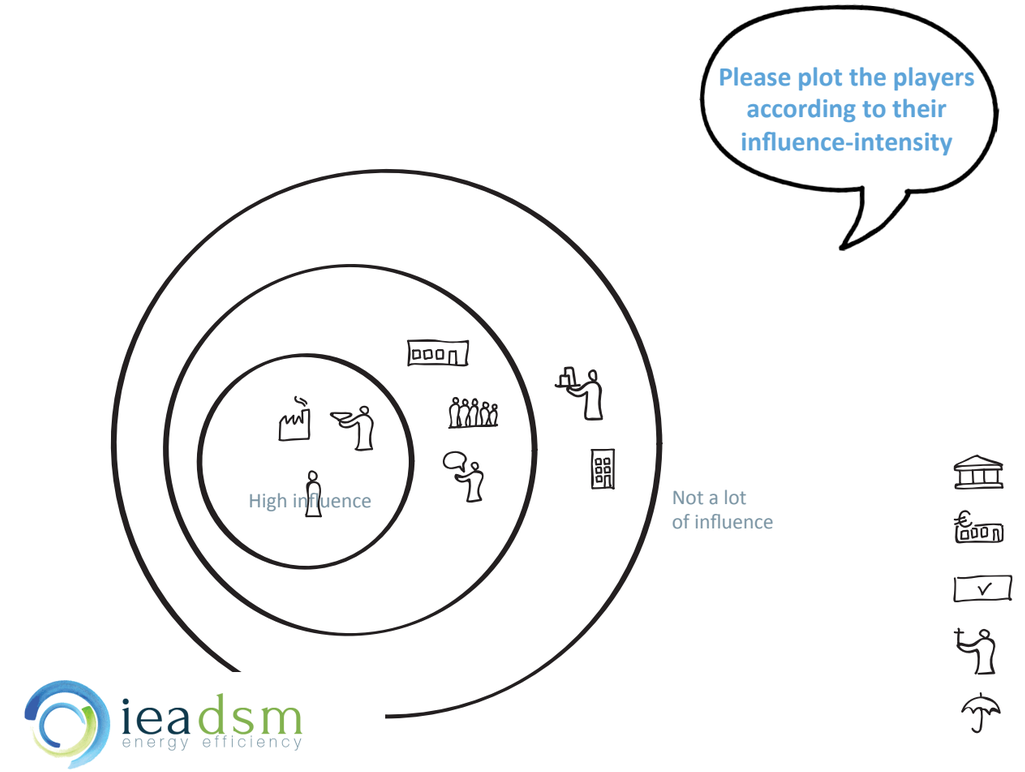


Figure 25: the context of DEFA HyattaMi

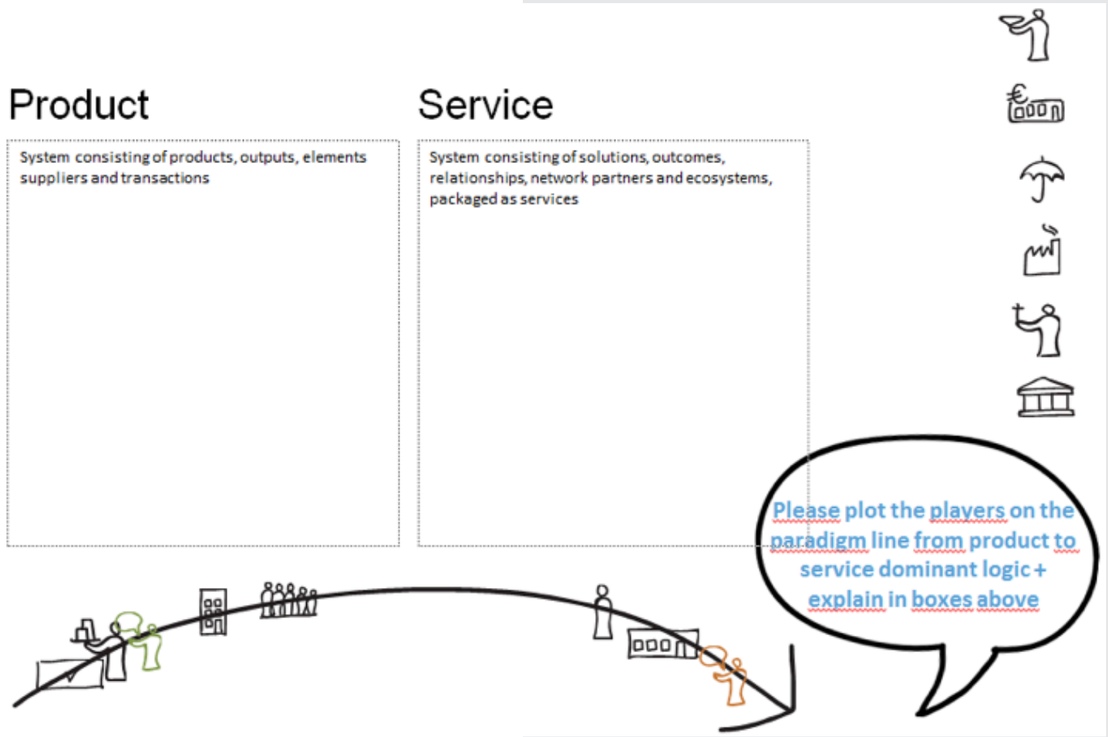


Figure 26: where does DEFA HyattaMi and her stakeholders stand in the product versus service paradigm?

The story of Sikom

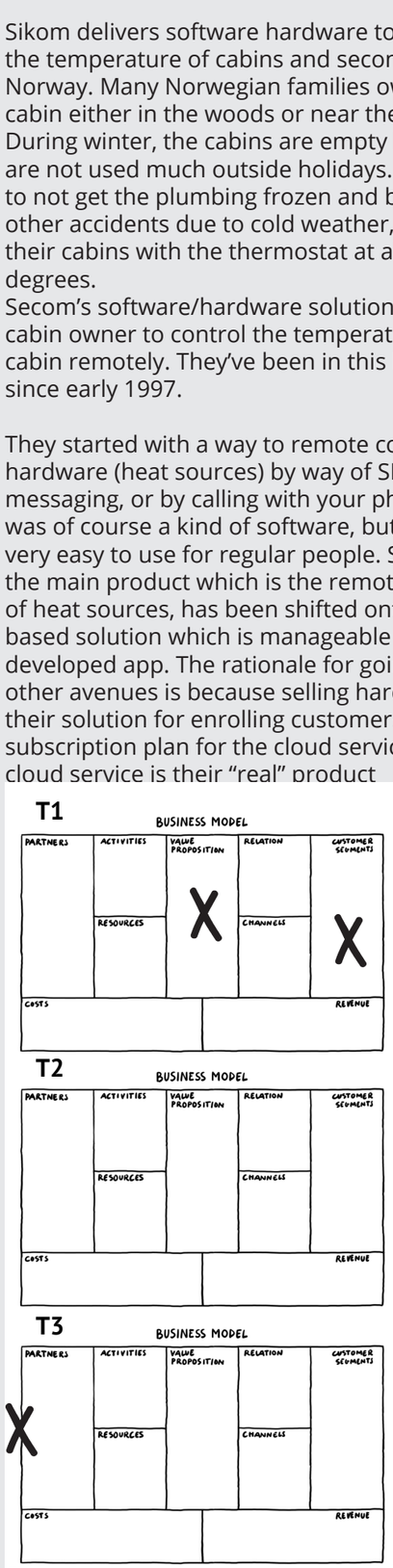
Sikom delivers software hardware to control the temperature of cabins and second homes in Norway. Many Norwegian families own a vacation cabin either in the woods or near the beach. During winter, the cabins are empty because they are not used much outside holidays. In order to not get the plumbing frozen and broke and other accidents due to cold weather, people leave their cabins with the thermostat at about 12-16 degrees.
Secom's software/hardware solution enables the cabin owner to control the temperature of their cabin remotely. They've been in this business since early 1997.

They started with a way to remote control hardware (heat sources) by way of SMS text messaging, or by calling with your phone. This was of course a kind of software, but it was not very easy to use for regular people. Since then, the main product which is the remote controlling of heat sources, has been shifted onto a cloud based solution which is manageable with a self-developed app. The rationale for going into the other avenues is because selling hardware is their solution for enrolling customers into their subscription plan for the cloud service. I.e., the cloud service is their "real" product

Sikoms offers two key values:
- safety (one has control over the temperature of the cabin, which protects them from damage caused by frozen plumbing or power outage)
- comfort (with sikom, one will always have a warm and comfortable welcome). A holiday home is to relax.

In order to sell the system, Sikom uses electricians as referrals. They recommend the system to their clients, install the system in return of a commission. After the installation, people pay a monthly fee to control their cabin temperature from a distance. Sikom has an online shop where the sell hardware like plugs, stoves, thermostats etc. However, they consider themselves as a provider of software. (producers of radiators attach to their product in order to make their radiators wireless controlled). That is because of the eco design directive of the EU, i.e. they have to, but they have no wish to develop the technology themselves, and so Sikom provides this.

The entrepeneur's journey
Sikom started in 1997 and grew up to the market leader they are today.
Did they start with the hardware or the software?



What changed?	What caused the change?
Started introducing control capability to oven producers	Oven producers are subject to eco directive demands about control capabilities, but have no idea how to install it or maintain cloud (IT) services to make it work in the long term

Figure 27: the entrepeneurial journey of Sikom

What caused the extensions in their assortment with other
- DIY options
- Oven control
- Alarm systems

Do they consider the 'first home' market as a growing option? On the website they have this smart home button.

Capabilities
Sensing user needs and conceptualizing
Considering the market position (70K systems installed) there is an obvious need for owners to control their cabin-climate. The market is big and the possibility of a power outage of frozen plumbing is realistic. Sikom is interacting with clients mainly for sales purposes. They have a fair market share. They have a service desk that helps customers with technical problems, which is also a source of information in order to improve their offer. They don't reinforce the energy efficiency benefit (tucked away on the website), they position their solution as a means to increase comfort in the home and in the mind (not to worry about frozen plumbing).

Scaling and stretching seems to be well developed
Sikom is continuously adjusting and extending their assortment.
They seem to have integrated new technologies into their offer on regular basis. Also, they have a DIY offer.

Orchestrating: key partners are heat panel producers and electricians. Obviously, they fill the gaps in their value chain. The question is whether these partners are valued as a source and gives them the opportunity to enter new –niche-markets?
Sikom sells a lot of technical stuff online (thermostats, plugs, stoves etc.). Do they produce any of those themselves? Or are they reseller? Is this a large part of their profits?

Analysis
Context
Sikom is considering entering the 'first home market, but there is a lot of uncertainty because of newly installed smart metering. They do face a lot of questions that relate to what kind of interface will be possible between different kinds of products and the meters. The network companies are not very forthcoming about these things toward companies like Sikom, because they have zero obligation. This leads to uncertainty, and a lot of fence-sitting. I'd say there is a slow development here, as smart meters become normalcy in the homes and technology surrounding it can be allowed to rest firmly on mature smart metering technology and practice.

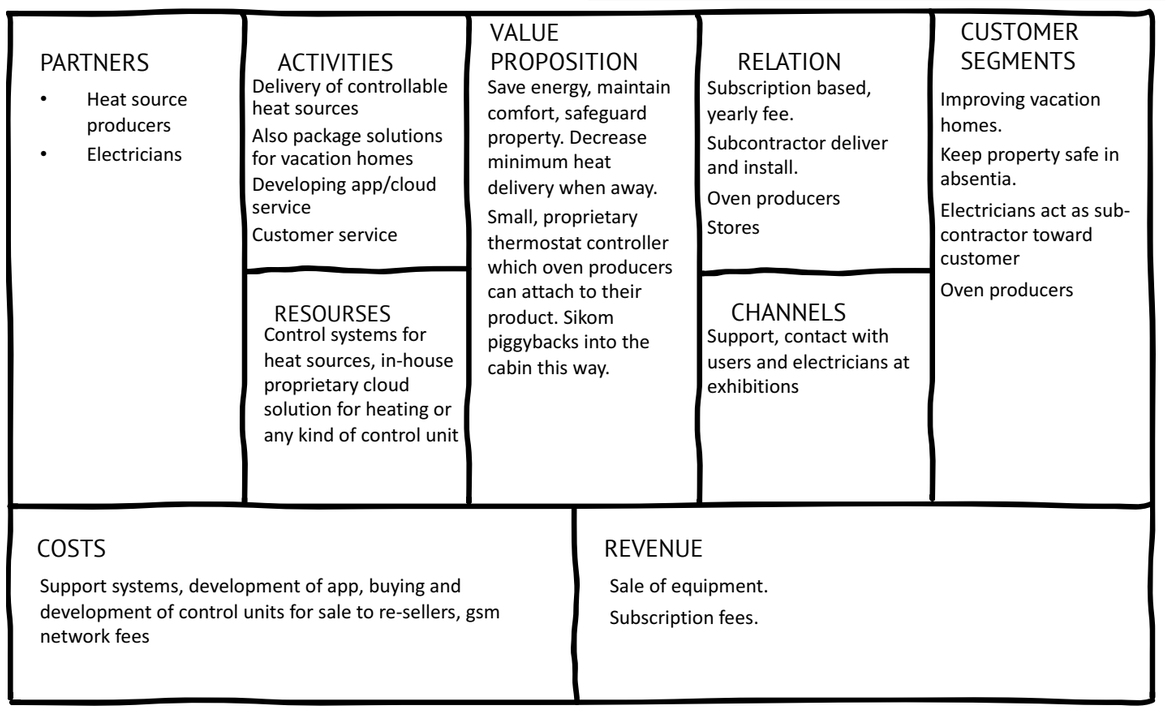


Figure 28: the business model canvas of Sikom

Sikom is 'in-between' reactive and exploring, in the sense that they make use of the momentum in the market. They are maybe not even so much exploring as they are contributing to defining how smart solutions in the home will work, and it is not very different on the surface than most app-cloud-based smart home simple, flexible solutions. to. They base their solutions on technological capacity and experience they have been able to developed based on their vacation home market. They do want to enter new niches and seem to focus more on the experience than their main competitor HyttaMi. They are a smart matcher that is moving towards an aware market changer.

Type
Sikom is a type 2 BM, moving towards 3, as they seem to focus on technological innovation and more or less straight forward ways and standardized to deliver this solution to their clients.

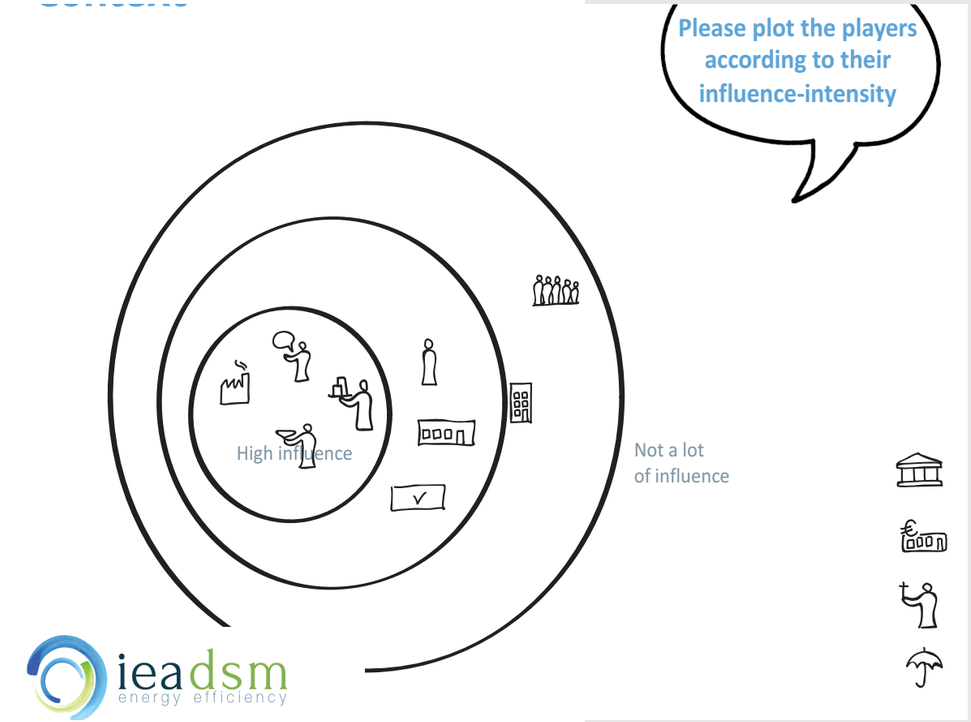


Figure 30: the context of Sikom

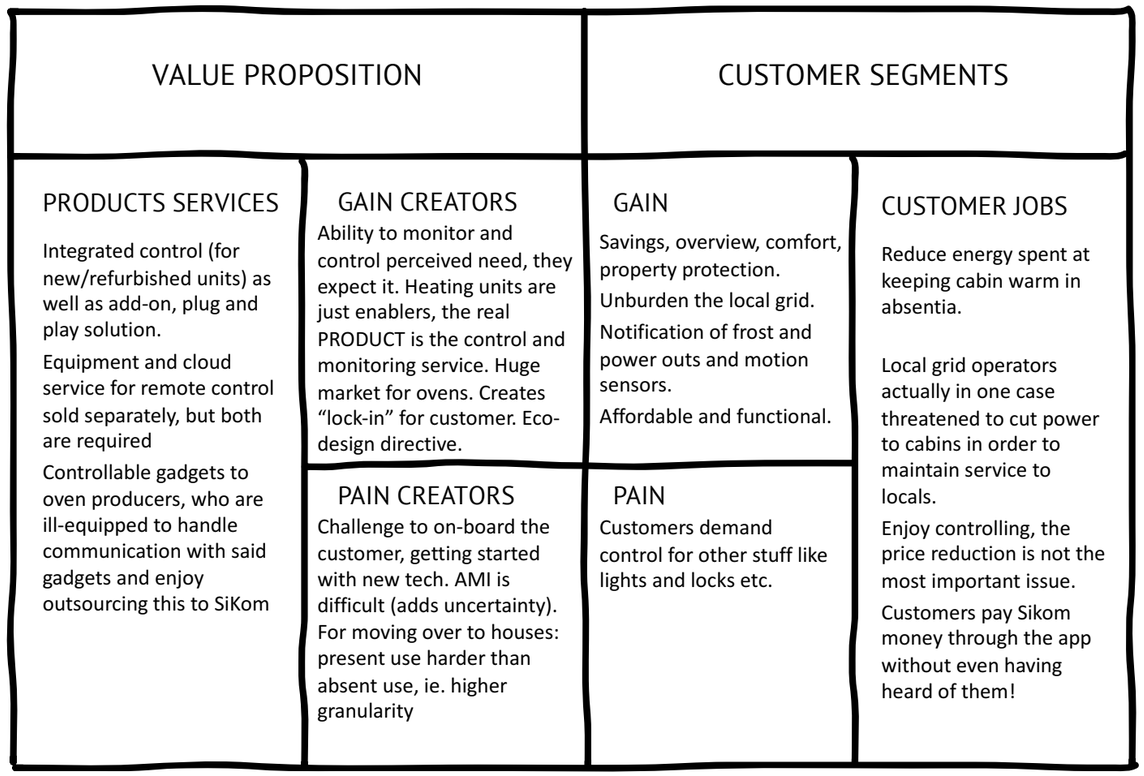


Figure 29: the customer value canvas of Sikom

Figure 31: where does Sikom and her stakeholders stand in the product versus service paradigm?

The Story of Tiny Mesh

Entrepreneur's journey

Tiny-Mesh is a business focused on combining microcontroller units, which in the world is a very pervasive technology controlling everything from car systems to washing machines. Tiny-Mesh provides this kind of control capability to “dumb” technology, whether it is newly implemented or pre-existing, with the help of mesh network connectivity (low power radio communication). This can then be used to monitor and control most things connected to hardware machinery, like HVAC systems, pumps, motors, etc. The technology is also known more commonly as the basis of the Internet of Things. It has some of its roots in the NCE Smart Energy Markets configuration talked about above in the case of Smart Energy Hvaler. It provided the start-up that was Tiny-Mesh with research capabilities and pilot methodology.

The origins of this start-up date back to the birth of the Vingcard system, which was the first electronic lock system in hotels, the creator of which also invented monitoring system for minibars, also with mesh radio technology sensor network. A partnership with this guy resulted in combining this control technology with smart metering in buildings, which eventually ended up involving Texas Instruments in a venture they were doing with smart metering and energy companies in India. Tiny-Mesh resulted in 2011. Texas Instruments were a good match with Tiny-Mesh since they were in the market for low power radio communication to control smart meters. Low power radio communication is also incidentally a Norwegian innovation, and there is a strong community of experts.
A business case for a need for monitoring and control of smart meters in India surfaced, representing a potential for low hanging fruit – the market is very big. Finally, the frequencies on which this tech operates were open in India (unlike the highly regulated and saturated bands in the west), which ultimately constituted great potential. Future plans are manifold for this service. Current focus in Tiny-Mesh now is urban stuff, smart city, health care state reporting, EV-mobility, etc. This technology can go a long way to make efficiency gains not only for optimizing energy consumption but also health care, agriculture, etc. They are looking forward to connect buildings together in the same way as radio mesh nodes, making buildings share energy and cooperate to increase efficiency.

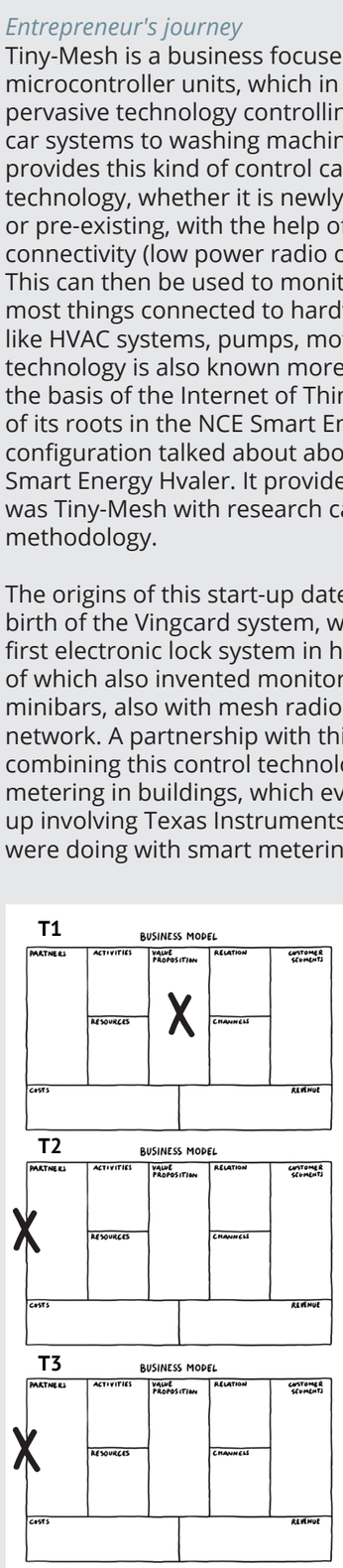
Business model canvas

Activities: Currently Tiny-Mesh has a lot of activity in India, which is good for business simply because of the sheer size of the market. Currently they are operating in the Indian market for “sub gHz smart metering”, street light controls, car tracking, agricultural monitoring, security systems, etc. Besides NCE, which helped spur a similar start-up in Norway (represented herein by case 009 Serinus), other important partners are Texas Instruments, which provide the physical infrastructure (e.g. I/O controllers, radio modules, and sensors) along with Indian distributors. Tiny-mesh sells operating licenses for their software to radio module producers (Texas Instruments), who then deliver to distributors in the Indian market. Together with TI salespeople, they reach out to electricity sector and promote their hardware running Tiny-Mesh software. Closing the loop, Indian retailers order modules from TI who then order more licenses from Tiny-Mesh. The software provided by Tiny-Mesh enables the hardware that TI are selling, providing them with benefit in return for their product, increasing their market potential.

> What’s the deal with embedded programming? An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured as components of embedded systems. Examples of properties of typically embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. (Source: Wikipedia)

Resources: Tiny-Mesh are market leaders from a country that itself is market leading in radio mesh technology. Physical resources they have available are self-organizing, self-configuring networks that they create for the customer, which then can monitor and control microcontroller units, or, in lay-man’s terms, “gadgets”.

Value proposition - product services: The main delivery of Tiny-Mesh is “online state analysis of systems with self-organizing, self-configuring networks”. It is a system which appropriates cheap, stable, generic and on-line data for whatever purpose. The idea is that you can put a sensor wherever you have a need for it, and Tiny-Mesh provides it with “last-mile” connectivity for data capture or command-and-control through an I/O controller. This kind of setup is delivered to customers as a tailored service. An app developer at the site of the customer can make use of this in the form of an API, and build whatever kind of interface is needed for the specific context. This means that what was previously cordoned off within the realm of embedded programming (a rather large niche) becomes available for a standard web application computer engineer (much larger, less niche) to manipulate. This makes taking control of MCUs possible for



What changed?

Minibars were monitored by legacy networks, but this caused problems and it was easier with mesh-technology. Led to the introduction of radio-mesh technology in India to monitor and control smart meters.

Indian developers were

What caused the change?

Monitoring minibars needed to be done outside the existing network, i.e. the local wifi, because they can’t be maintained by local staff.

Mesh-technology is leaner and more efficient

Figure 32: the entrepeneurial journey of Tiny Mesh

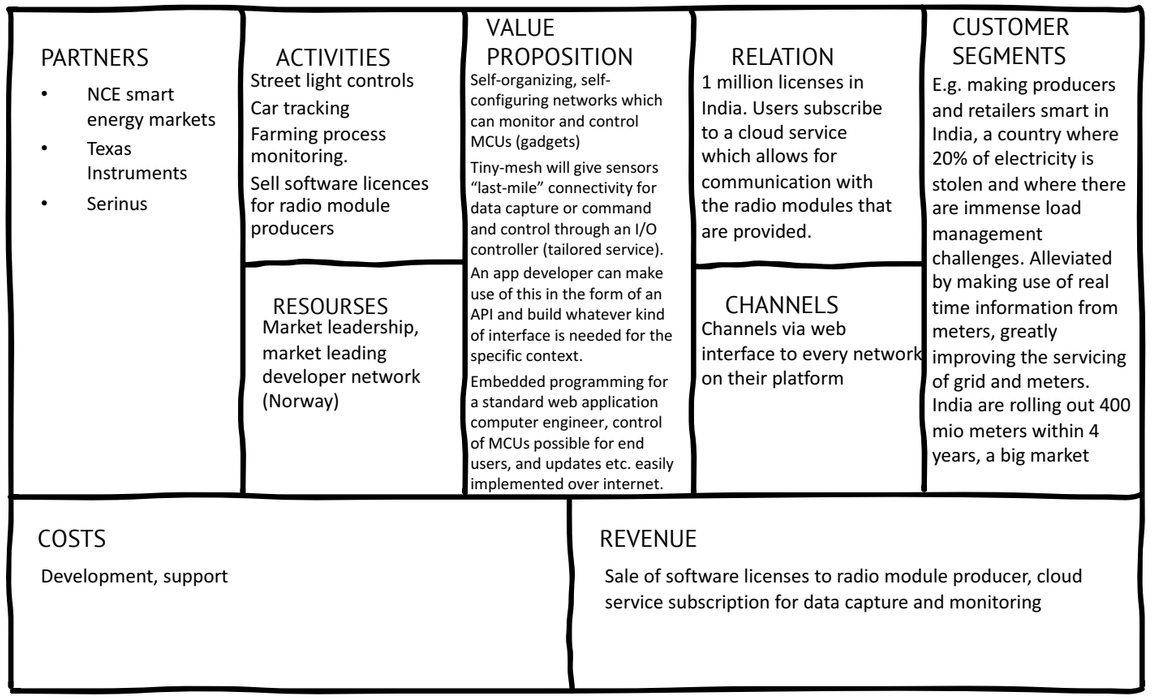


Figure 33: the business model canvas of Tiny Mesh

end users, for instance a janitor or building manager. Updates etc. are easily implemented by connecting the mesh network to the Internet. Advanced systems can be built in short time, giving end users higher granularity in their control of systems.

Gains related to this are the very cheap material cost, which makes this kind of solution better than “consortium-driven competitors” – i.e. protected by standardisation – like Zigby, on price. Zigby also requires embedded programmers (who are experts at MCU programming) to calibrate the setup, which results in less flexible systems. In practice, it means the need to call an MCU programmer every time changes need to be made. MCUs in general are also usually closed when they are finished, and can’t be reprogrammed – this changes with adding a layer on top of the MCU of Tiny-Mesh connectivity, which then provides a web interface between the MCU (now connected via mesh network to the internet), and an app-programmer. The programmer can now create an app for the end user (like a janitor). In sum this bridges the gap between MCUs and users. Zigby solutions need pre-programming for the same functionality as mesh.

Some of the pains in this model are standardization processes which for instance sees proprietary Zigby taking market shares, setting up systems which are interoperable. Since Zigby is closed, and will not communicate with open software, this ultimately locks customers of Zigby in, walling them off from any other mesh solution. Even though India is a great market, it is also a very competitive and price contested market. European pain: very standard driven, which is a very massive base to start struggling with for a small company. This has made Europe a small potential area even though a presence here is maintained for much smaller scale solutions (see case Serinus).

Tiny-Mesh has 1 million licenses in India. Users subscribe to a cloud service which allows for communication with the radio modules that are provided. Tiny-Mesh also connects directly with customers via a web interface, which connects Tiny-Mesh to every network in existence on their platform. Cost related to this is mainly due to efforts in development and support.

Customer segments – customer jobs: Customers of Tiny-Mesh are making energy producers and retailers smart in India, a country where 20% of electricity is stolen and where there are immense load management challenges. This is alleviated by making use of real time information from the meters, which then can greatly improve the servicing of grid and meters. India are rolling out 400 million meters within 4 years.
A large gain driver in the service Tiny-Mesh delivers is that little to no configuration is needed. The customer simply specifies which sensors they need, and where to place them. Then it is ready to use for monitoring systems or for manipulating other gadgets, via a web interface. Tiny-Mesh thus steps in as “a cable replacement”. Also, the infrastructure of mesh networking is independent of its “host” infrastructure. Operating like this, outside the pre-existing hardware, causes it to be more stable, and more pertinent measurements can be made at a cheaper price. In fact, and this is an important aspect, it is actually very often cheaper to add Tiny-Mesh connectivity to a layer “on top” of the existing system, then to monitor the pre-existing systems with their legacy solutions. In short, it is data gathering out of the box – or, as they call it, “state based resource management”.

Revenue: Sale of software licenses to radio module producer, cloud service subscription for data capture and monitoring.

In my understanding Texas Instruments, together with Indian retailers, are the ones who offer. Customers are for instance the energy sector in India, who can combine this technology in order to provide flexible and functional connectivity to their smart metering infrastructure. This is a struggle for anyone implementing smart metering. How do you rig your business to actually "physically" retrieve the data and once that is done, how do you make use of it in your value chain? Together with the gadgets TI sells to monitor real-world states of systems, tiny-mesh has software which can be used to represent and help "make sense" of the data. Thus they sell software licenses (TI sells the product, and then the customer needs the license from tiny-mesh to use the product)

I fell it's a very tech-driven business, but it relates very much to solving specific problems clients may have in keeping themselves updated on whatever systems they already have. As my informant said, it is state-based information their service delivers, i.e. if you have a system and you want to know more often and in better detail what the system is doing, and maybe even using this data to manipulate the system in turn, tiny-mesh makes your system talk back to you. And it is more flexible than embedded programming, as I tried to explain.

TI is in between tiny-mesh and customers, and that these customers, big companies and utilities, are in front of end users again. So the customer is mostly someone who needs a large scale implementation of a control/monitoring system. It seems to me like TI has the main client relationship, and that they are the ones selling products that are enabled by tiny-mesh connectivity and software. So the reason for entering the Indian market I'm guessing is the reason TI wanted to enter the Indian market.

Context
type 3

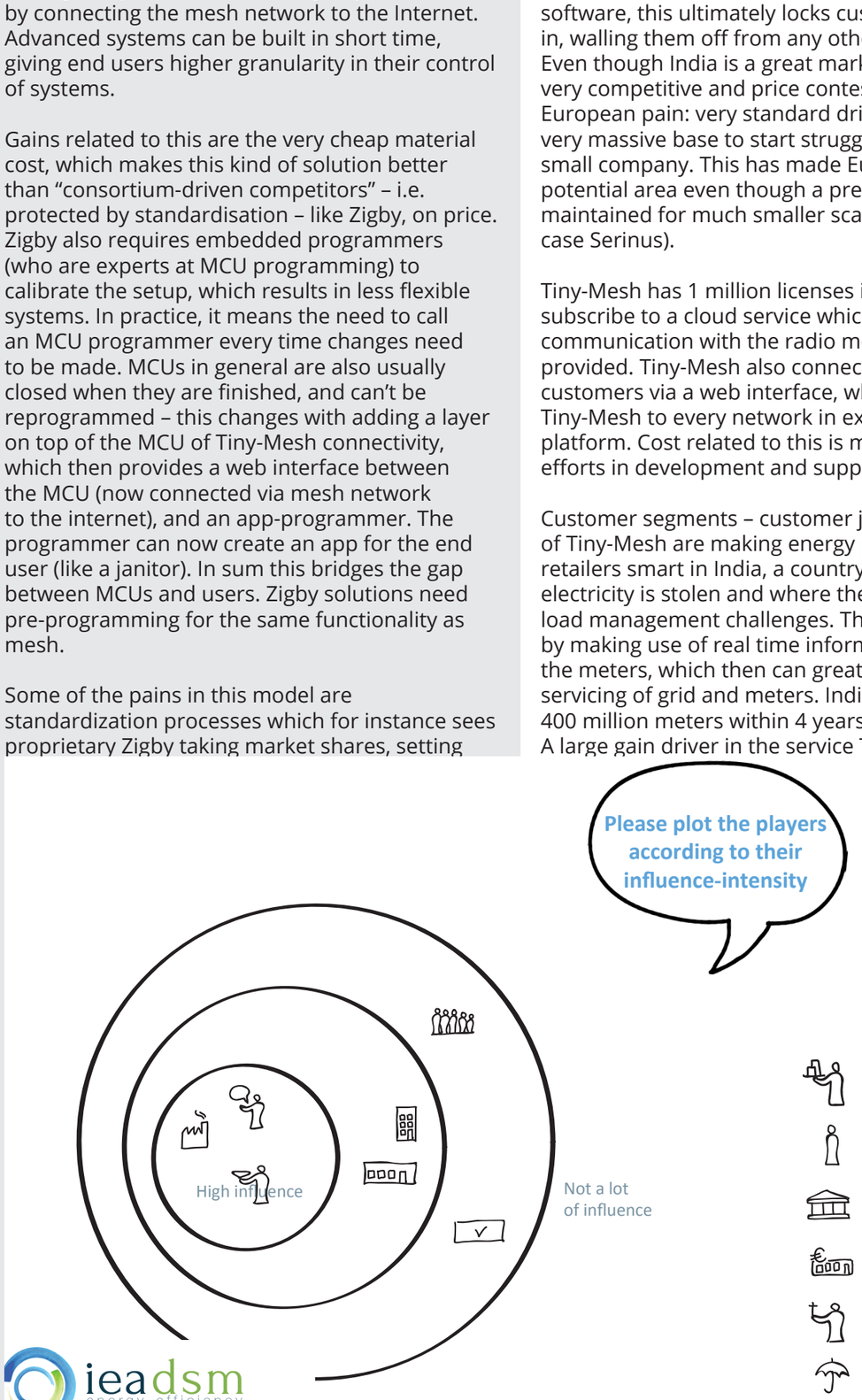


Figure 34: the context of Tiny Mesh

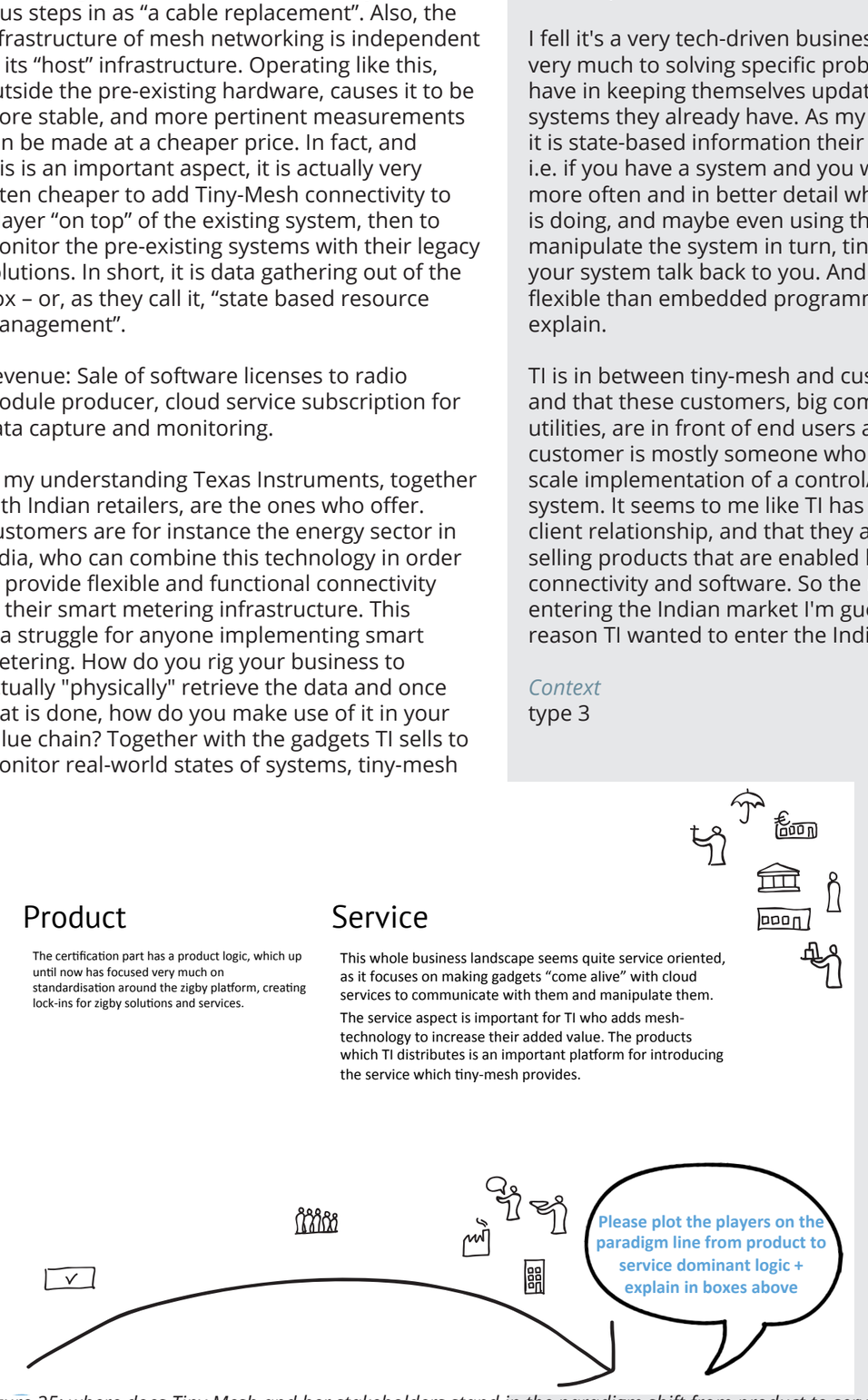


Figure 35: where does Tiny Mesh and her stakeholders stand in the paradigm shift from product to services?

The story of Meshcraft

Entrepeneur's journey

This is a company which develops a platform to attempt solving some of the problems of being an EV owner today, by connecting the many stakeholders connected to an EV infrastructure as well as creating a new market for electricity for EVs.

The original idea surfaced when the entrepreneur had to charge the battery of his little sailboat along the Norwegian coast, and it cost him €20, the same as the boat next to him, which incidentally was a giant cabin cruiser. Could it be possible to differentiate between the consumption of the two in the charging point? After taking a course in entrepreneurship, they realized they were not supposed to make a meter, but a platform which can join EV owners, charging points, owners of charging points and suppliers of electricity. From the start-up in 2013, it took two years to understand what the business model they should provide actually was, based on a lot of trial and error. The model also went from a hardware to a software venture, as there "isn't a lot of money in hardware" because of all the competition with established actors like ABB and Siemens. Better then, to aim for increasing functionality by combining already existing hardware with the help of software.

Business model canvas

Value proposition – product services: Meshcrafts have been featured in WIRED magazine as "The Airbnb for EVs ", and the service will provide real-time information about available charging points nearby which also suit the specific car, how fast the charging point is, what are the costs, etc. Also, private persons can use this business offer to acquire their own chargers, and offer to sell charging time over their private chargers, in return to Meshcraft for a small cut of that transaction. The user interface toward chargers can be used for other services in the future. The ambition is to create an infrastructure of chargers where any retail company can deliver power over any charger, and tie customer connections to Meshcraft through the chargers. The hardware solution is comprised of standard components put together in a charger (radio mesh technology from Tiny-Mesh), which then makes the chargers capable of providing information mentioned above, brought forth in a proprietary software solution. This is a product that can be sold to any proprietor who wants to offer charging stations, e.g. shopping centers, hospitals, municipal buildings etc.

Gains related to this is that it is a quite simple product compared with competitors, and it provides timely information to EV users that is lacking today. EVs are coming fast, and there will be a burgeoning market for charging technology, which Meshcraft can deliver at competitive prices, software included, system ready to sell power immediately. The start-up is also a recipient of Innovation Norway subsidies.

There are also some pains, mostly relating to the fact that today many EVs still lack two-way communication capabilities, limiting the potential. Also, the appropriation regulatory framework for the public sector is huge obstacle, so even if the public sector could be a huge customer of Meshcraft, they are not ready to invest in an unfinished technology like this. The appropriation legalities also create another conundrum: even though the private sector likes the idea they would like to see a demo first. But, if you get public support for a demo (it's usually very little), the public appropriation framework disallows recipients of subsidy support to partake in the actual bidding rounds later on because it is deemed competition distortion. Ordering competence of the public sector is also a problem. They don't know what problems need solving, even so they are very specific about it, meaning that what little they do know tend to make for conservative estimates of what they need. In order to be eligible for public support in demo context it is also necessary with three years book-keeping to be eligible for test project participation. This is identified as an odd problem, especially since this is a service the municipality would need in order to solve EV infrastructure issues later on either way.

On the relations side, end-users of EVs are connected with a freemium app and a web portal (smartcharge.io), where there are plans for a community. There is also a primary web portal (meshcrafts.com) for the professional customer part. They are also involved in some customer research, and have also themselves "become the customer", as they have all started driving EVs themselves. Other channels include LinkedIn, Facebook, printed media etc.

They are currently partnering up with electricians for setting up chargers, as well as hardware retailer for sale and installation. To provide the

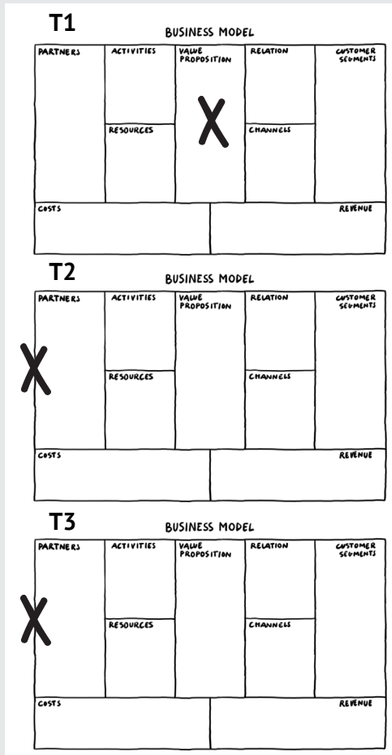


Figure 36: the entrepeneurial journey of Meshcraft

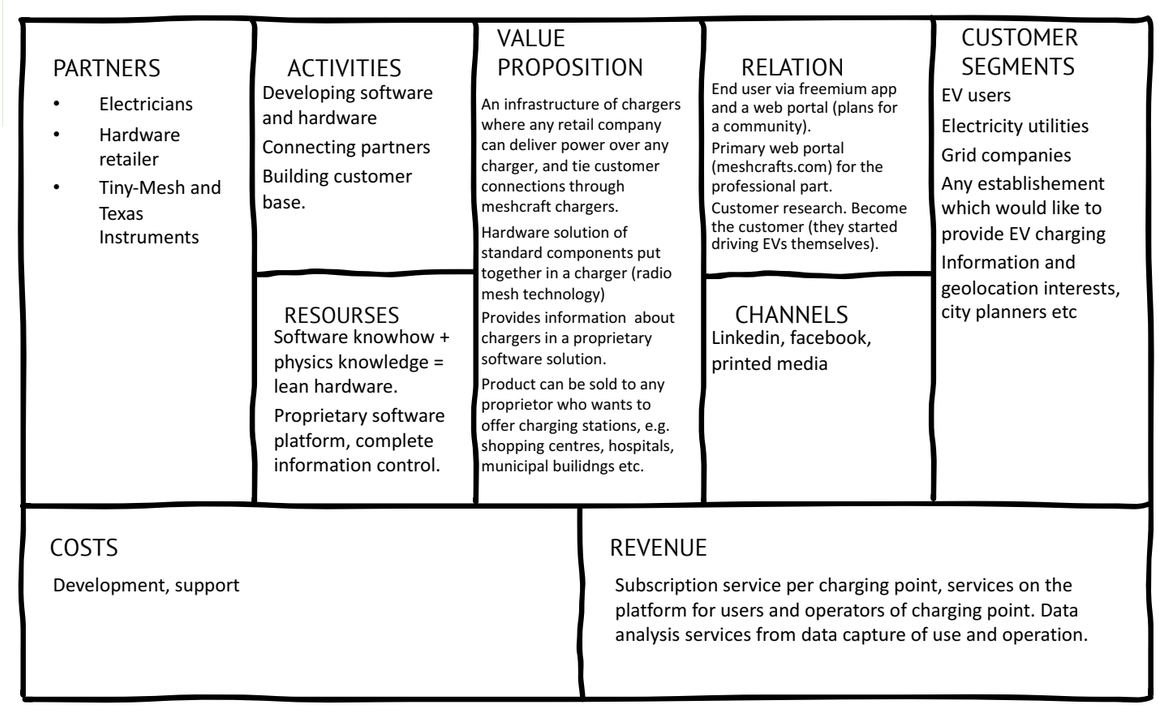


Figure 37: business model canvas of Meshcraft

connectivity between hardware, cloud service and customer app, they are in business with Tiny-Mesh and Texas Instruments (see case 06 Tiny-Mesh). Ongoing activities are related to developing software, configuring hardware and testing it in realistic setting, connecting partners, building customer and user base, etc. Resources at their disposal have been mainly software knowhow in combination with physics knowledge, which respondents report results in what makes this charging platform competitive: lean hardware. The business model also consists of a proprietary software platform which combines customers and users, and this makes out for complete information control. After all, the information may be valuable in the future in ways not yet known.

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Customer segments – customer jobs: The focus is what problems need solving from the point of view of the user, such as "where can I charge, will the charger fit my car, how fast is it (how much effect), and is it available now?" At the time they had about 600 users in Oslo area. The main important gain related to this is that it enables customer to avoid "charging anxiety" (as opposed to range anxiety). The service will make the EV easier to use, and private chargers can sell own energy over charging points,
Revenue
Subscription service per charging point, services on the platform for users and operators of charging point. Data analysis services from data capture of use and operation.

Capabilities
Meshcraft offers a simple yet smart benefit: real time information for charging your EV. They're actually one of the very few examples that have the ' green energy efficiency benefit' communicated central on their home page. Interestingly enough, they're not the provider of green (chargers, EV's). They only provide relevant, valuable information that gets the green driver going. And they are of course looking into maybe using this to provide a platform where others could implement their chargers and sell their energy, but that is a little bit in the future. The user base comes first, and then the user base can be used as a selling point for charging infrastructure, which finally can be used as a selling point for other people's energy. Probably the data on existing chargers have been gathered manually, but from open sources. After all, they are enabling the further use of these chargers, so whoever owns them should benefit either way.

There are legal issues which inhibits the municipalities from purchasing meshcraft solutions if they have been given money to make a pilot, but they don't want the product without seeing the tech piloted.
They anticipate a rise in EVs as well as congestion in EV charging infrastructure. They also anticipate their ability to deliver their user base to retailers of electricity through delivering either chargers to users or users to chargers (or both)

Analysis
Context
The legal framework is very specific. It requires any government organisation, whenever they are "appropriating" anything, that is buying a service or a large, expensive item (e.g. which company should provide the buses for our fleet of public transportation, what computer company should provide us with our office work stations, server solutions, etc. etc.), they need to evaluate the sellers of these products very carefully. They are required to have at least three thoroughly evaluated offers before they can choose one. There are set criteria's for how to evaluate offers, and one of them is that the offer needs to have attached the books of the company from three years back. But if you are a start-up, you might not have any books! Also, if you are a start-up, you could enrol into a pilot project (municipalities often have them, and in this case it is related to a service/product they very much are inclined to offer to their citizens), but then the legal framework says that you are not eligible to enter into the competition for ending up among the final three offers, because it could be considered unfair from an anti-trust legal perspective. So this is a real problem for any start-up who tries to provide a service or offer

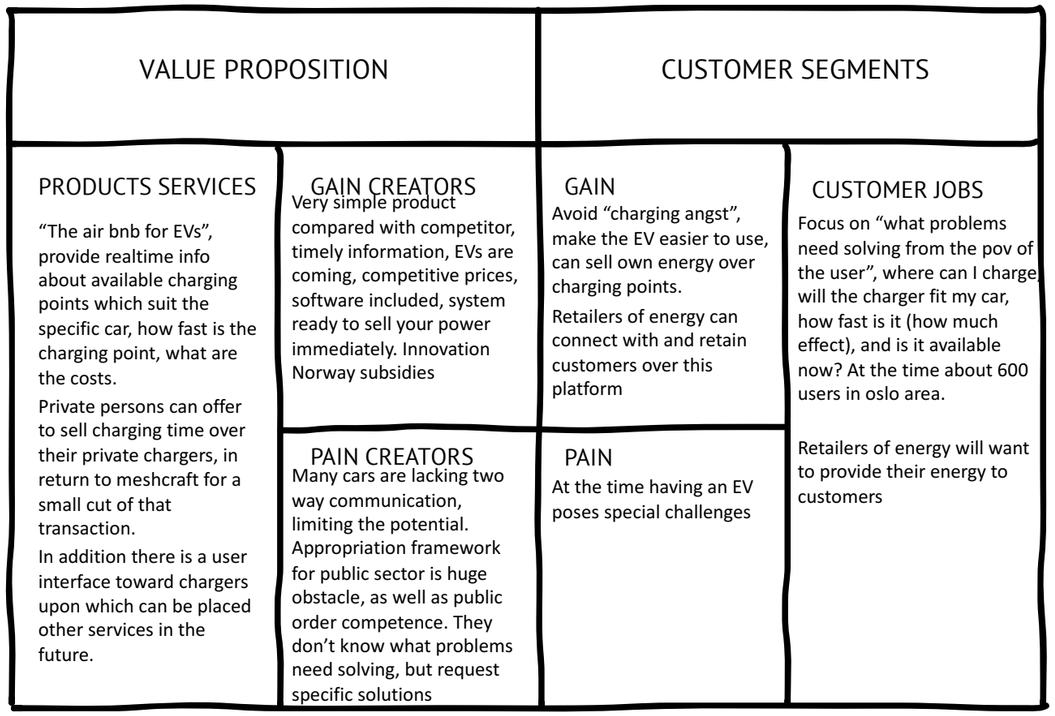


Figure 38: customer value canvas of Meshcraft

to national or municipal organisations, because they have to follow these rules (the private sector does not, but they sometimes follow the practice anyhow). Obviously, keeping municipalities as a key potential buyer seems important, as they will have an increasing demand for charging infrastructure as EVs proliferate in Norway. (this is because much parking in towns are regulated and controlled by municipalities)

Type 4
Meshcrafts is a type 4 BM. Although they are still a small, almost start-up company, they set the user centre stage and seem to offer the client a state of the art solution to an obvious problem. They cooperate with clients, have a use phase supporting revenue model an offer a wide range of solutions that serve the user.

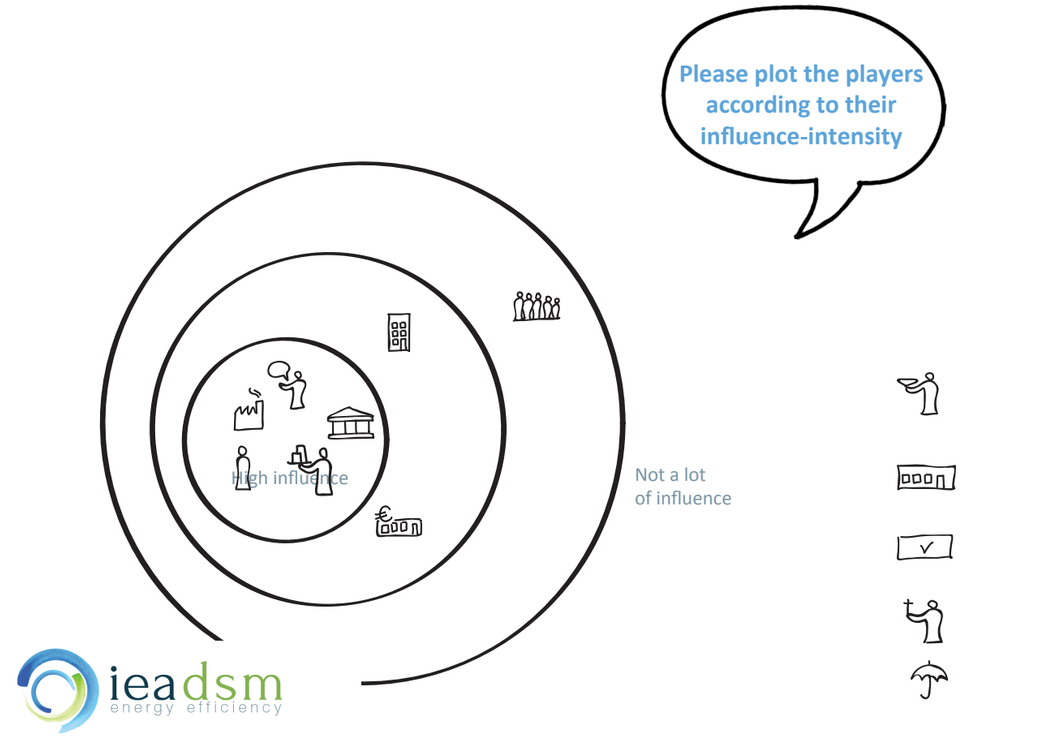


Figure 39: context of Meshcraft

Figure 40: where does Meshcraft and her stakeholders stand in the paradigm shift from product to services?

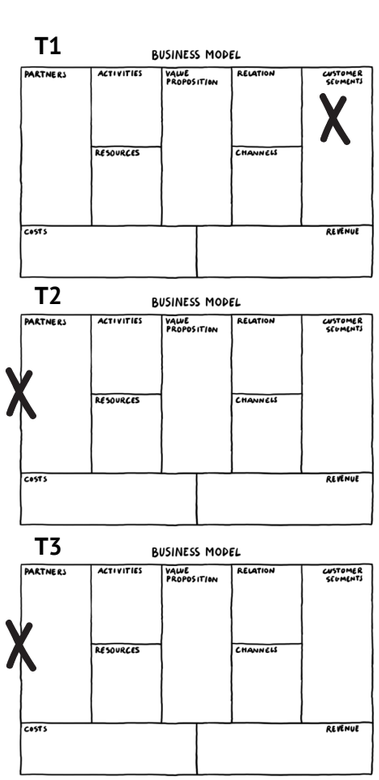
The story of Serinus

Entrepeneur's journey

This company started three years ago as a project directed at energy efficiency in buildings combined with a focus on indoor climate, and started selling their indoor climate solution to schools. The initiative started out as a proof of concept development of using radio mesh technology to make smart indoor climate control systems for buildings. No one believed them, so the Tiny-Mesh inventors (see case 06) spent one Christmas holiday to put together a system for controlling indoor climate in buildings based on a self-created demanding user. Eventually they showed their result to Statsbygg, the government building owner, and they liked so much that it ensued a four-year project which resulted in a solution they are now commercializing through Serinus.

The indoor climate angle seemed like a good idea, because there has been a lot of focus in these issues by the working inspection board, highlighting problems with documentation of indoor climate improvement action per regulation. So Serinus contacted principals around the country, and it was quickly apparent that they did not have or want to have anything to do with this issue, and Serinus was instead directed to the municipal building operations departments. It was evident that in order to get anywhere you had to contact the ones who were in charge of the buildings. As it turned out, this was not the principal. Now, as a daughter company of Tiny-Mesh (which owns 20%) delivering hardware and software for Serinus, they are in dialogue with a lot of building operators to improve actual indoor climate as well as the monitoring capabilities for documentation purposes. They are also currently looking at going into Microsoft in order to put their cloud systems on their Azure information platform.

Currently they are engaged mainly in developing and operating cloud services, as well as some market research and mapping. They also do a lot of meeting potential customers, municipalities, and do old fashioned knock on door sales tours. Resources at their disposal include Tiny-Mesh technology, and a self-developed cloud system for delivering real-time and historic building information to customer. They are also involved in some R&D projects, which their products are especially suited for (Tiny-Mesh is involved in Vicinity EU project which provide strategic direction to development of Serinus).



What changed?

Re-focused the customer segment

What caused the change?

Having first anticipated schools to be a big market, school principals had been targeted. It was apparant they wantet nothing to do with this issue, and it was realised the municipal bulding operators must be targeted instead

Figure 41: entrepeneurial journey Serinus

Business model canvas

Value proposition – product service: Serinus is capable of delivering optimal indoor climate for the lowest cost possible. They are mainly an information platform provider, and do not deliver actual control capabilities of indoor climate. They deliver sensors, cloud service and presentation of data as a package. The product is the information, delivered by the sensors as a context relevant infrastructure. The systems provide measurements of temperature, humidity, sound pressure, CO2 levels, light, movement, every 1 minute. Combined with knowledge of area and volume of building and energy consumption this enables econometric analyses of building, which in turn can be used to increase productivity of inhabitants. As they explained, the actual energy cost of the building is 1%, if operation is 10 %. The rest is human capital, and bad indoor climate can result in intellectual capacity decrease. Another important service this system can provide is documentation for government regulatory inspections etc. Can also monitor use of building and quantify use patterns etc. In the even it is relevant, it can also monitor gases, radon, etc. Information can also be used to benchmark climate systems for running-in periods after building completion.

Gains which this proposition caters to, is a strong focus in media and in regulation (of working environment, school regulation). Public sector is mandated by law to implement measures. Serinus' products and services are cutting edge, and can be placed by customers in a R&D context. Sensors are battery driven, no need for installation or electricians; a local operator can attach them to walls with a screw wherever they like.

However, pain wise, there are very many different actors who deliver control systems for HVAC, and delivering systems which can integrate with all of them is extremely demanding. Each sale is tailored on a case to case basis, as every building needs a tailor made solution in cooperation with the customer, their needs are taken into account when designing solutions. This also defines the relationship. The solution, sensor, cloud and data is the entire solution, which is leased by customer. There is a little competition (one possible actor), but most are already integrated in existing SD-systems.

Serinus reach customers by sales tours and visiting municipalities (50 so far). A cloud solution with open interface delivers data to users. They are face to face in delivery situation. Ad-hoc relationships are the order of the day, and they

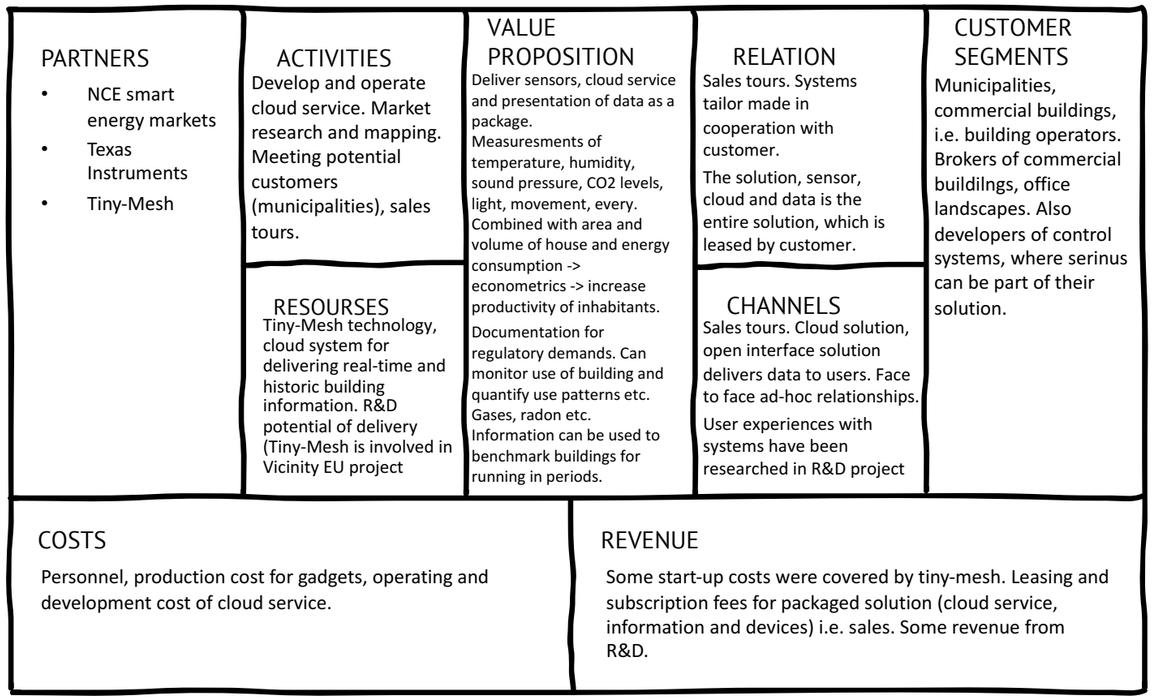


Figure 42: business model canvas of Serinus

have no dedicated support system as of yet. User experiences with systems have been researched in R&D project. Costs are related to personnel, production cost for gadgets, and operating cost of cloud service.

Customer segments – customer jobs: Relevant clients are municipalities, commercial buildings, building operators, brokers of commercial buildings, and office landscapes, as well as developers of control systems, where Serinus can be part of their solution. In general, the solutions fit well those who want to ensure they get the most out of an already existing VAC system, or those who can't afford a prime VAC system. Municipalities are an important customer, especially older buildings who don't have modern control systems, where Serinus can come in and increase monitoring and control abilities for older systems as well. Serinus delivers the information, but customer needs to maintain the control aspect.

In terms of gain this allows operators to see exactly where and how they can improve indoor climate. This allows them to more easily create optimal indoor conditions, which is important as indoor climate is connected to worker productivity and well-being. The data provides a good picture of how buildings perform. Building owners can assess if new buildings delivered to them meet requirements. A good part of it is that operators won't have to go to the actual building itself to see if things are within parameters. Pains arise if the user has an existing control system, the data delivered from Serinus must be integrated with these systems by the user.

Revenue: Some of the start-up costs were covered by Tiny-Mesh. Most revenue arise from leasing and subscription fees for packaged solution (cloud service, information and devices), i.e. sales. Some revenue from R&D.

Capabilities

Serinus targets a group of clients that have high technical knowledge of indoor climates. Their technical solution is therefore easily understood by their users. The conceptualizing of the technology into an offer that meets or even exceeds their expectations can be considered as a proof of sensing. However, also the sensing is still very focused on tech improvement and not so much on improving the total experience. This doesn't have to be a problem as long as Serinus targets the commercial and public building market.

Analysis

Context

Serinus makes use of the fact that Norwegian regulation demands from public buildings to control and modernize the indoor climate. Their investors are large multinationals who do have the time to let Serinus grow. Also, they make use of the technological knowledge of their clients for R&D purposes. They can build a relation with these clients and become a trusted partner. Their state of the art technology arises the interest of other companies to invest. Serinus can therefore be described as a stealth changer. They can be patient.

Type 3 Business model. Serinus is certainly taking the use phase into account and turns learnings into improved and tailored solutions.

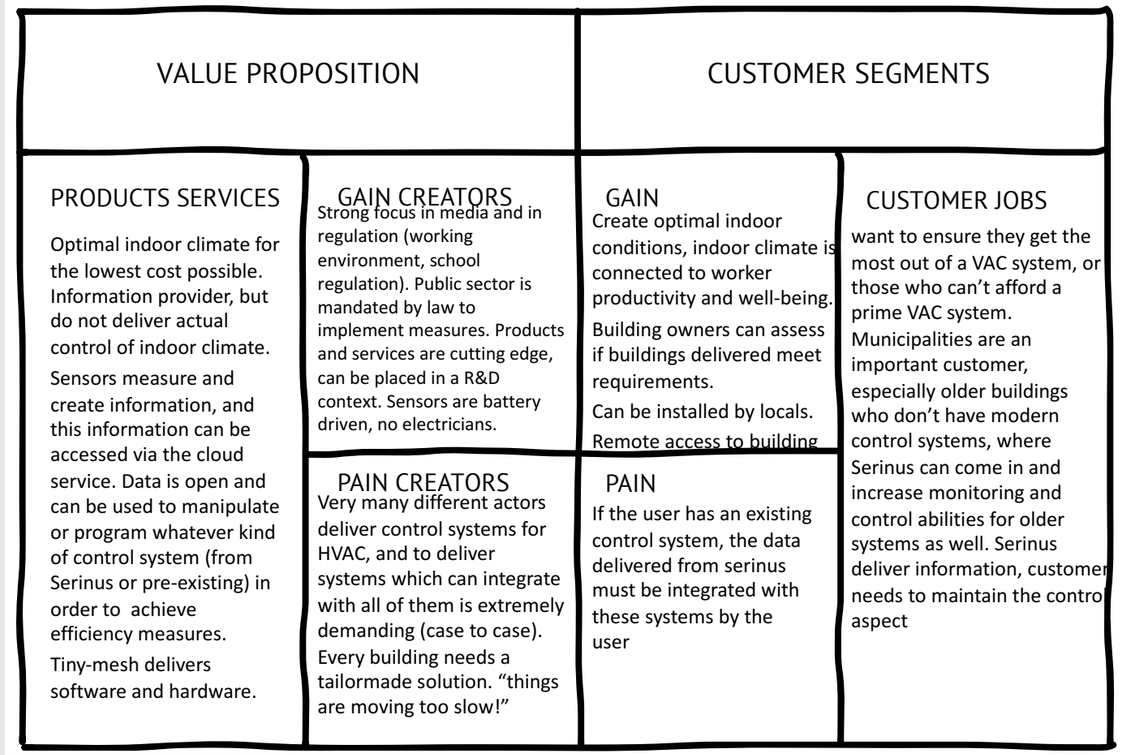


Figure 43: the customer value canvas of Serinus

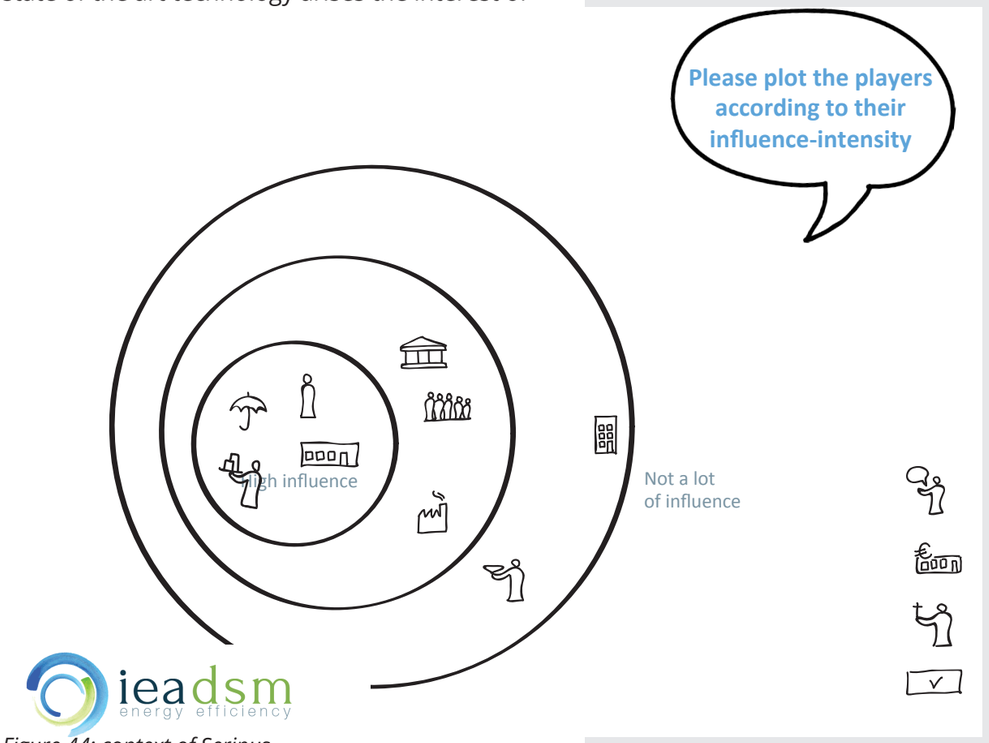


Figure 44: context of Serinus

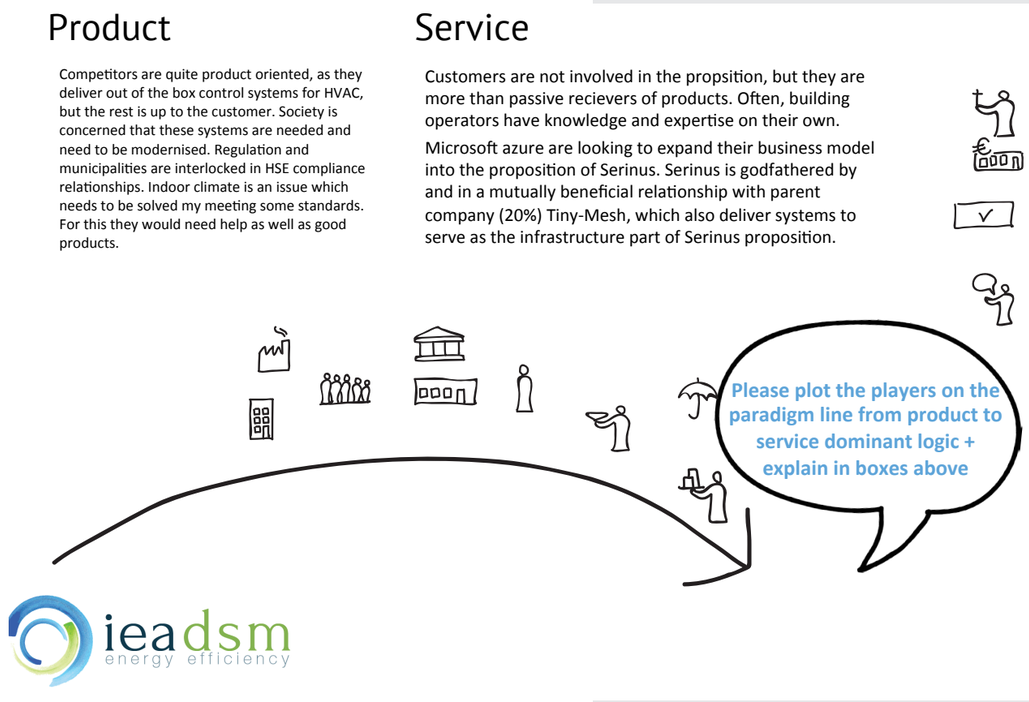


Figure 45: where does Serinus and her stakeholders stand in the paradigm shift from product to services?

The story of Futurehome

Entrepeneur's journey

Everyday life is filled with many different smart gadgets, and there are many different interfaces, protocols etc. Futurehome proposes a gateway app that connects all these different units and make them talk and act together, sensors, locks, energy, heating, ventilation, etc., all programmable.

It started with one of the entrepreneurs finding himself with five different remote controls after having finished his man-cave project, and eventually made a system where a simple button would power up the entire setup with a single push of a button. Then came the realisation, there was nothing in the way of making such a system for the rest of the house as well. This guy worked as an electrician in Bravida, which is a provider of technical installation services, and was allowed by them to bring a demo-rig of his system to a customer exhibition. He had made the rig over one weekend using his employer's space and equipment, connecting it with the systems they already had and providing an interconnected solution. Then they took this concept and started a smart house company in 2013.

Business model canvas

Resources:The entrepreneur started out as an electrician and had extensive experience with smart systems and customer preferences.

Value proposition – product service: The proposal mainly consists of a user friendly app which can connect together and offer programming and control capabilities to all sorts of gadgets and sensors, alarm systems, washing machines, heating units, etc. The model of Futurehome is "the Uber approach", bringing service providers, products and potential customers together. An app serves as a tool for customers to prospect and purchase a complete smart home solution, but at the same time a tool for electricians to sell the same to those customers. This app, called smart home Wizard, connects electricians with an online smart home builder-tool which results in the ordering of a turn-key solution for the customer, after which the specific order for it goes out to electricians. Electricians calls and confirms with customers, accepts the offer in the app, whereupon the hardware he needs to complete the order gets automatically ordered for his address. When he goes to the site of the customer to install he then already has a complete blueprint of the house, the system as well as all the stuff needed. This platform can be used for a wealth of services, not just smart home systems. The platform can be used to "provide" customers to other service providers.

Gains involve the fact that conventional tailor-made smart home systems are complex and expensive, impossible for regular people to install. This model "cuts about 80% of costs". It will also contribute to steadily increasing smart house know-how. On the pain side, it still requires a quite knowledgeable customer. Work and effort is required to train and educate electricians who are going to be partners. Standardization and proprietary communication protocols sometimes gets in the way, different families of devices are hard to connect with each other, and often have the customer in a lock-in. KNX systems, "the Ferrari of building automation", are also very rigid as they only rely on wires, very expensive, and they are hard to connect with Futurehome because it has no wireless interface. KNX systems are made from scratch and the programming for them is embedded and hard to reach. This makes them robust, but not flexible.

If you have a proprietary gadget with its own app to control it, like a door lock, then that makes it hard to create an eco-system controllable with one single app. This is a major problem. Gadgets need to be placed on open protocols in order to really cater for the Internet of Things-logic of Futurehome, and this is the main problem for smart houses not becoming more popular at this point.

In terms of relationships, Futurehome has relied much on crowdfunding based on door-to-door, face-to-face sales, i.e. time consuming and hard work. Electricians are an important way to reach customers, and both are recruited "manually". These are also closely connected with existing customers via a support desk. Apart from this other channels include the sales platform itself, or the service provider/customer eco system, as they call it. They also run a web shop for devices. Costs are mainly related to sales efforts and app development.

Customer segments – customer jobs: Everyone should be within the target group. First customer was one of the entrepreneur's grandmothers. Main customer segment is the refurbishing market. Off-duty electricians are good customers, early adopters and easy targets. Electricians and ISPs are also "customers" in that they want to keep their customer base alive with new offers, for instance like this one. Partnering companies like ISP- and utility providers have a complete turn-key smart home solution to offer their existing, and increasingly threatened customer base. Gains for the customer are apparent if they

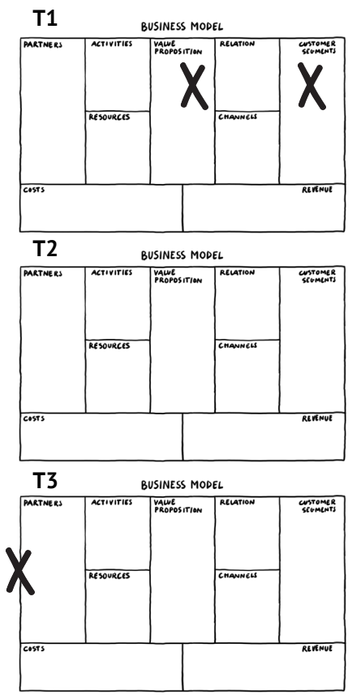


Figure 46: the entrepeneurial journey of Futurehome

PARTNERS	ACTIVITIES	VALUE PROPOSITION	RELATION	CUSTOMER SEGMENTS
• Bravida (electricians) • Innovation Norway (Innfovative R&D) • Klarna (for payments)	App development, sales, developing partnerships with service providers like ISPs or electricians	A user friendly app which can connect together and offer programming and control capabilities to all sorts of gadgets and sensors, alarm systems, washing machines, heating units, etc into an eco-system. A gateway tool for connecting home owners with installers and sellers of smart home solutions (or other services).	door-to-door, face-to-face sales. Electricians are an important way to reach customers, both are recruited "manually".	Anyone. The first futurhome owner was entrepeneurs grandmother. Main customer segment is the refurbishing market Electricians, content providers and ISPs are also "customers" in that they want to keep their user base alive with new offers, for instance like this one, and they can do so by entering into the eco-system
	RESOURSES Bravida partnership was an early niche protector, with money, channels and other material resources		CHANNELS Support desk. The sales platform, or the "eco-system" Webshop Face to face	
COSTS Sales efforts and app development			REVENUE Crowd funded about €175000 from early adopters (a national record) for establishing the eco-system. Revenue from customer subscriptions, sales of equipment to electricians. Some plug-and-play kits, but the volume is low and the retailer steals the profits.	

Figure 47: business model canvas of Futurehome

are already shifting out electrical components like light switches, in which case they “might as well” get smart ones. The system for completing a complete order of a smart house including install and cost estimate without the need to consult anyone or make independent plans is in itself a gain towards smart housing. Some pain is related to the necessity at this point for knowledge and competence. Customers are reluctant to make their house smart in order to save energy in Norway, energy is too cheap. Thus the proposition needs to be about something else…

Capabilities

Futurehome has an innovative concept, however they don’t seem to be able to detach it from the technical solution it still is. Their clients, users still need to have quite a bit of tech knowledge to be able to understand and work with the future home concept. The sensing capability as well as the orchestration therefore need some development. The orchestration skill can be improved as well as the conceptualizing, both in order to turn the concept into more easy-to-use offer they want to be.
The conceptualizing skill is now mainly tech driven and sensing is focused on the smart home concept. In order to improve both skills, they need to move from tech sensing to user sensing.

Analysis

Context

Futurehome still is a very tech oriented company. The smart home market is there to be conquered, however, it still is difficult to get beyond the early adopter clients.
Technological difficulties as well as a ‘young’ market are inhibiting. Although the market is promising, there still are no real solutions ready to enter a mass market. The main barriers seem to be technical, but it looks like the solutions still are very technical as well. (Possibly, shift of focus from the current clients (home owners) to new clients (for whom the interface is the real value) will open new opportunities. With them, they can co create new solutions based on the platform) . In the current situation, the absence of a large investor increases the urgency for Futurehome to become successful. Their strategy to target the tech savvy clients like electricians might be sensible and makes them a smart matcher.

Type 2

Futurehome is a type 2 business model. They offer a technical solution that is also a tech experience for the user.

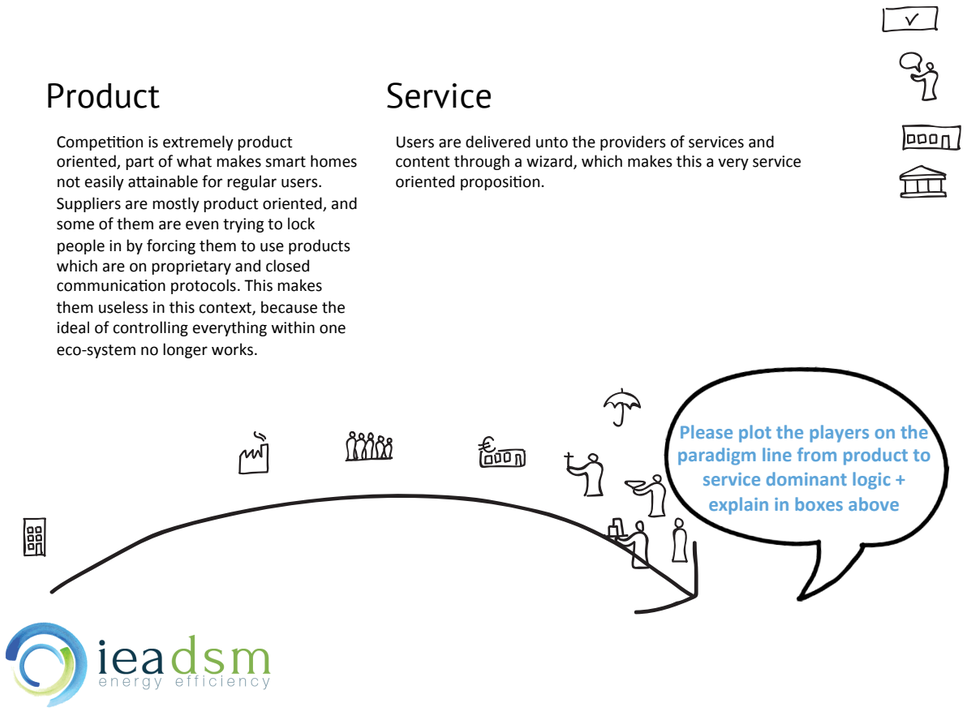


Figure 49: context of Futurehome

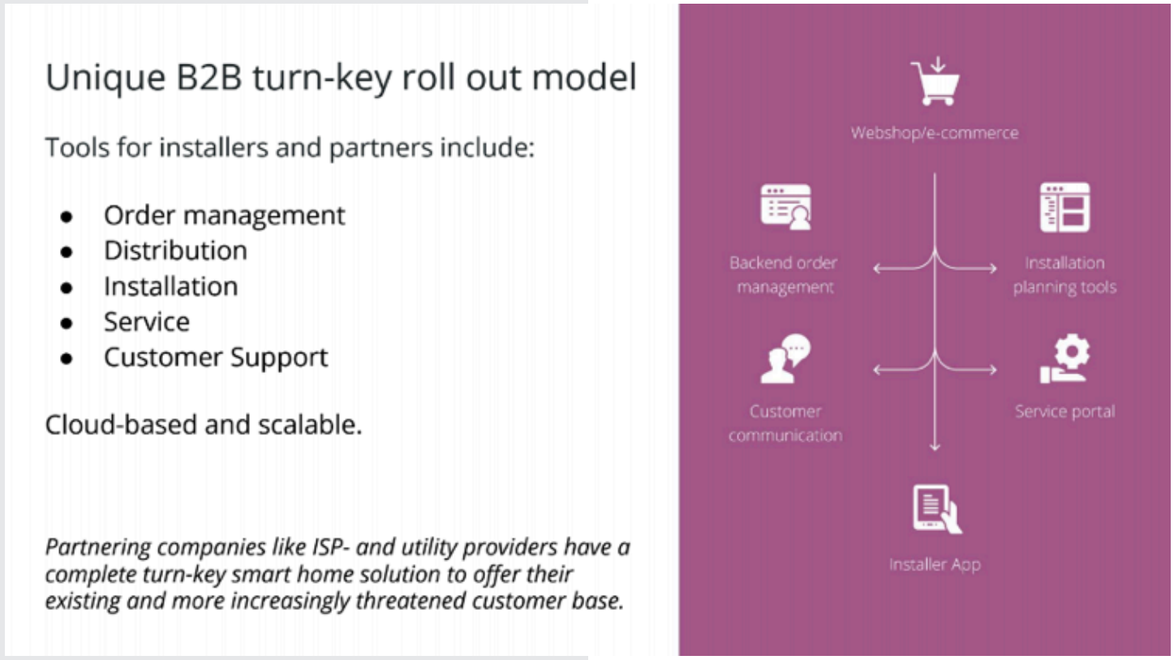


Figure 48: B2B turn-key roll out model Futurehome

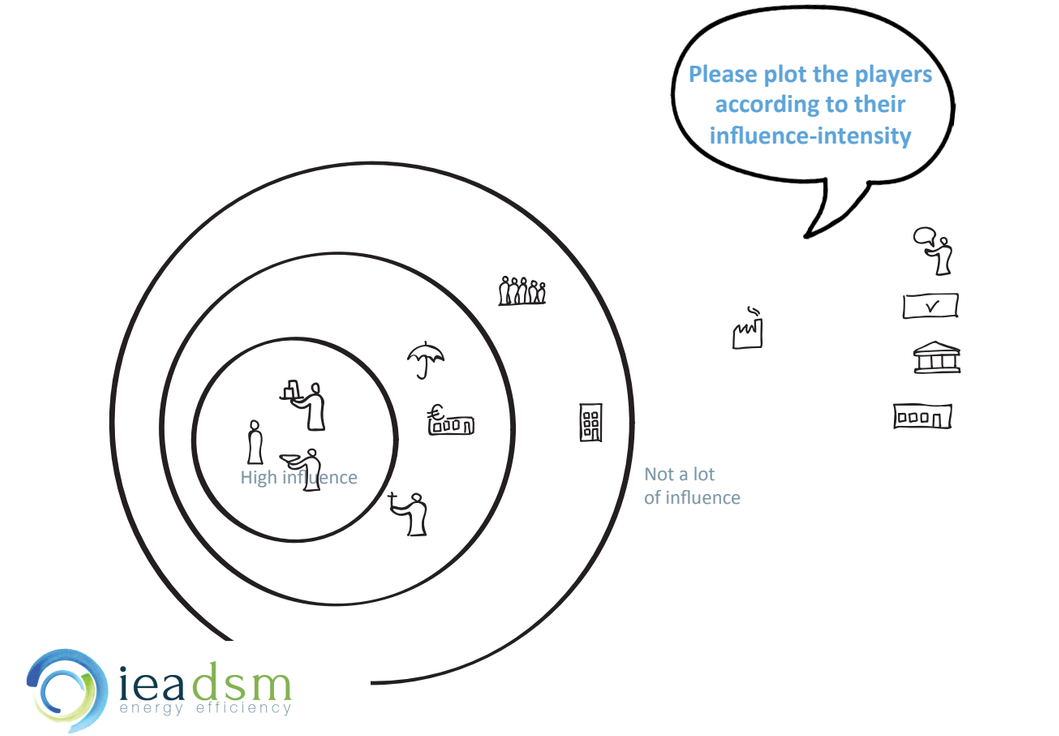


Figure 50: where does Futurehome and her stakeholders stand in the paradigm shift from product to services?

Conclusions

TBD`

References

TBD

IEA Demand Side Management Energy Technology Initiative

The Demand-Side Management (DSM) Energy Technology Initiative is one of more than 40 Co-operative Energy Technology Initiatives within the framework of the International Energy Agency (IEA).The Demand-Side Management (DSM) Energy Technology Initiative, which was initiated in 1993, deals with a variety of strategies to reduce energy demand. The following member countries and sponsors have been working to identify and promote opportunities for DSM:

Austria	Norway
Belgium	Spain
Finland	Sweden
India	Switzerland
Italy	United Kingdom
Republic of Korea	United States
Netherlands	ECI (sponsor)
New Zealand	RAP (sponsor)

Programme Vision: Demand side activities should be active elements and the first choice in all energy policy decisions designed to create more reliable and more sustainable energy systems.

Programme Mission: Deliver to its stakeholders, materials that are readily applicable for them in crafting and implementing policies and measures. The Programme should also deliver technology and applications that either facilitate operations of energy systems or facilitate necessary market transformations

The DSM Energy Technology Initiative's work is organized into two clusters:
The load shape cluster, and
The load level cluster.

The 'load shape" cluster will include Tasks that seek to impact the shape of the load curve over very short (minutes-hours-day) to longer (days-week-season) time periods. Work within this cluster primarily increases the reliability of systems. The "load level" will include Tasks that seek to shift the load curve to lower demand levels or shift between loads from one energy system to another. Work within this cluster primarily targets the reduction of emissions.

A total of 24 projects or "Tasks" have been initiated since the beginning of the DSM Programme. The overall program is monitored by an Executive Committee consisting of representatives from each contracting party to the DSM Energy Technology Initiative. The leadership and management of the individual Tasks are the responsibility of Operating Agents. These Tasks and their respective

Operating Agents are:

Task 1 International Database on Demand-Side Management & Evaluation Guidebook on the Impact of DSM and EE for Kyoto's GHG Targets – Completed

Harry Vreuls, NOVEM, the Netherlands

Task 2 Communications Technologies for Demand-Side Management – Completed

Richard Formby, EA Technology, United Kingdom

Task 3 Cooperative Procurement of Innovative Technologies for Demand-Side Management – Completed

Hans Westling, Promandat AB, Sweden

Task 4 Development of Improved Methods for Integrating Demand-Side Management into Resource Planning – Completed

Grayson Heffner, EPRI, United States

Task 5 Techniques for Implementation of Demand-Side Management Technology in the Marketplace – Completed

Juan Comas, FECSA, Spain

Task 6 DSM and Energy Efficiency in Changing Electricity Business Environments – Completed

David Crossley, Energy Futures, Australia Pty. Ltd., Australia

Task 7 International Collaboration on Market Transformation – Completed

Verney Ryan, BRE, United Kingdom

Task 8 Demand-Side Bidding in a Competitive Electricity Market – Completed

Linda Hull, EA Technology Ltd, United Kingdom

Task 9 The Role of Municipalities in a Liberalised System – Completed

Martin Cahn, Energie Cites, France

Task 10 Performance Contracting – Completed

Hans Westling, Promandat AB, Sweden

Task 11 Time of Use Pricing and Energy Use for Demand Management Delivery- Completed

Richard Formby, EA Technology Ltd, United Kingdom

Task 12 Energy Standards

To be determined

Task 13 Demand Response Resources - Completed

Ross Malme, RETX, United States

Task 14 White Certificates – Completed

Antonio Capozza, CESI, Italy

Task 15 Network-Driven DSM - Completed

David Crossley, Energy Futures Australia Pty. Ltd, Australia

Task 16 Competitive Energy Services

Jan W. Bleyl, Graz Energy Agency, Austria / Seppo Silvonen/Pertti Koski, Motiva, Finland

Task 17 Integration of Demand Side Management, Distributed Generation, Renewable Energy Sources and Energy Storages

Seppo Kärkkäinen, Elektraflex Oy, Finland

Task 18 Demand Side Management and Climate Change - Completed

David Crossley, Energy Futures Australia Pty. Ltd, Australia

Task 19 Micro Demand Response and Energy Saving - Completed

Linda Hull, EA Technology Ltd, United Kingdom

Task 20 Branding of Energy Efficiency - Completed

Balawant Joshi, ABPS Infrastructure Private Limited, India

Task 21 Standardisation of Energy Savings Calculations - Completed

Harry Vreuls, SenterNovem, Netherlands

Task 22 Energy Efficiency Portfolio Standards - Completed

Balawant Joshi, ABPS Infrastructure Private Limited, India

Task 23 The Role of Customers in Delivering Effective Smart Grids - Completed

Linda Hull. EA Technology Ltd, United Kingdom

Task 24 Closing the loop - Behaviour Change in DSM: From theory to policies and practice

Sea Rotmann, SEA, New Zealand and Ruth Mourik DuneWorks, Netherlands

Task 25 Business Models for a more Effective Market Uptake of DSM Energy Services

Ruth Mourik, DuneWorks, The Netherlands

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http://www.ieadsm.org

Task 25 D2 report Norway

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National experts: Bjørnstat, R, Throndsen, W.