

Unleashing Consumer Flexibility: A Business Oriented Recruitment Process

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ABSTRACT

User acceptance for involvement in demand side management regimes starts with recruitment. The paper describes a process where a group of consumers were solicited on sustainable and scalable business terms. The dominant group of recruits and the principal factors influencing their choice are described.

INTRODUCTION

The research reported here addresses demand side management and user acceptance. The work constitutes a part of the national demonstration project in Norway named DeVID (Demonstration and Verification of Intelligent Distribution Grids)¹. The project covers a wide set of issues related to Smart Grid. DeVID has access to two demonstration sites, one situated in the town of Steinkjer, the other at Hvaler, a coastal region in the south-east part of Norway. All subscribers in the two demo areas have smart meters and are connected to an AMS infrastructure. A part of the project is dedicated “regional consumer flexibility”. It addresses issues related to both demand side flexibility and micro-production. The discourse here addresses the process of recruiting people as participants in demand-side management regimes. How to engage people on regular business terms is the central issue. What makes people enroll to create a platform for an economic sustainable, lasting and scalable service? What process can be designed to cater for this? The basic idea has been to investigate drivers and incentives that are not created for R&D, but that can be applied for regular business development, marketing and sales. This takes the studies like [1] and [2] on user acceptance one step further. The way people are recruited and what commitments they make up front determine degree of user acceptance and suggest the level of future engagement.

TENTATIVE PROCESS

The basic approach explored has six steps: 1 Define context 2. Analyze consumption and consumption profiles 3. Perform user surveys 4. Perform literature and a market survey 5. Define and execute a communication plan 6. Produce tentative offers. Promotion and sales based on the results generated have served as a test.

1 <http://www.sintef.no/Projectweb/DeVID>

Context definition

Norway is blessed with a significant percentage of environment friendly hydroelectric power. Although energy prices are increasing Norwegians have persistently enjoyed some of the world’s lowest prices for electric energy for several decades. Price elasticity is low. At the same time standard of living is very high. The average annual consumption of electric energy in both regions is approximately 16000 kWh. That represents the national average. This places people here at the upper part of Europe’s consumer list. Electric heating has been dominant for several years. As Nordic countries are exposed to harsh winter periods with negative outdoor temperatures and dark days the consumption of energy is strongly related to outdoor temperature and indoor life style. The demo site at Steinkjer has more than 300 energy subscribers equipped with smart meters. Hvaler has 6800 subscribers. 2200 of these are households with all-year inhabitants. 4600 are summer houses or cottages with only seasonal occupation. Both sites represent the typical small town community and rural area respectively. They are both typical for Norway and many parts of Scandinavia.

Analysis of consumption loads

For this step a Big Data approach was applied [3]. Several thousand time series were analyzed. To determine covariant aspects of consumption various multivariate statistical techniques were applied. Attention was first directed towards current consumption profiles and estimation of latent flexibility. Metering data was collected from both Steinkjer and Hvaler in order to determine the composition of the daily load profiles experienced by the local DSO’s.. It was established early that profiles for households in the two areas did not differ much. Comparing meter values with the overall load profiles recorded in the utility control center revealed when and how different consumers contributed to the aggregated consumption during a season, a week and on a diurnal basis. The transparency provided by the smart meter and AMS gave very valuable insight that could be used to design tentative control strategies, characterize tentative market segments and reveal pertinent communication elements. Summer houses are typically used continuously only for a few weeks during the year. But autumn weekends, Christmas and Easter holidays see an influx of cottage owners despite low temperatures. This contributes significantly to hourly consumption levels. From November to March consumption is strongly correlated with outdoor temperature (-0,8 to -0,9). Indoor heating constitutes

more than 60% of the overall consumption. Analysis of the collected data also identified life style aspects of importance i.e. temperature levels and occupation – vacancy ratios. Hidden structures in the time series analyzed revealed resident groups with the greatest impact on the aggregated consumption. Loads imposed by a modest commerce and industry winter time were less dominant than the aggregated contribution different groups of households. As expected heating to control frost during the winter in non-inhabited summer houses imposed only modest loads per unit. But we found that load reductions/shifting of app. 800 watts per unit was still possible. Intervention in non-occupied residences is attractive for demand-response tasks. The sheer number at Hvaler made this group even more appealing.

User survey

The analysis work was followed up by surveys and interviews. Support for this step was also gathered through application of results from similar surveys performed by others, but related to the same or similar target groups. A number of demographic, psychographic and behavioral aspects were addressed through the surveys and followed up by means of direct communication either in the form of interviews or in meetings where several users were assembled. Of the more than 2000 selected for the survey at Hvaler 962 participated. 50% of the respondents were between the age of 51 and 65. A survey conducted by [4], with a wider geographical spread, included respondents from Steinkjer. 603 valid responses (300 from Steinkjer) were obtained based 3000 invitations issued by e-mail and through social media.

Literature and market survey

A comparative market study and a survey of historic research on consumer behavior were also done. Important work on human behavior and general energy consumption as well as behavior exposed to smart grid technologies have been reported [5,6,7,8]. Several of these have identified social and cultural norms that should be observed if voluntary behavioral change is desired. This applies to aspects of cleanliness, convenience comfort and even coziness [7,8]. Despite universal relevance the emphasis on each and the relative behavior is deeply rooted in local culture. Harsh winter conditions, short days and low temperatures have a great influence on use of lights, heating and indoor life in general during the cold season. “Home as a haven” was coined by Aune [7] and provides an explanation model for this. “Home as a project” is an alternative model for those who places attention on property enhancement. Norwegians invest around €3000 every year in their homes. This also proved to be true for the regions addressed in DeVID.

Like [1,5,6] we found that control and security of property as well as reassurance of life style determine attitude towards different use of energy as well any kind of interventions related to such. Cottages built during the last two decades are no longer simple shelters, but well equipped and very comfortable resorts enabling what borders to luxury living. Energy consumption has increased accordingly. Support from general claims made in the literature was also found in the course of our market review. Multiple businesses, in different domains targets refurbishment, home styling and redecoration. This inclination is also evident in parts of the publication industry. Life style magazines center a lot of attention on homes and living, typically hailing extravaganza. Home and life style are strongly connected in such media. Evidently the ideas maintained appeal to a lot of people, primarily females of different age. Consequently life style oriented incentives emerged as strong motivation factors in our early work.

Services offering home security and monitoring have also picked up momentum over the past few years. Interest in services that allow owners themselves to monitor their property while away and assure a comfortable temperature prior to next visit have also soared. In fact, we found that relatively little had to be added to a service like that to yield a full-fledged demand side management concept. DEFA², a company with more than 30.000 subscribers in Norway alone, is a case in point. This company offers a remote controlled Home Automation System (HAS) and associated services across the telecom net. Functions include burglar alarms, frost control when residence is vacant and simple monitoring of energy use. All which provide DEFA with an annual income of €110 in addition to profits on each device sold.

Communication

Bases on insight gained during the first phases of the process, a three step communication plan was defined to support the last steps of the recruitment process: 1. A community directed activity 2. A DM (direct marketing) activity. 3. A dialog typical for regular sales processes involving telephone calls (TM) or meetings.

The aim of the first step here was to address specific issues of the community and to educate people in terms of energy use. A strong, local flavor was added to this due to feedback received earlier. Emphasis was placed on people, their homes and their daily life. Focus on technology was toned down, but portraits of different suppliers and solutions were presented. Great care was made in order to refute impressions made by environmentalists that objectives and norms related to life style do not have to be sacrificed to take part in

2 www.hyttami.no

activities related to energy and load reductions. In step two, communication was customized for what had earlier emerged as principal segments embracing different regions, households, age groups, value emphasis, consumption level and load profiles. Each major segment was then provided with a set of offers supported by a well-designed promotional rhetoric. The DM was typically followed by a direct dialog, either by phone or by means of general meetings. Support for this was provided through web/social media updates. Meetings were held in order to explain more elaborate aspects of demand-response, tariffs and micro-generation. This opened for a direct dialog with interested people. This proved to be very important to eliminate obstacles prior to enrollment.

Customer Offers

Three sets of offers were designed. Each issued from different business platforms. All had the same objective, to recruit households and cottage owners for demand side energy control. However, different incentives were highlighted as part of the offer itself as well as through the promotional rhetoric applied. Final commitments were made on a pure “opt-in” basis.

Offering	Net owner	Energy Sales	«ESCO»
New tariff (subscribed effect)	X		
Combined product and energy offer		X	
Combined product and service offer			
Energy and effect display	X		
HAS/Control system	X	X	
HAS/Control system and existing business platform			X
Aggregation/ meta-control system			X

Fig.1 Shows the different offers and the business platform behind each.

Households with annual consumption above 20.000 kWh and living in the Steinkjer area were offered a bundle consisting of a new tariff (subscribed power) and a HAS (Home Automation System) (Fig.1). The HAS allowed monitoring of consumption and loads, both aggregated and per device, through a web interface. The HAS was complimentary when accepting the new tariff. A similar offer was produced for subscribers in the Hvaler with consumption above 16.000 kWh. Here subscribers were offered a complimentary, hand held display. Both offers were issued from the local DSOs seeking in this way demand-side management partnership. The rhetoric promoted better control and savings. Direct Marketing by e-mail (DM) and meeting constituted the main channels for promotion. From the perspective of a power retailer the permanent households at Hvaler (>16000 kWh) were offered a product-energy combo where the user could choose between a display or 3 types of HAS combined with an energy product. The

target group was split into three equal sub-groups, each receiving a promotional package by surface mail consisting of the same combo but with different promotional rhetoric: 1) Emphasis on cost savings and environment, 2) Emphasis on comfort control and convenience 3) Sole emphasis on technology. The up-front price for the various combos, indifferent to the rhetoric applied varied from app. €100 - €360. The DM was followed up with a TM using professional sales people. DEFA did not aspire to become an ESCO, but let the project offer their products on their behalf combined with a demand-response addition produced by the project itself. In this way the project emulated a service company. Cottage owners at Hvaler were then exposed to the offer through e-mail and advertisement in a local magazine. Again the three different messages were used to trigger the interest of the receivers. The entry fee for the combined product and service was €350. Free service charge for the first year was granted s part of the offer.

MAIN FINDINGS

Work is still ongoing, but a rich set of empiric material has already been harvested based on « trial sles ». More than 4000 people have been exposed to surveys. 50% of them have left an empirical footprint. Almost 1300 have been exposed to one of the offers described above. The results are very encouraging. Fig. 2 shows the responses from the final campaigns. The power retailers’ yield is especially good with a 35% hit rate. The TM is still ongoing and several more commitments are expected.

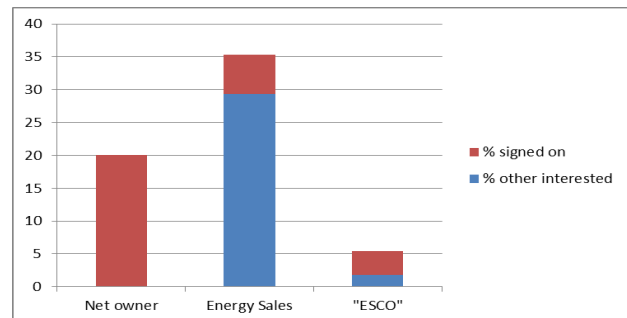


Fig.2 Hit rate for DM's. Firm comitment in red after TM or meetings. « ESCO » did not apply TM or meetings.

The number of responses for the new tariff combo exceeded the expectations and predefined quota that the DSO's had predefined. But the ESCO initiative produced reponses below what was expected. This has a number of likely reasons, the major one being that the initiative was not rooted in professional sales organization, but the project. Professional marketers designed the DM, but there was no TM. Another likely reason is improper timing. Several cottage owners were apprehensive about going to their cottage an install something during winter time. The unusual mild winter reduced the willingenss to buy in. The general drop of sales experienced by DEFA supports this. The similar reponse rate of receivers of

offers supported by the «economy and environment» rhetoric and the «comfort and convenience» message is also interesting.

To explain the final results several geographic, demographic, psychographic and behavioral have come forward through the process described. These variables characterize the context and segments described and can be used as a reference for similar initiatives. Not surprisingly **climate** and the **local weather** is an essential context parameter when heating is dependent on electricity (high negative correlation). When temperatures drop significantly below 0 degrees C for a long time during the winter it is well known that demand for heaters grow and issues related to comfort, welfare and energy prices become a public concern. This triggers heated debates in media. People focus accordingly. In our case the lack of “frost feeling” produced a degree of indifference that was notable.

Gender emerged as an important screening factor. Although some of the responses to our DM’s showed a greater balance, the set of recruits actually gathered for all initiatives was dominated by males. Surveys and head counts in actual meetings showed that candidate recruits were typically middle-aged men. The fraction of women was less than 20% during the whole process. Moreover the females that appeared in meetings and direct dialog would seldom do so without their spouse. However, we sense like [6] that female partners play an important, but tacit umpire role that must be recognized. This will be further investigated.

Age is essential. All meetings and all the final transactions were dominated by middle aged people. More than 74% of the respondents at Hvaler were older than 50 years old. This percentage was also reflected in meetings held. This age group dominated also the attendees at Steinkjer who volunteered for trials. These observations comply with our initial survey indicating that the majority of real estate owners in the two regions are middle-aged people with relatively high income. With a different demographic blend in ownership it is not unlikely that we would have experienced a different type of response.

The **type of residence** matters. It became apparent quite early that concerns related to temporary residences are different from those of regular households. Energy to support daily life is prominent for the latter. Maintenance or preservation is central to the former. Distinctions between apartments, villas or chained houses are not so apparent. The differences here seem to appear more in terms of **consumption level** and **load profiles**. However, the age of the house or time since refurbishment plays a role. This might be linked to the fact that older houses generally holds a

poorer energy efficiency standard.

Somewhat surprisingly “**local patriotism**” seems to be one of the most important psychographic variables. People are concerned about the local community. Affections related to Hvaler are quite apparent. At Steinkjer people tend to care about the doings of the local DSO. In our surveys and talks, the welfare of the local community surfaced as a concern. These sentiments seem to favor local brands. We found that local **brand loyalty** tend to influence degree of attention (with respect to DM’s and TM’s) and level of confidence in the offer made.

Technology interest proved to be an important driver for many. 25% had already installed in their houses fairly advanced technology prior to our interaction with them. Survey results from Steinkjer as well as Hvaler indicate a strong interest in technology. This was also experienced when people were invited to meetings to discuss or demonstrate everything from control systems, display and micro-production. Technology that is possible to integrate as part of the house seems most appealing. This can be rooted in the notion that integrated technology increases the value of the house. The survey conducted by [3] suggested that this interest correlated negatively with increased age. Our observations from Hvaler suggest that all age groups are equally interested.

Convenience and comfort are life style elements that need to be observed. Our initial investigations did reveal that approximately 12% of the respondents at Hvaler had invested in systems to remotely control indoor temperatures. 50% of the cottage owners said they would consider a demand side control service if it assured proper comfort and made living easy. The same percentage reappeared in the final campaign where 50% of the Energy Sales and ESCO respondents were encouraged by that type of rhetoric.

Upbringing is associated with income, year of birth and cultural legacy. By listening to discussions and questions asked in meetings held we found that older people could well relate modern demand-response principles to parents’ practices during the 50’s and 60’s were effect based tariffs were common. A more technical explanation was required for younger people.

Need for **security** is essential. This has also been indicated by [2] and [5]. The feeling of security has different expressions: Control of life and life style, concern for property, trust in supplier and several more. It was revealed early that 33,5% thought that demand-response would pose a risk to their house or its electricity system. Those that eventually signed in, readily expressed concerns when a software error drove the temperature in their vacant residence up 20C. Similar

worries about frost were expressed during normal operating conditions when a sudden fall in outdoor temperature happened. Confidence in the technical support, the brand and people behind all soothes the uneasiness. Worries about privacy intrusion hardly surfaced during the process. Even in a low price, high income world **price of energy, price of entry and cost-benefit aspects** play a very prominent role. The general notion is that equipment and services should cost less than €120 and yield up to €620 in annual savings in order to embrace 2/3's of the population addressed. Fig.3 illustrates the price sensitivity for cost of entry based on the observations made.

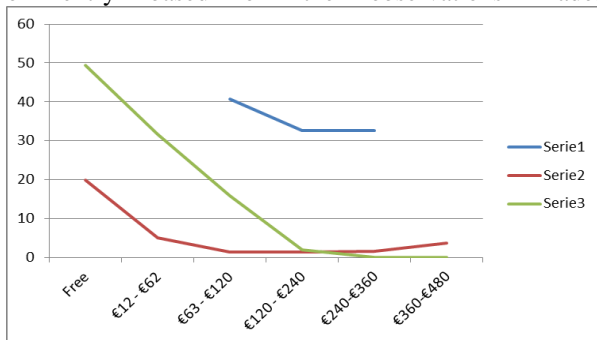


Fig.3 Price sensitivity to entry cost

The horizontal axis displays a price range while the vertical line represents the hit rate (%). Despite the fact that sales figures can increase if more competences, resources and hours are invested the instant response to an offer corresponds with the attitude portrayed by the green line in the figure. The green line (series 1) represents answers from the survey at Hvaler. The red line (series 2) shows the percentage of final closures at time of writing. The blue line represents the ceiling that the professional power retailers pursue with a proper post-DM effort. "Free" means that there is no entry cost (i.e. tariff combo)

CONCLUSIVE REMARKS

The process described applied a number of sources of intelligence to specify important segments and tentative offers. The importance of acute communication rooted in a context that address people's lives and their local community became evident. The final results prove that people are willing to sign up to share their flexibility on business terms that are scalable. During the process we have identified important segmentation variables that must be honored in order to identify the best group of users and balanced set of incentives. In our case the prototype pioneer most willing to involve himself is a middle aged man with a relative high income interested in technology. His proficiency in the type of technology relevant is probably not very high. He owns a house or a cottage or both and is a significant energy user. He

demonstrates a great concern for his property and is a local patriot. Despite his prosperity and success he is concerned with entry cost and price of energy. He sees a monetary reward as a necessity. Life style aspects are important, but not always well articulated with this type of user. A streak of environment and social concern can also be found, but it is not very salient. He is surrounded by other prototypes that influence him. Like [5] we found indications that his wife acts as an umpire. She seems a natural sceptic. If true, her tacit needs must be investigated closer to assure final commitment. The "trial sales" have shown that if the needs of the prototype user described here are met a firm group of pioneer users can be signed on for lasting cooperation and mutual benefits.

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