Task 25 D2 report Korea

Korean 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 Korea

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 Korean Subtask 2 final deliverable for Task 25. The report first provides a short description of the analysis framework for the Korean context and cases. Then the analysis of the Korean context is discussed and finally the different business models and services selected for are described. For the comparative analysis of cases we refer to Deliverables 4.1 and 4.2 of Task 25.
The Korean cases are in one important way different than the other cases collected in the other countries. The Korean cases are based only on material available on the internet, and are not flanked by interviews with representatives of the companies by the national experts. Because of this, the analysis of the cases is very much based on expert judgment of the national experts, and cannot be considered fully comparable to the other cases collected.

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 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.

Korea – context analysis

This analysis uses a multi-level perspective to describe the relevant context for business models in the market that sell energy efficient products or services or both. As there is an impact of contextual factors on the development of business models and businesses in general (Provance, Donelly, & Carayannis, 2011) (Huijben & Verbong, 2013) a context analysis can be considered useful. Context can be interpreted in two ways: first of all it can include policy landscape pressures, deep structural trends in the macro environment that determine contextual opportunities. Context also includes barriers for socio-technical transitions (Geels, 2002) which can be seen as relevant context for the market. Besides that, in the process of a transition firms bring products or technologies to the market via their business model (Boons & Ludeke-Freund, 2013). Dominant business models are present in the regime, while radically innovative business models develop their niches to form and grow (Bidmon & Knab, 2014). As in the wider market transition, these firms operate within a larger context, and their business models face selective pressures present in the regime. This context analysis will describe the broader landscape, the environment in which a firm and the business model are positioned and policy that specifically tries to empower the energy efficiency niche. Smith & Raven (2012) note the relevant context is formed by the 1) established industry structures, 2) policies and political power, 3) market and user practices, 4) dominant technology and infrastructure, 5) the cultural significance of the regime and 6) scientific knowledge. These factors and landscape pressures will be described below for the energy efficiency market.

Broader landscape

The South-Korean economy has shown 5.39% of the average annual GDP per capita growth rate since 1980, although it is only about 2.5% since 2010. As a country with not much of domestic energy sources, South-Korea depends on 97% of total primary energy from abroad. Energy import accounts for 33.1% out of total import, in 2014, totalling 174.1 Billion USD. Korea currently has 3,039 thousand barrels per stream day refinery facility with a total of 93.2GW of power generating facilities.

With this high dependency on imported energy, South-Korean government has various measures to promote the rational utilization of energy for all sectors. A nation-wide energy master plan is being revised every 5 years, while each of the energy sectors such as power sector, natural gas sector, district heating and cooling sector, renewable energy sector, etc., have biannual sector-wise energy plans. Most of the energy sectors except that of oil are government created monopolies the power sector is monopolized by Korea electric power co. (KEPCO), the natural gas sector by Korea gas co. (KOGAS), the district heat sector by Korea district heat co. (KDHC), etc.[1]

[1] For details, refer to Kim et al. (2015)

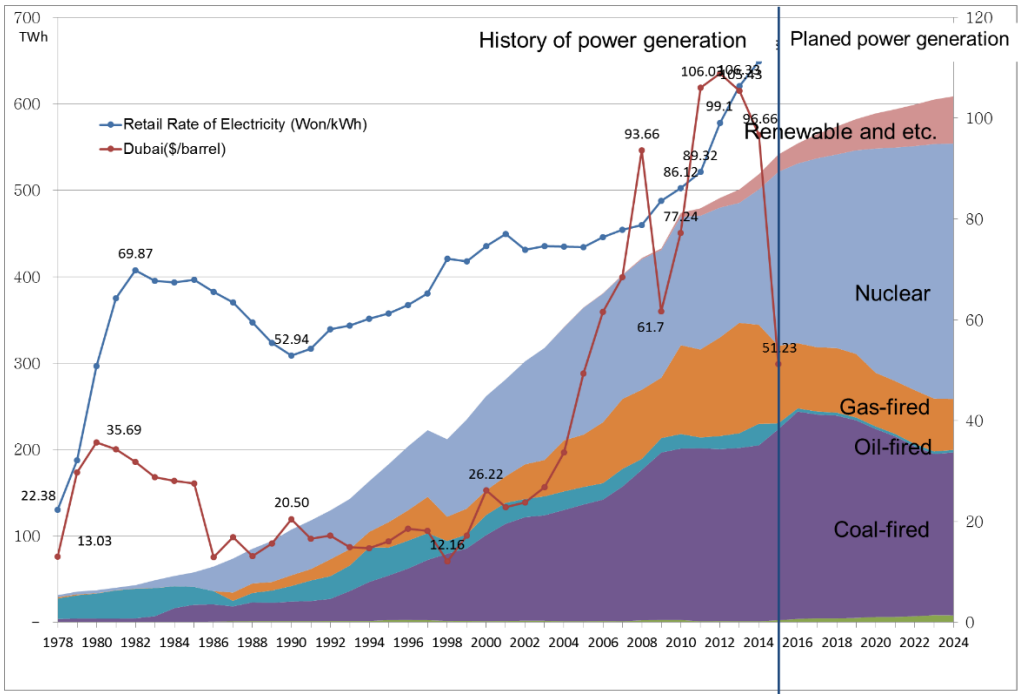


Figure 1 Overview of Korea Power Sector
Source: constructed based on EPSIS, BP

With the recent submission of the Intended Nationally Determined Contribution (INDC) to UNFCCC, Korea set the target of 37% emission reduction based on 2030 business as usual forecast of carbon emission[2]. Carbon emission reduction through the stricter energy conservation in various sectors is ever more required.

Using data for the period from 1980 to 2014, energy intensity is calculated to show the general trend of energy intensity improvement in the following diagram. While the figures of energy intensity for the most of the selected high income country cases show the continuous improvement, the Korean case reveals that there could be further energy intensity improvement in the future as per capita GDP increases.

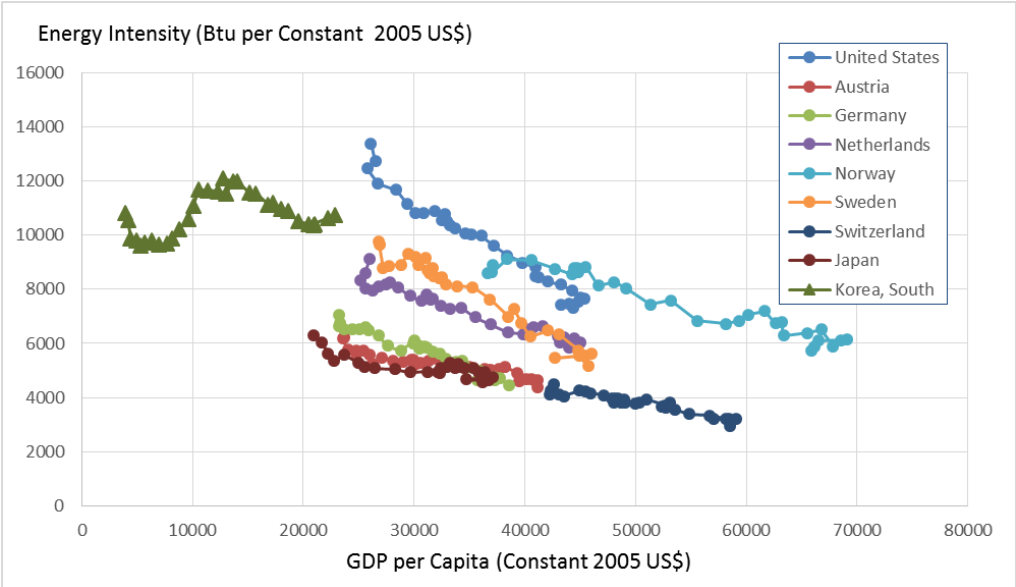


Figure 2 International Comparison of Energy Intensity

[2] Check INDC at UNFCCC for details

Source: World Development Indicators, World Bank, http://data.worldbank.org

Energy efficiency improvement can be achieved from various parts of energy balance flows. A simplified diagram of the South-Korean energy balance flows is being presented in the following figure. Most of energy sources imported from abroad constitutes the primary energy sources of South-Korean economy. Gasification of LNG for town gas, oil refinery, heat generation through cogeneration process and power transformation using various energy sources including renewable energy constitutes a transformation of the sector and there could be a whole lot of opportunities for energy efficiency improvement. Rational energy utilization of final energy sources by various energy service sectors such as buildings, industry and transportation would further constitutes another broader set of opportunities for energy efficiency improvement.

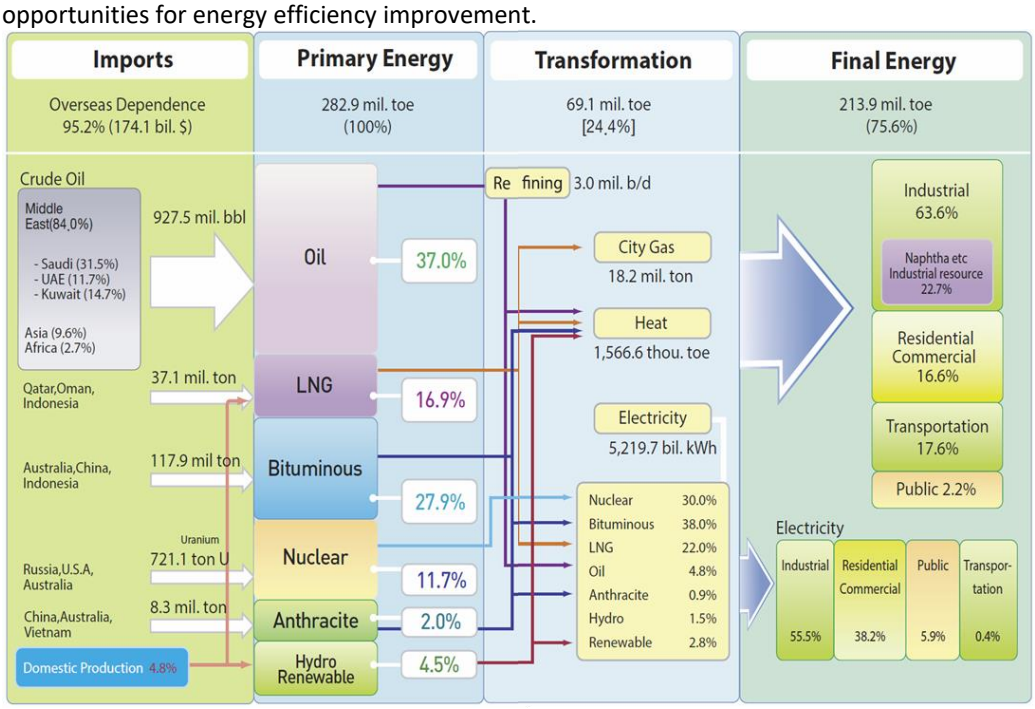


Figure 3 2014 Energy Balance Flow of Korea Source: KEEI (2015)

Energy efficiency improvement from the demand side management (DSM) will be relatively a small part of the whole energy balance flow, compared to the efficiency loss from primary energy to final energy as listed above; occurring mostly from final energy service supply and demand using electricity.

Structural elements

In the following sections, structural elements are discussed. Formal Institutional elements such as governance structures are discussed first, while actors of the institutional elements from energy service providers to various target groups are discussed consecutively.

Established industry

In Korea, three major energy companies such as KEPCO (Korea Electric Power Co.), KOGAS (Korea Gas Co.), and KDHC (Korea District Heat Co.) are obliged to participate in Demand Side Management (DSM), legal framework is prepared under rational energy utilization act, article 9 (energy provider's investment plan for demand side management) and related decree, article 16. DSM in Korea is categorized into three major areas: Energy Efficiency Improvement, Load Management, and Expansion of Related Infrastructure.

- Energy Efficiency Improvement – The purpose of Energy Efficiency Improvement is to satisfy the consumer's energy service utility level (the function provided by the energy) at the same time reducing energy consumption. This includes the energy saving activities such as the promotion and use of energy efficient facilities, to promote the diffusion of high efficiency technology and cash back to consumers, installation of smart meters, etc.

Most of these activities are technology oriented, although there are some behaviour related actions as well.

- Load Management – The purpose of Load Management is to induce the efficient utilization of energy supply facilities by shaving the peak load while filling the base load. This includes the design and application of tariff structure for load shift from the peak to valley, application of new technologies for the peak load shaving, new technology promotion for energy mix transition which leads to the achievement of the given purpose of load management. Many market based incentive structures are imbedded for demand response for peak shaving, valley filling, etc.

- Expansion of Related Infrastructure – The purpose of this program is to expand the foundation and infrastructure via various dissemination programs, education, research and development, and the promotion of related funds.

Except the monopolized energy enterprises discussed above, there are other types of energy providers thriving in the energy market based on the incentive structures being provided by the master plan for rational energy utilization.

- SME ESCO –Based on rational energy utilization act, article 25, and related decree article 30, qualified SMEs are enlisted for ESCO business, and public fund of up to USD 20 Mil. is allowed to be financed for ESCO promotion. It is announced that large enterprises are no longer eligible for ESCO public fund since 2015.
- Private EE business enterprises thriving from former ESCO – Dual benefit of both public fund and tax break on the investment for energy conservation for large private enterprise was found improper, large private enterprises are no longer eligible for ESCO public fund since 2015. Previous experience on ESCO business, however, allow them to be thriving for various type of EE business themselves.
- Smart Grid Related Business: Qualification standards adopted negative type which allows every potential entrant if not disqualified by enlisted conditions. Types of services by this business are:
- DR Aggregators –DR Providers (aggregators) are independent energy solution providers. As is observed in power market, DR providers that assemble the electricity demands of their clients into larger block are participating in demand response resource market in Korea and the size of this market is growing. Frequency market, which has been dominated by large enterprise, is expected to be open to SME depending upon the future design of market incentive structure.

Utilities

Korea has only one monopolized company, KEPCO, at retail electricity market while 5 subsidiary power generation companies of KEPCO and many other private power generation companies are competing in a mandatory whole sale power market called CBP (cost based pool) market. Monopolized retail power market hinders all types of the progresses in smart-grid related business. Town gas market in retail sector is also monopolized by 32 Local town gas companies due to the lack of joint utilization of pipeline network. KOGAS is the world largest LNG importer and the only supplier of gas to those retailers. No consumer including industry firms can choose their own utility companies for energy service of electricity and gas. Electricity price is regulated by power commission, a government entity and residential power tariff has progressive scheme so that the energy bill will progressively increase as consumption increases. Cross subsidization from household to industry and agriculture sector has been controversial issue.

Industry

In 2015, manufacture sectors in industry consumes more than 53% of final energy consumption of the whole Korean economy and electricity is 18.2% of all manufacture sector energy consumption. Among those manufacture sectors, coke and petroleum refining, compounds and chemicals and primary metal industry consumes 27.1%, 26.4% and 24.7%, respectively, according to industry sector survey conducted on 2013. That is, those three industry final energy consumption is 41.4% of the total final energy consumption in Korean economy.

For the GHG mitigation and energy conservation of industry sector, various measures are being implemented for industry sector and those includes[3]:

- GHG . Energy Target Management Scheme
- Soft Loan for Energy Saving Facilities & Tax Incentives
- Energy Service Companies, ESCO
- Energy Utilities' Investment in DSM
- Energy Utilities' Grant on DSM
- Mandatory Energy Audit
- Energy Saving Consulting
- Energy Management System, EnMS
- Integrated Energy Supply
- Energy Efficiency Projects in Industrial Complex
- Green Growth Partnership of large and Small-medium enterprise, GGP
- Energy Supporter
- Negotiation on Energy Use Plan
- Subsidy in District Cooling
- Grants to Local Energy Saving Projects
- Inspection on Thermal Equipment

SMEs

According to Korea Federation of SMEs report of 2015, SME is defined as those enterprise with less than 300 employees. The number of SMEs in manufacture sector are 123,661 composing 99.4% while their value of production is 48.3% of the whole manufacture sector. But the value added created by SMEs are 51.2% of the total manufacture sector and stays at this level since 2000. Average monthly working hours for SMEs in manufacture sector are 187.8 while those of large enterprises are 181.3, showing 6.5 more working hours for SMEs. Per capita salary level compared to large enterprises show only 56.5% implying the importance of the large and Small-medium enterprise partnership.

There is no report on energy usage, especially for SMEs. But from the discussion in industry sector given above for major three industry case which are composed of large enterprises only consuming more than 78.2% of total manufacture sector energy consumption, it can be assumed that SMEs play rather a minor role in energy consumption because in general the top 300 factories in Korea (in total there are 100.000s of factories in Korea) consume more than 50% of the total industrial electricity. However, it is also needed to see if the energy consumption in SMEs are as efficient as that of large enterprises.

Chapter 123 of Constitution declares the protection and promotion of SME and various enactments legislation for the protection and promotion of SME includes the followings:

- Basic Law of Small Business
- SME Start-up Support Law
- Act on Special Measures for the Promotion of Venture Business
- Act on the Promotion of Small and Medium Enterprises
- SME Technology Innovation Promotion Act

[3] Refer to Kim et al. (2013, 2015) for details.

- Special Act on the Promotion of Small and Medium Business Transition
- Special Law for Supporting Small and Medium Enterprises
- Act on Special Measures for Small Enterprises and Small Businesses
- Law on the Support of Women Enterprises
- Act on Promotion of Disabled Persons Activity

Political context

In 2008, the government announced the 4th Master Plan for Rational Energy Use, which lay the groundwork for energy efficiency policies for 2008 to 2012. It aims to improve 11.3 percent energy efficiency by 2012 and 23.5% by 2017. It contains scores of policy initiatives in four areas: energy efficiency R&D, energy demand management, market creation and improvement, and social and regulatory infrastructure. Some of the initiatives are symbolic or look like slogans, such as green government buildings and promoting energy-saving life style, and some seem to be simply government wishes. For example, the government did not act on the plan to revamp the electricity tariff structure yet although it has 100 percent control of the tariffs, increasing the energy tariff is not favoured. However, others have substances involving specific actions. For instance, the plan to ban incandescent light bulbs from 2013 is actually carried out. Energy demand management plans apply to four sectors: industry, transportation, buildings, and the public sector.

In 2010, 15 green energy technologies were selected (see chapter on government laws and policies) for mid and long term energy technology targets. It clearly shows that PV, wind and fuel cell are strategically selected for future technology development target among 8 renewable energies and 3 new energies defined by law. For the utilization of fossil fuel, it is noted that cleaner use of fossil fuel such as clean coal technology and IGCC are explicitly mentioned for technology development in addition to carbon capture and storage (CCS).

Nuclear energy is categorized as clean energy production in Korea since it does not emit CO2 in its power generation process. Nuclear power has been producing more than 30% of electric power ever since 1986. Korea, with very limited indigenous energy resources, has been heavily dependent upon nuclear power. It produced more than 40% of total electric power until as recently as 2006. After 2011 Fukushima accident, however, with increasing concerns over the nuclear safety and the fraud scandal in nuclear power plant construction and maintenance made a team of 58 from South Korea's nuclear safety agency inspect all 23 of the nation's nuclear plants in Nov. 2012. As a result, the proportion of nuclear power generation dropped below 30% for the first time since 1986. Min et al. (2012) discusses the potential environmental issues of nuclear power in north eastern Asian countries examining the seasonal wind directions and China's nuclear plans[4]. With massive promotion plans of over 280GW nuclear power in China including inland nuclear power plants and in areas potentially overlapping with seismic zones, any nuclear related environmental issue could be a problem of all countries in this region, they argued.

As discussed earlier, energy sectors are mostly under government regulation and energy Plans. Except the petroleum sector with five major refinery companies, gas, power, district heating sectors are all monopolized. Most of those sectors are under careful energy plans following nation energy master plan as is presented in the following diagram. As is shown in the diagram, most of the plans, however, are geared toward the supply side. Many of small sectoral plans are being designed and implemented following the master plan for rational energy utilization. Activities regarding demand side includes the promotion of LED replacing the existing incandescent lamps, fuel efficiency improvement in transportation sector, energy and carbon emission target management for industrial sectors, etc. That is, each final energy service sectors of building, industry and transportation are constantly reviewed by many governmental agencies such as the Korea Energy Agency for the enhancement of energy efficiency.

[4] Refer to the article published. http://www.scribd.com/doc/109969771/

Figure 4 Framework of Energy Plans

After Korean government submitted its INDC (Intended Nationally Determined Contribution) to UNFCCC on 2015, more emphasis is given to new technologies for emission reduction and energy efficiency improvement. Most of energy sectors have their own master plans designed by government and expert group discussions and energy efficiency improvement is also one of those sectors. Under the guideline of Rational Energy Utilization Act, government is trying to provide proper incentive structure for energy efficiency improvement effort from both the consumers and producers.

Market & User practices

Private households

National Census is conducted for 5 different types of private households in Korea, Single house, Apartment, Alliance home, Multi-family house, and Non-residential housing. Private households in Korea consumes 9.18% of the total final energy consumption in 2015 and about 27.3%, 45.8% and 15.8% of residential energy consumption is electricity, natural gas and petroleum products, respectively. According to energy survey conducted in 2013, 71.2% of residential energy consumption is for heating energy services. For the detailed discussion, refer to Kim et al. (2013).

Due to the progressive tariff structure of electricity tariff for residential sector, summer time cooling energy service demand has been excessively suppressed up to the end of 2016. Progressive residential power tariff had 5 different stages showing the last stage 11 times higher than the 1st stage per kWh price. Since Dec. 2016, the tariff structure has been changed to have only 3 stages with the last stage price 3 times more expensive than the 1st stage price. But additional condition has been set for summer time consumption of more than 1000kWh by penalizing 7.6 times more than the 1st stage price of electricity so that consumers can be kept aware of the energy conservation.

Discussions on the promotion of smart grid is hindered by KEPCO, the sole retailer in power market as discussed earlier. Energy efficiency improvement by the driving force of household demand change cannot be working since there is no choice of utilities to be made by consumers. The same is for commercial sector and public bodies. Smart grids can be promoted via consumer choice, and this consumer choice can be realized only when there is a market functioning for consumers. As long as the retail power market is monopolized by KEPCO, it cannot be happening.

Public bodies

The promotion of energy conservation, efficiency improvement, and the promotion of new and renewable energy on the side of public institutions are required to spread national consciousness of energy conservation to cope with climate change convention, see the chapter on public bodies for more detailed information. According to article 8 of the Energy Use Rationalization Act, effective measures to streamline energy use by public bodies are required. In accordance with the "Regulations on the

Promotion of Rational Energy Utilization of Public Institutions", the government buildings are obliged to present and observe the implementation of this legislation.
By this enactment, following energy conservation policies are being implemented to public bodies such as:

- Central administrative agencies and local governments (wide area, foundation)
- City and provincial office of education under 「Local Education Autonomy Act」
- Public institutions under Article 4 of the Act on the Management of Public Agencies
- Local Public Enterprises and local public industrial complex
- Public Hospitals
- National and public schools
- National and public schools of Higher Education

Culture

One of the most important issues of energy sector in Korea is the nuclear power generation. 2011 survey conducted by KEEI shows 88.8% of respondents agree that nuclear accidents and radiation damage can occur in Korea. The result reveals the aftermath of Fukushima nuclear accident. According to the Korea Nuclear Culture Foundation (KNCF) in 2016, however, 85.1% of respondents said that nuclear power plants are needed and 33.7 percent said they should add nuclear power plants. The latter report should be reconsidered in view of the fact that KNCF is an affiliation of Korea Hydro and Nuclear Co.
According to Presidential Commission of Green Growth press release (2013), 54.6% of the nation supports the development of renewable energy, 34.5% for public propaganda to promote green living and 32.8% for expanding regulations to reduce greenhouse gas emissions. 94.6% recognizes that climate change is serious so that the urgent tasks are the development and supply of alternative energy such as solar heat and wind power (58.8%), the implementation of greenhouse gas reduction campaign (52.0%), and the regulation of large amount of greenhouse gas emission business sites and automobiles (51.4%) in order to solve that problem. Other than the awareness of cleaner energy, of course, there are many measures to provide incentives system to individual consumers such as RPS, FIT, etc.

Technology

It is not easy to measure the energy technology development level, especially for those related to energy efficiency improvement. It is not easy either to get statistics on energy sector technology development by private sector.
According to STEPI (2017), the size of total R&D expenditure is 6th of the world and it is world highest in its weight to GDP. Government R&D budget of 2017 is USD 16.9 Billion[5] 1.8% increase compared to 2016. Private Sector R&D investment, however, is expected to be decreasing. According to the report, R&D sentiment index or RSI obtained based on the survey conducted for 500 sample enterprises is 95.1, which is much lower than that of previous year, 102.4. Among the large, medium, and small enterprises, the decline is expected to be highest for small enterprises. For power and gas industry, private R&D investment for 2017 is expected to decline by 7.5% while that of 2022 is 15.5% higher so that future expectation is still turn out to be positive.
For the energy technology development, KETEP (Korea Institute of Energy Technology Evaluation and Planning) has been established on May 2009. KETEP has its own 2017 budget of approximately USD 600 Mil. for energy technology development, electricity related technology development, nuclear waste

[5] Calculated using exchange rate of KRW/USD, 1150.

management, etc. In the process of R&D support, the participation of SMEs are encouraged with addition benefit in its evaluation process of proposal. Even when the technology development is not currently economically feasible, the future potential impact of the technology development in the world market is supposed to be evaluated, therefore, many new and renewable energy related technologies are some of the main target of R&D support.
From the perspective of demand or final end-use, more and more importance is being given for energy conservation, the efficient utilization of energy and energy saving. Example technologies for such can include BEMS (building energy management system) and FEMS (factory energy management system), which takes care of all types of building and factory related energy utilization – heating, cooling, lighting, smart grid, and even retrofit. ESS (energy saving and storage) using lithium-ion batteries for peak power demand management could be another example of such technology from demand side.
Since the whole process of technology development usually require the cooperation among public and private sector experts and enterprises interested in its development, Korean economy is becoming to emphasize the interdisciplinary perspective of energy sector.

Scientific Knowledge

In terms of scientific knowledge, and for the better understanding of the role of knowledge producers in South Korea, the examination of the case of NSTC (national science technology commission, 2016) would be of help. Since one of the main reasons for energy technology development and conservation of end use energy consumption is for the active response to climate change, NSTC under Korean government proposed a road map for climate technology development (CTR. Climate technology roadmap) on 2016. According to NSTC, climate technologies are categorized into three big categories: carbon emission reduction, utilization of carbon as resource, and various measures of adaptation. From NSCT (2016), it is easy to note that most of the climate technology development is being managed by research institutes affiliated with each ministry of government, and it is not surprising then that technologies around carbon use and emission reduction are promoted..

It seems, however, that cost effectiveness in this process is being emphasized, showing the growing awareness of the market or demand side perspectives. At the same time, a growing reflection on the past, as is being discussed in the previous section of technology, the participation of SME and private sector is regarded to be of importance in the sense that those entities may better respond to the needs of the market.

Conclusion

Needs from potential target groups for energy efficiency services and products differ. Besides, the political framework conditions offer support on the one hand, but challenges on the other. It can be stated that there is increasing needs and demand for energy efficiency services from most of target groups, legal, financial sectors. With this atmosphere in Korean economy, barriers to effectively reach the potential clients will gradually be removed and the energy market will be penetrated by the energy efficiency improvement solutions with new technology. The complex market for energy efficiency still needs to deal with different government institutions at the national, regional and local levels and a better system for cross-cuts of different agencies will be required.

To actually generate a change towards the much needed more user centred energy efficiency services, learning from and experiment with business models that challenge the existing framework conditions would better prepare all the interest groups t to deal with the constantly changing and inherently complex, uncertain framework conditions, and to overcome internal organisation barriers (Smith and Raven, 2012; Chesbrough, 2010; McGrath, 2010).

A couple of Korean business models analysed show that there could be various approaches of developing a business model, it is not easy to make prototypes from those limited case studies. A further extended studies may be needed for the development of energy efficiency improvement related services, yet.

The Korean case studies

Category of Energy Efficiency service	Name of business	Description of proposition	Success Declining – Stable o Growing +
Retrofitting & Total Solutions	Samchully ES	Solutions and services that help its customers reduce their energy costs and change their waste resources into useful energy	++
Renewable waste energy	Eco Solutions	Contaminated Site Redevelopment for an oil storage place, a gas station, a refinery facility, a chemical factory site, an abandoned mine, and an insanitary landfill	o
Smart management systems (home/industry)	Gridwiz	Energy storage system (ESS) linked with demand resource trading market (DR market), Smart factory energy management system (EMS)	+++
Lighting Solutions	Withlight	Providing enhanced services as a leading LED measurement equipment company.	o

In the chapter below we provide case descriptions for each of the services.

Smart Management Services

The Story of Gridwiz[6]

Gridwiz is a Korean company offering Demand Response solutions to business customers. In essence, they offer complete control over efficient energy consumption by providing instructions on when to adjust the use with the peak and low demand moments. They offer smart solutions, which means they offer the hard- and software to help the customer either reduce or increase the use of energy at peak or at low demand. Also they offer their clients economic demand response. This is offering support (or is this complete service) to trade on the Korean Power exchange to buy at lowest costs.
Gridwiz is a communications software & hardware company with more than 15 years of significant resources and expertise in the deployment of connectivity solutions for the embedded device market. Working with organizations and leading technology providers across many industries gives us the ability to provide valuable insight to our clients with a broad spectrum of functional areas.
By continually analyzing evolving markets, they provide practical consulting and up-to-date smart energy communication solutions that go beyond the hardware itself to include associated smart energy product designing, total system design, communication module technology, testing and certification, and related application productizing.
Gridwiz provides high-level in-depth training and Seminars both in house and on-site training for smart energy communication by specialists. Gridwiz aims to assist customer goals by integrating development and training, standard education and certification harness. Training areas include, but are not limited to: Product Development and Productizing, Standard Stacks, TCP/IP Internet Stack, Embedded System, Test Tools and Certification Tools, and System Designing from the perspective of Smart Energy.
Gridwiz training team claims to know the smart energy standards and products inside-out and to have expertise in OpenADR2.0, SEP2.0, TCP/IP stack, Communication Hardware, RTOS[7] and overall embedded systems.

The business model Canvas

[6] Gridwiz is an officially registered DR aggregator at KPX (Korea Power Exchange). Refer to KPX website for details: http://dr.kmos.kr/main/market_05.htm.

[7] Real-time operating system, http://rtos.com/PDFs/What_Is_An_RTOS_and_Why_Use_One_Embedded.com_.pdf

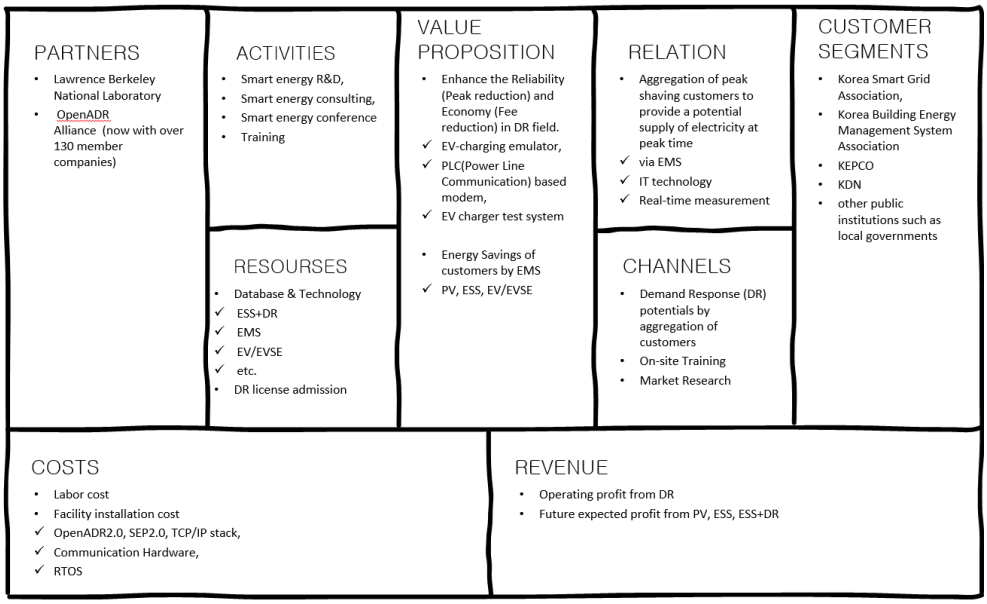


Figure 5 The business model canvas of Gridwizz. Based on Osterwalder and Pigneur (2010)

As the current standards are too costly and restrictive, Gridwiz cooperates in the ADR alliance to reduce the resources needed to achieve results with DR programs. (www.openadr.org). the Gridwiz offer is a high tech solution in the relative young field of DR solutions. The cooperate with the Lawrence Berkeley institute for R&D. Their revenue models is a percentage of the savings the customer achieves with the DR program. Also, their profits consist of Operating profit from DR future as well as expected profit from PV, ESS, ESS+DR.

Gridwizz is more or less co creating their offer with their clients in order to tailor it to the specific needs and the specific situation of their clients. They don't really have any other option, as each a specific situation requires a different solution.

Although the Gridwizz offer is a high tech solution from many perspectives, their key activities consist of, besides R&D (being a high tech solution in the relative young field of DR solutions a large bit of their efforts is being spent on R&D), consulting and participating in conferences and training their clients. These activities aim to assist their customers to be able to use the solution and make the right adjustment in their day to day business.

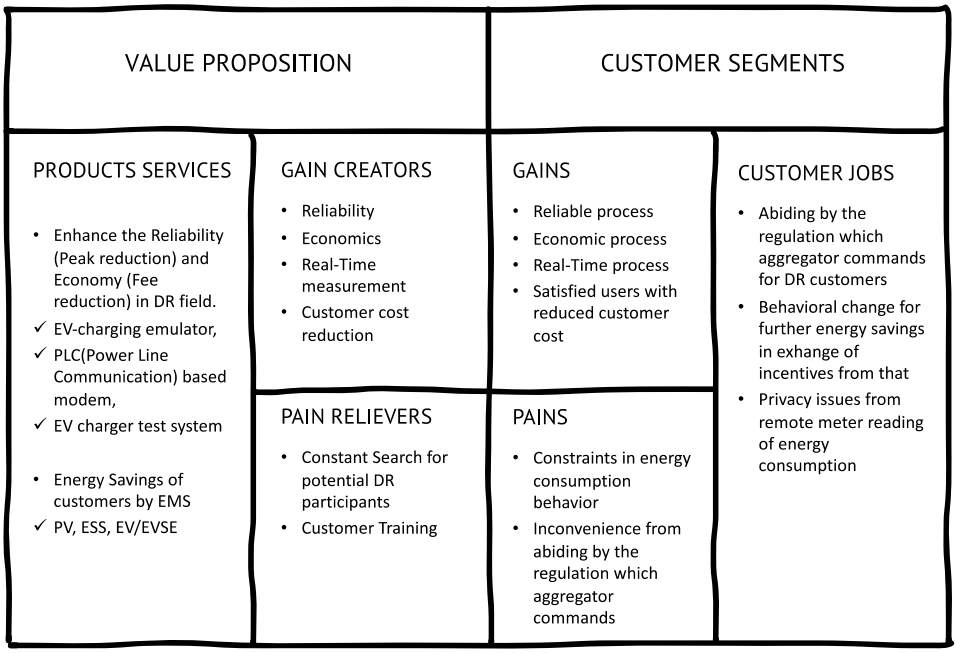


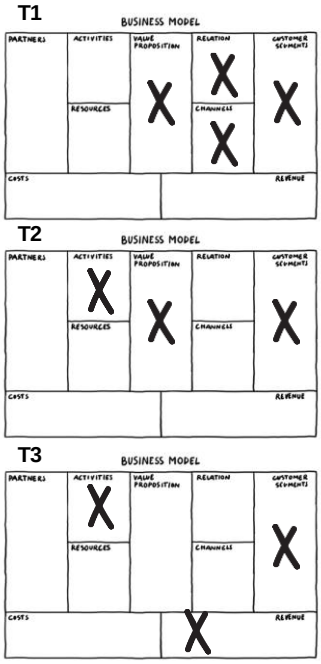
Figure 6 The customer value canvas of Gridwiz. Based on Osterwalder and Pigneur (2010)

The Gridwiz solution is described as a new way to handle the excessive demand of energy. The value proposition is the high tech and very smart solution to help the client with their DR goals. As this smart solution still requires a serious effort from the customer in order to use it properly, training is included in the offer. From how the offer is described on the website, Gridwiz still positions itself as a tech company with a smart tech solution.

Their clients, especially those with a high energy consumption, suffer from two things. High costs and the exposure to power shortages and blackouts, which is growing problem. Not only to companies, but also to the Korean energy providers.

DR solutions potentially are a solution to this problem, however, in many cases this requires severe knowledge and recourses.

According to Gridwiz and how it is described, Demand Response will always be the result of a close cooperation between actors that understand the essence of DR as well as the technological backgrounds.



	What changed?	What caused the change?
T1	• Over 15 years of Internet stack chip designing and manufacturing has been transformed to DR business	• Government policy of introducing Reliability and Economcs market for DR
T2	• After focusing on DR business, major activities turned out not to manufaturing, but to Smart energy R&D, Smart energy consulting, Smart energy conference and Training.	• Changed business proposition
T3	• New business fields are being investigated.	• For the expansion of operating profit.

Figure 7 The entrepreneurial journey of Gridwiz.

Market Performance of Gridwiz

According to Gridwiz, it achieved sales of USD 19 Million (operating profit USD 0.2 Million) mainly in the DR sector last year. The sales, which were USD1.3 Million in the first year of 2014, jumped more than 15 times in three years. It claims to have a steady profit structure with more than 400 workplaces (customers) in the DR field of Reliability (Peak reduction) and Economy (Fee reduction).

Competitiveness comes from a 1-minute real-time data acquisition & processing, and system operation technology. As the core of the DR trade market is real-time response, it should support faster and more accurate power demand management system. Big data technology, which combines remote advanced meter reading infrastructure (AMI), which collects real-time power data with system semiconductor technology, and data analysis algorithm, was applied. It claims to have provided demand management services since 2014 and to have secured open standard ADR 2.0 (Open ADR 2.0) standard technology.

Gridwiz is set to expand its `ESS[8] + DR` market. Last year, ESS, Power Management System (PMS) and international standards-based test operation were claimed to have been successfully conducted in three locations in Los Angeles, California, USA. This year, ESS will be used to expand the service to automatic control of power usage at the load site. The customer obtains the base and usage rate reduction and the energy consumption effect by avoiding the power peak. In addition to upgrading demand management services, GridWiz additionally conducts plant energy efficiency projects that can be linked to demand management.

Mr. Kim, CEO, said, "With this year's ESS solution business, we will expand the business beyond the DR by establishing an electric vehicle recharging service module and a photovoltaic power generation business. We will promote ESS · PV power generation and personal transaction (P2P) Based energy trading market. "

[8] Energy saving and storage

Dynamic capabilities

The user sensing capability is well developed, based on their efforts to train and educate their clients in (preparing for) using their solutions. However, Gridwiz can grow in their understanding of the desired outcomes of their clients. This however depends on the growth ambitions of Gidwiz. If Gridwiz' ambition is to expand their business beyond the innovators to a larger, less tech skilled client base, they could benefit from reframing their offer.

The conceptualizing capability is also well developed, based on training and education.

Gridwiz is co creating with both partners and clients, which implicates that their orchestration skill is developed. This orchestration is important as the smart solution and the aggregator requires both development and partners[9].

Although Gridwiz is a tech-oriented company, they pay a lot of attention to the use phase. This is probably efficient, as their client base consists of larger, heavy users with technical knowledge. It seems that they have many pieces of this puzzle already: partners, training the users, high tech communication software to alert the user etc. However, to me it seems they have to align and position all these pieces in order to serve the client. As it is now, the client needs to have a lot of understanding of the offer. Gridwiz can be categorized as a type 3 businessmodel.

Context Strategy

Gridwiz, they are a smart matcher. This means they work very hard to align al partners needed to form a coalition and enhance the technical standards. Gridwiz 'matches' with partners and clients who are on a more or less similar knowledge level. This can be a very effective strategy at this very moment in time, simply because many stakeholders as well as rules, standards and regulations need to be aligned.

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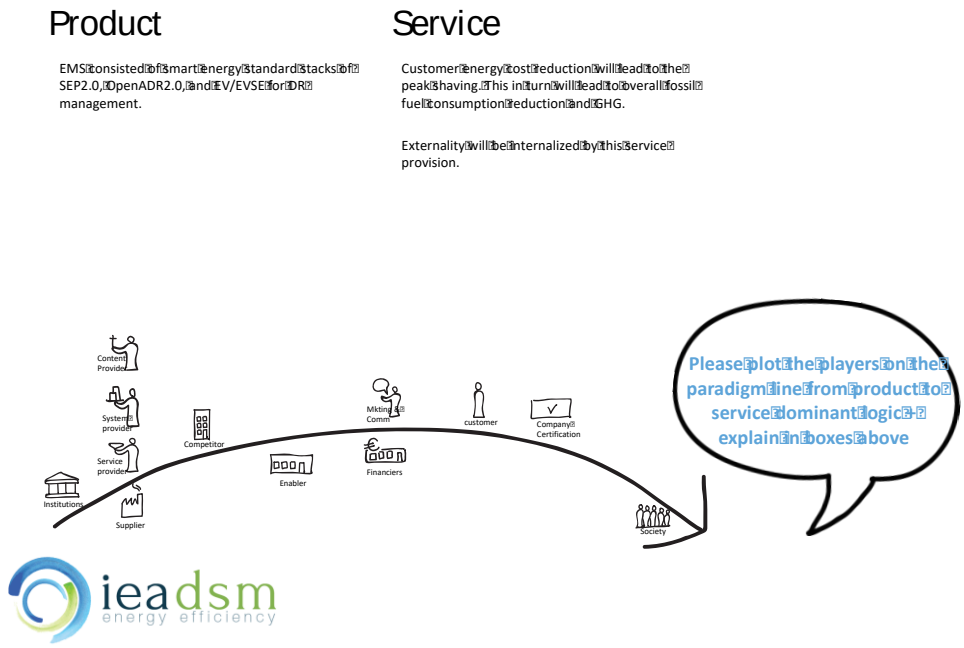


Figure 8 The position of Gridwiz and its stakeholders in the paradigm shift from product to service dominant logic

[9] For the partners of Gridwiz, refer to http://www.gridwiz.com/wp/about-us/partners/

Renewable waste energy

The Story of ECO Solutions

ECO Solutions Co., Ltd. is an alternative case study from Korea. It is one of the Korean leaders in the environment industry and is claiming to become the leader in the renewable energy industry as well. It specializes in environmental technologies ranging from environmental remediation, such as soil remediation and water de-contamination to biodiesel production. On the renewable energy front, the company has experience engaging in a large-scale, multi-million U.S. dollar bio-diesel project. At full operation, ECO Solutions claims to have capacity for producing the largest quantities of bio-diesel in the world. Its target market was confined to South Korea, but the company is now embarking to expand into other Asian countries recently, with the vision to expand operations globally. The company finally also focuses on civil construction projects involving road construction, housing development, and river facilities. Ecosolutions was chosen because energy efficiency is also a focus of the company. Through plant, production yield and logistics improvement, ECO solutions expects to increase biodiesel production yield by installing a reprocessing equipment of glycerin, and to improve production yield by preventing heat loss and adjusting the mixture ratio of feedstock. In addition, Ecosolutions focuses on waste management focused on Waste Reduction, Reuse and Energy Recovery, food waste and waste recycling.

Business model canvas

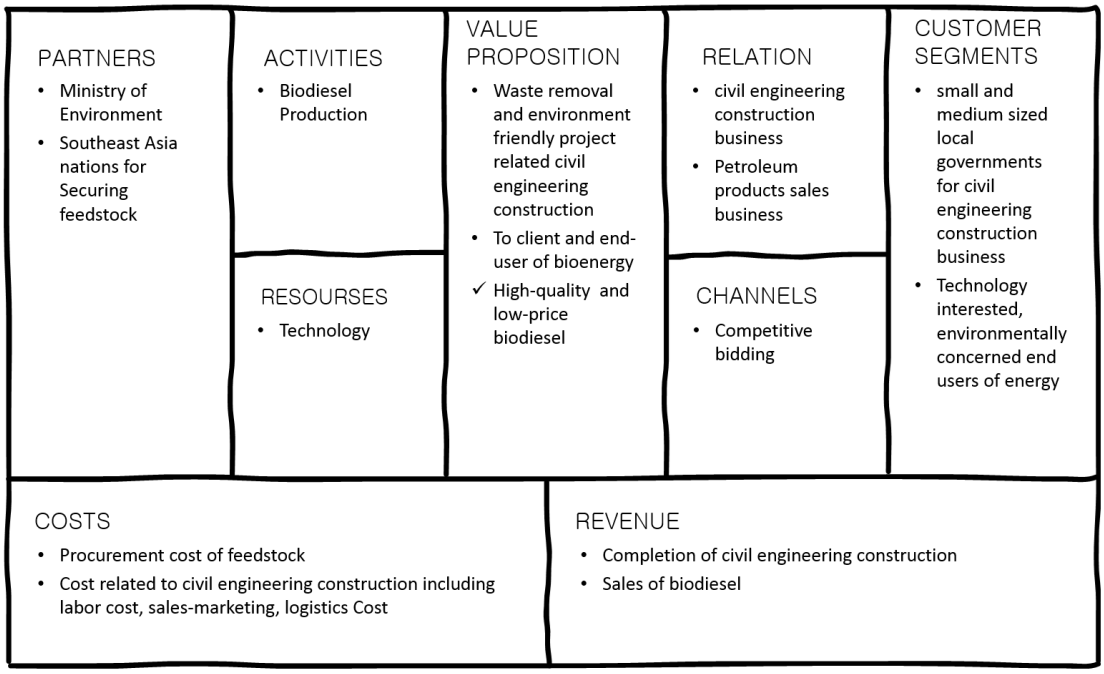


Figure 9 The business model canvas for Ecosolutions. Based on Osterwalder and Pigneur (2010).

The Key Partnerships for ECO solutions from the international market includes Earthwatch Institute, Sierra Club, UNEP, UNDP, and World Conservation Monitoring Center. In the domestic market, key Partnerships includes the Ministry of Environment, National Institute of Safety Research, Ministry of Legislation, Korea Agricultural and Rural Infrastructure Corporation, Digital Information Center for Environment Research, Korea Resources Corporation, Korea Institute of Civil Engineering and Building Technology, etc. Most of renewable energy, waste management and geo-technology related national research institutes are also listed as its key partners.[10]

[10] For details, refer to website (in Korean), http://www.ecosol.co.kr/html/ref.html

In the past, ECO solutions focused on soil remediation and water decontamination. Now it continues its activities with in addition waste removal, resource recycling, land development and related value added projects. The most important resources required to make the ECO solutions business model work include its experience and expertise in the field of soil remediation and water decontamination. For the bioenergy related business, secured procurement of feedstock could be a new building element of key resources. Current Business Area includes Contaminated Site Redevelopment for an oil storage place, a gas station, a refinery facility, a chemical factory site, an abandoned mine, and an insanitary landfill Treatment and Reuse of Food Wastes, Installation, and Upgrading Underground Storage Tanks & Aboveground Storage Tanks, General Construction Work including Building Construction (Office, Factory, Shopping Center), and Civil Construction (Sewerage, Water Supply Facility, Road Repairing), Civil & Building Constrictions - road construction, housing development, and river facilities.

Customers of the ECO solutions include: for waste management project, mostly small and medium sized local governments are listed.[11] Ecosolutions carries out civil engineering construction business based on its past experience, and there are many customers requiring such services. For civil engineering construction business, small and medium sized local governments form a very specific Customer Segments.
Past business experience and communication channels established in that process are a really important asset for delivering the proposed value. It is also noted from the list of key partners that, business to small and medium sized local governments must constitute another important channel.
The relationship between Ecosolutions and its customers is a direct one, where often governmental authorities are main clients and have been so for a long time.

For the stable revenue stream, the current type of simple engineering service is expected to be converted to a long-term contract structure. For the product export, for example, procurement of feedstock and product export is systematically connected so that the revenue stream becomes stable. The completion of civil engineering construction is also a source of revenue. The cost is closely linked to procurement of feedstock and the efficiency of the production process of for example biodiesel. For the procurement of feedstock, an effort is made to systemize the input and output. To increase production yield, new equipment such as a reprocessing equipment of Glycerin is installed. Research on new process such as HBO and no catalyst is being conducted for cost reduction.

[11] For details, refer to website (in Korean), http://www.ecosol.co.kr/environment/env2_1.html

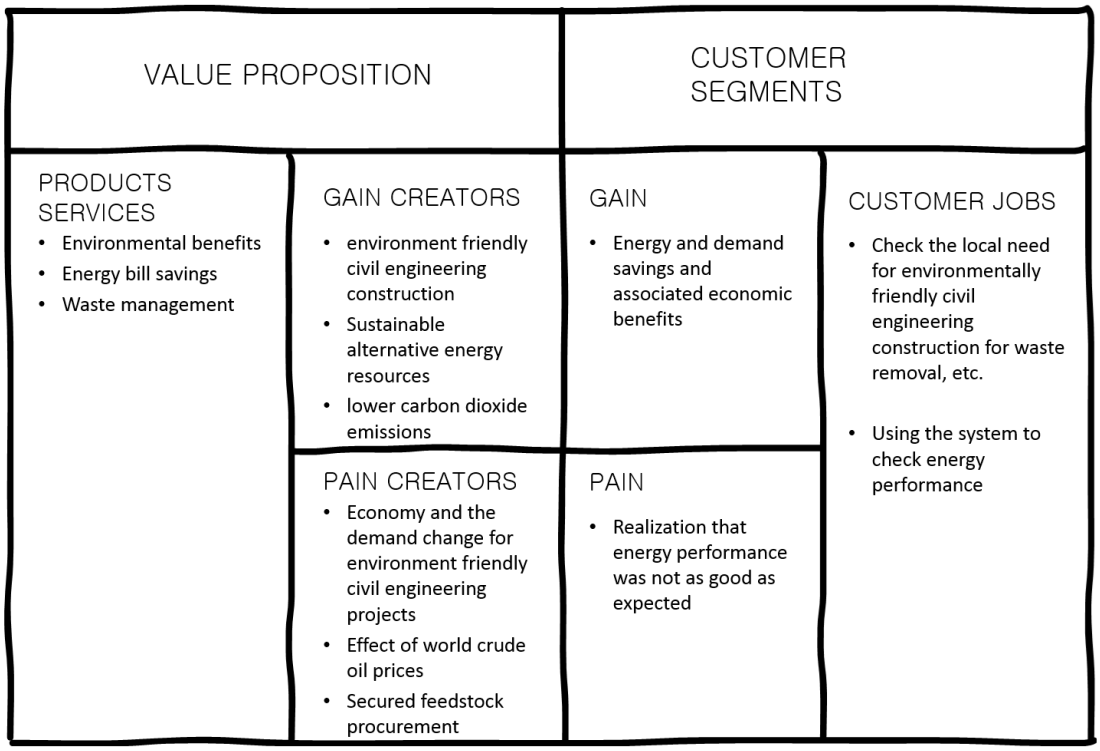
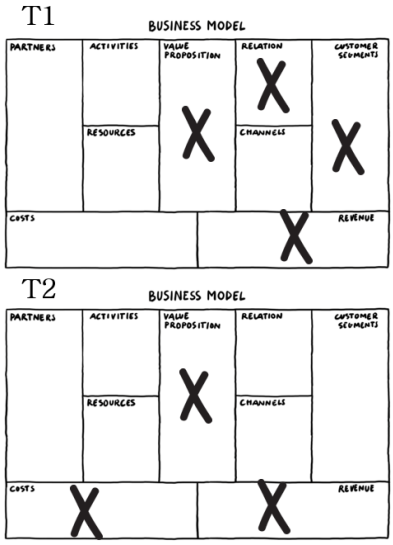


Figure 10: The customer value canvas of Ecosolutions. Based on Osterwalder and Pigneur (2010).

Value Propositions

Building on the past, Ecosolutions moved from being a company experienced in soil remediation and water decontamination, to continues its work into waste removal, resource recycling, land development and related value added projects, with a strong focus on energy performance and energy efficiency, including reuse of energy or waste. This is very strong shift from providing value mainly in a technological sense, to now becoming a problem solver for clients, including the management of the process of dealing with waste and contamination. As part of its rehabilitation and diversification strategy (see next section), Ecosolutions also started focusing more on delivering services such as environmental services, studies and analytical support (now the main source of income), special studies and analysis, next to the more technological products.[12]

[12] http://government-contractors.insidegov.com/l/360500/ECO-Solutions#Products%2FServices&s=3wQseH



	What changed?	What caused the change?
T1	Diversification of business structure including Drainage construction, Sewer pipe construction, Plant business, Environmental Facilities and Energy facilities, etc.	Increased demand for environmentally friendly civil engineering related construction
T2	Future revenue expected from diversification of value proposition	Trying to reduce cost and increase the revenue by systemizing the contract

Figure 11: The ECO Solutions entrepreneurial journey

Dynamic capabilities

The user sensing capability of Ecosolutions is well developed, with the remark that the customers are often governmental authorities and sensing their needs is relatively easy given that their needs often is clearly demarcated in laws and regulations. Conceptualising is clearly also a core capability of Ecosolutions, with multiple tailored solutions being developed, and constant innovation of products and services is taking place. Orchestration is by definition a capability necessary to coordinate the multiple activities in the chain that Ecosolutions is aiming for, from waste management to civic building. Scaling and stretching are a challenge (see also the section below on the rehabilitation of Ecosolutions). Unfortunately insufficient information was available to exhaustively assess the quality of the capabilities of Ecosolutions, so the above text is an expert judgement based on the information available.

Context

Since its establishment in 1998, a very friendly environment for new venture business by governmental support at that time, ECO solutions were acknowledged by many institutions including the ministry of environment and the ministry of science and technology. Financing was also smooth until 2008, including USD 4.5 mil. investment by Korea Industry bank on 2007, USD 49.5 mil. by Dubai Investment Group and equity increase from KRW6.75 Bil. to KRW7.9 Bil. on 2008 by M&A..

In 2011, though, ECO solutions became delisted from the KOSDAQ market. A decision was made for corporate rehabilitation proceeding by the court and a draft of rehabilitation plan was approved by the court in 2012. Ever since that approval, ECO solutions has been exerting efforts to survive the market by registering patents[13], obtaining certificates, etc.[14]

With this type of efforts, ECO solutions obtained the official closure of corporate rehabilitation proceeding by court decision on Dec.30, 2015. On Feb. 2016, ECO solutions reports KRW25.4Bil. (equiv. to USD24Mil.) export of biodiesel to a US company indicated as 'N'. on its website.[15] Since domestic biodiesel market is not that active, diversification of business for ECO solutions is expected.

Current business competitors include Dankook Industry, Aekyung Oil Painting, Eikma Bio, BDK, GS Caltex, JC Chemical, SK Chemicals, M Energy Daekyung Ointy, etc.

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[13] Registered patent includes "Method for Preparing Biodiesel Using Supercritical Alcohol"(2013), "Pour Point Depressants for Biodisels"(2014)

[14] Obtain ISCC(International Sustainability and Carbon Certification) for export to Europe and register as "Renewable Fuel Producer" in EPA(USA) for export to US.

[15] Refer to website for notice (in Korean), http://www.ecosol.co.kr/html/history8.html

Ecosolutions does experience strong context support from the government, both as client and through the rules and regulations that the Korean government is developing which are conducive to Ecosolutions' successful diversification, e.g. in the field of biodiesel.

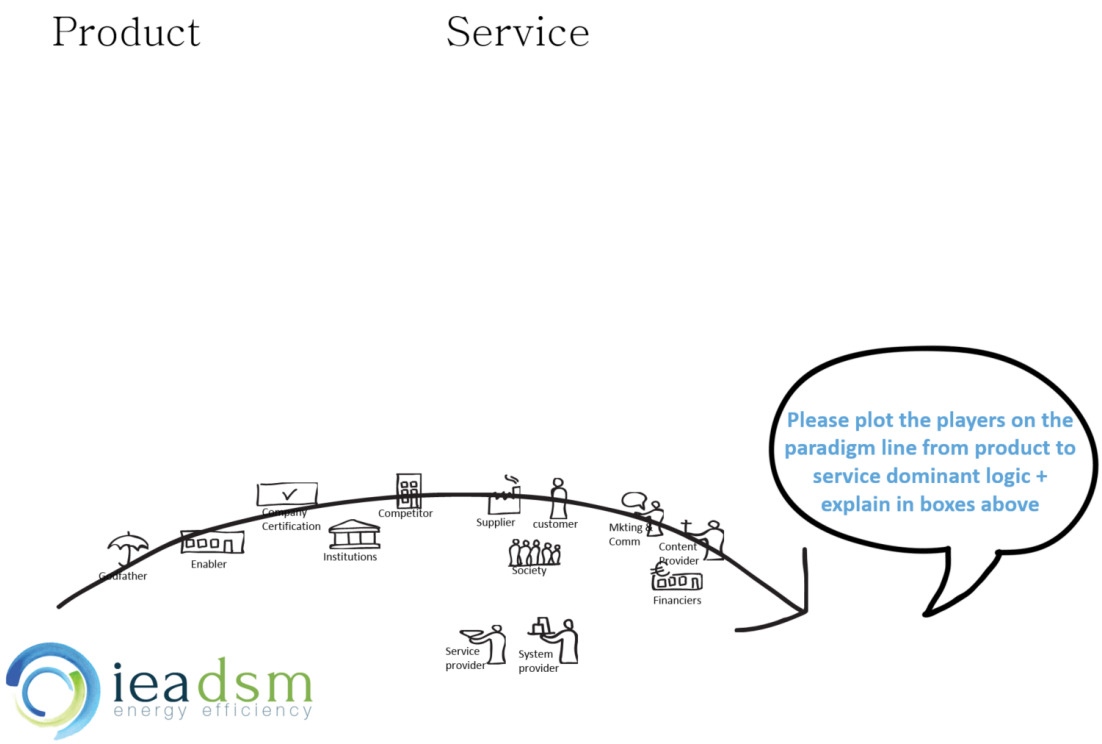

Figure 12: The position of Ecosolutions and its stakeholders in the paradigm shift from product to service dominant logic.

Given the above information on Ecosolutions, it can be concluded that its business model can be categorized as a combination of category 2 and 3, a combination of reframing what is being proposed and a shift from pushing a solution to becoming problem solvers. Start-up of new businesses in environmentally friendly civil engineering related projects and advise and assessment services, based on its past experience on soil remediation and water decontamination is the typical example of reframing what is being proposed. Diversification of this civil engineering fields is another example of a shift from pushing a solution to becoming problem solvers.

Lighting solutions

The Story of Withlight

Withlight Co., Ltd is a Business to Business company that specializes in measurement devices for the various properties of LED (Light Emitting Diode), OLED, PD, LD16, display and other common light sources. It manufactures and sells more than 30 kinds of measurement systems and measurement equipment. The measurements it sells are mainly focused on research and manufacturing and as such aim to provide the right quality of light. To achieve this the measurements devices allow for LED auto dimming controller, automatically adjustment of illumination in accordance with external illumination, stable illumination for work surfaces, auto block standby power, innovative lighting energy saving, but also include more standard services such as replacing traditional LED light with simple on/off feature. Withlight's recent business idea is to provide the best solution to optical measurement as well to improve customer competitiveness.[17]

Withlight was established in 1997, and started out as a equipment (or more precisely, measurement and LED device) manufacturer. For the first decade, Withlight focused on developing measurement technology for LED related devices, developed various systems and has a long list of registered technology patents18. In 2008, Withlight signed a technology transfer contract with the Korea Research Institute of Standards and Science (KRISS) to create an opportunity to commercialize new technologies in Korea. In 2005 Withlight established a research institute where it continued developing innovative LED and related technologies. In 2014, Withlight developed the innovative automatic control technology of LED that maintains constant illumination. This technology was developed in cooperation with POSCO E & C and it allowed Withlight acquire the green technology certification. By acquiring various patented technologies and green certification for LED, Withlight has been able to pursue diversified projects to participate in the domestic and international market in this field.
Other partners Withlight works with range from local governments to research institutes.

The whole focus on measurement of the quality of light implies that Withlight focuses on customer satisfaction in light. In an attempt to provide this customer satisfaction, Withlight aims to tailor its devices and solutions to the implementation environment. Customers of Withlight includes LED related national research institutes, large corporations (Samsung affiliates, LG affiliates), SMEs related to LED lighting, schools, Universities, and Other Various LED related Business Enterprises.
According to the interview with CEO of Withlight[19], each equipment cost about 30 to 50 thousand USD, which is as expensive as a purchase of a foreign car. This logically implies that the customer segment needs to be large businesses.
The costs Withlight incurs are related to the large R&D efforts and related labour costs, and of course with the updating of its equipment and devices. The revenue model is based on a fee for testing and measuring, consultation fees and more traditional sales of various LED products.

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[16] OLED(organic light-emitting diode), PD(Photo Diode) LD(Laser Diode)
[17] For the business suggestions of Withlight, refer to this website (in Korean),
http://www.withlight.com/company/?gubun=business
[18] For details of its history, refer to http://www.withlight.com/english/company/index.php?gubun=history
[19] Refer to the following blog for further details (in Korean),
https://m.blog.naver.com/PostView.nhn?blogId=jbsupport14&logNo=220425069415&proxyReferer=https%3A%2F%2Fwww.google.co.kr%2F

Business model canvas

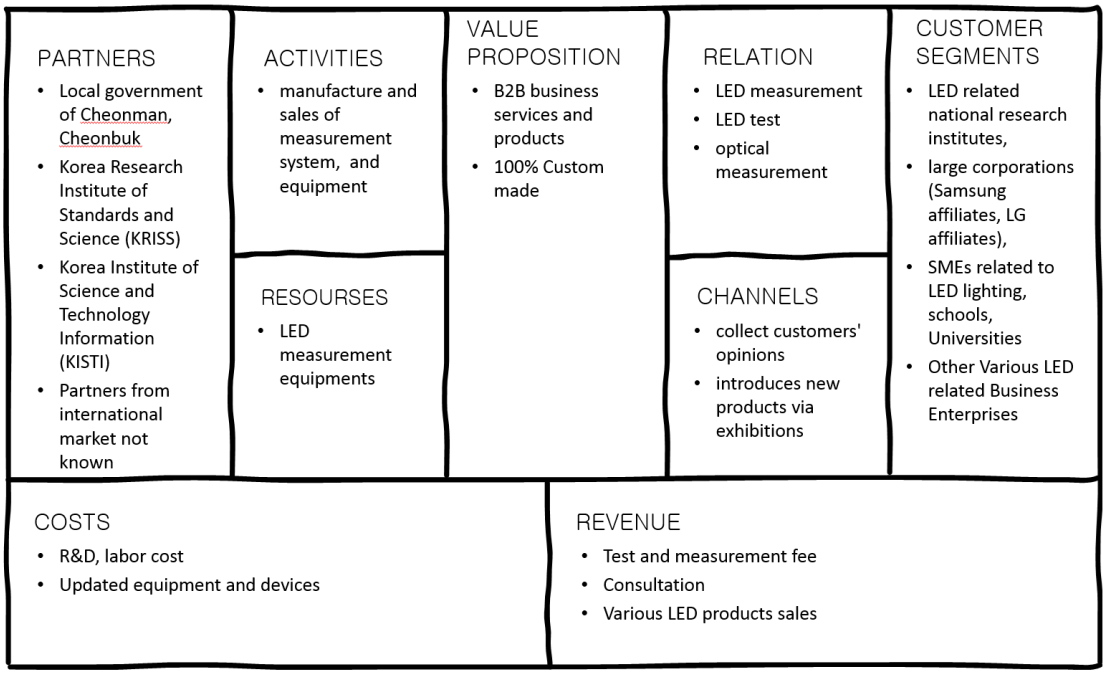


Figure 13 The business model canvas of Withlight. Based on Osterwalder and Pigneur (2010).

Value Propositions

The value proposition is focused on supplying various measurement system and equipment such as LED Lighting test equipment, LED thermal test equipment, chip counter, LED EL test equipment, illumination test equipment, solar cell test equipment, photodiode test equipment, integrating sphere system, goniophoto meter, mirror goniometer, goniometer system, LED reliability test, etc. Withlight is thus a company which has its basis in the delivery of technological solutions, and as such is a product dominant logic type of company. It also clearly expresses pride as the top technology leading company in LED measurement system in Korea. The value as such is providing certainty as to the operation of the lighting systems, and consequently providing continuous work conditions for research or other type of activities.

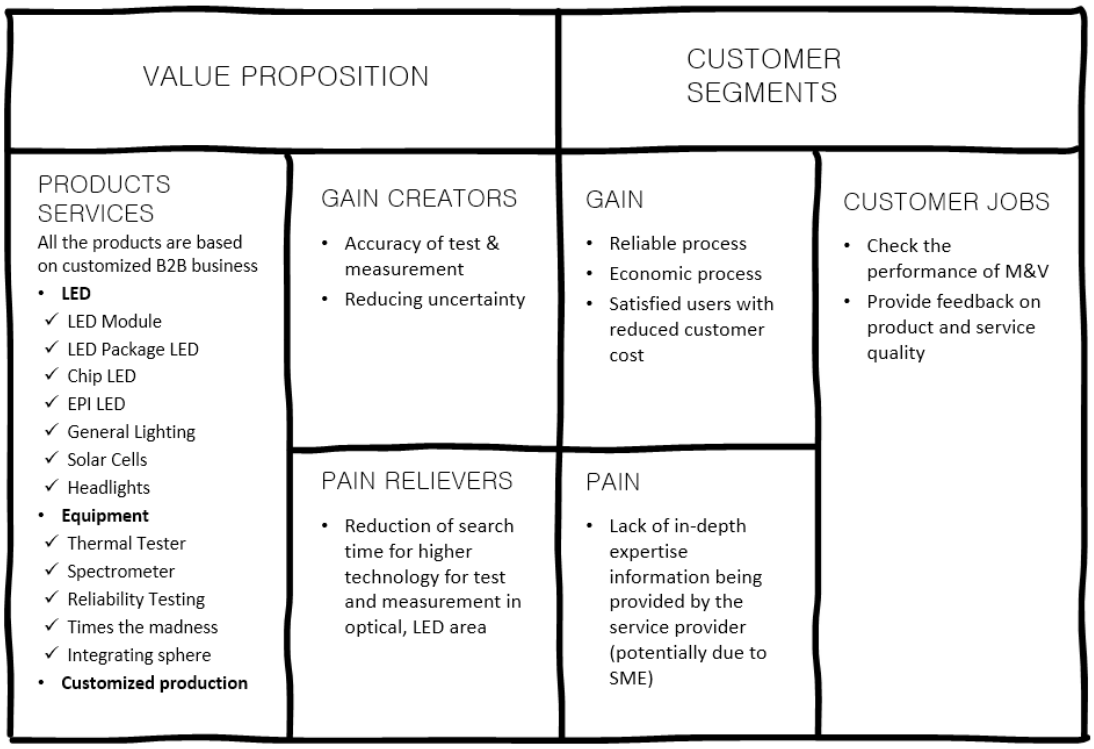


Figure 14 The customer value canvas of Withlight. Based on Osterwalder and Pigneur (2010).

Dynamic Capabilities

In terms of sensing user needs, Withlight tries to collect customers' opinions and introduces new products through participation in domestic/overseas exhibitions such as LED EXPO every year. In addition, through constant customer interaction, Withlight collects customer demands and designs new technological solutions in response. In 2016, for example, Withlight succeeded in localizing portable instruments and released new products according to customer's demand. This demonstrates a clear conceptualizing capability. In general it can be stated that Withlight is focused on the customer and in particular on the use phase as well, and the fee structure for quality control of the equipment and service provision are evidence of this. Withlight states that a high satisfaction rate with post-customer management is important to Withlight.

The orchestrating capability is not strongly developed in Withlight, given that it performs most of the activities itself, including research and development, maintenance, operations etc.

The actual market performance of Withlight is unknown, data are not public, but it is known that the sales increase as well as the number of personnel demonstrating scaling potential. In addition, the company is concentrating on expanding its business area through technology promotion, and the hiring of marketing executives is testimony of this stretching capability. Withlight has been showing steady technology development and domestic and overseas patent registration.

Context

Withlight is one of the leading technology companies in Korea in the field of LED measurement. It is necessary for Withlight, therefore, to carry out continuous research not to fall behind the development of related technology. In addition, the company plans to develop facility automation technology to enable LED lighting companies to have a competitive edge in production. By supplying high quality products to the world market, Withlight is trying to enhance its customers' competitiveness.

SO far the Korean context has been very conducive to the success of Withlight. Of course laws and regulation such as the mandatory implementation of energy use diagnoses[20] as a means of enhancing

[20] Refer to Article 32, Rational Energy Utilization Act

the efficiency of high-energy-consumption businesses will have helped Withlight. But also the several prizes won as most promising equipment manufacturing company, or certification of its equipment will have increased the competitive edge of Withlight.
Withlight is a smart matcher strategy. This means they work very hard to sense and conceptualise, and scale based on that strategy. Withlight started from a technology driven perspective, and clearly this is still their main strategy, where services are an add-on to help sell the products. Withlight tries to 'match' with context stakeholders and clients who are on a more or less similar knowledge level. Given that the Korean context is slowly moving towards servitisation, but from a strong technology focus, this is a very effective strategy at this very moment in time.

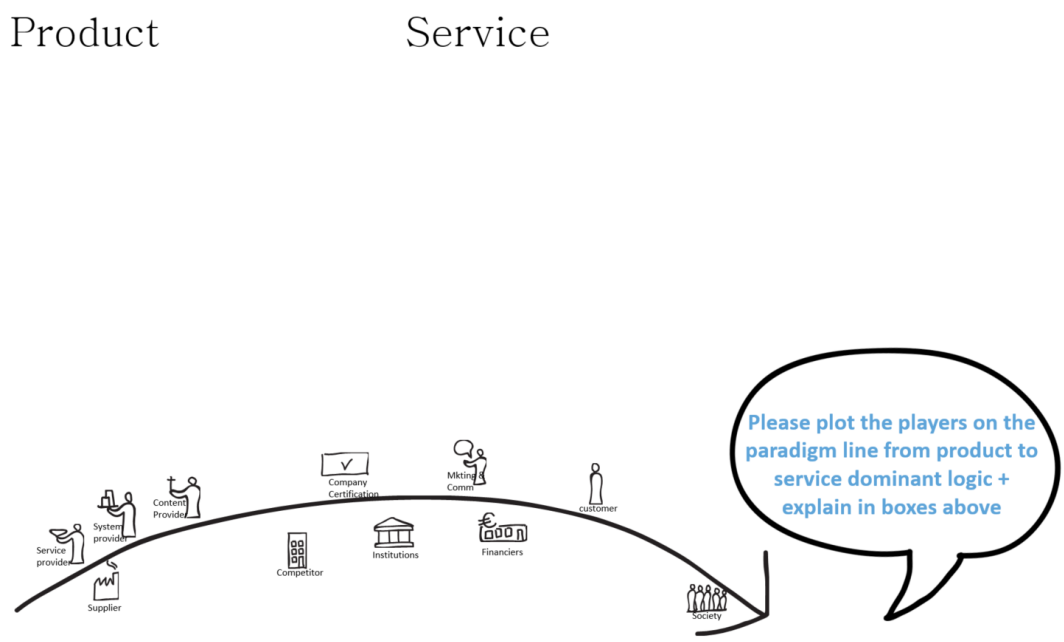


Figure 15: the position of Withlight and its stakeholders on the paradigm shift from product to service dominant logic.

Total solutions

The Story of Samchully ES

Samchully Energy Services is a daughter of Samchully, a company founded in 1955. Samchully started as a supplier for residential and commercial briquettes. Since the late 1980s, when town gas started to be promoted in Korea, and using imported LNG, Samchully became one of the major town gas companies in Korea.

Samchully Energy Services (ES) was founded in 2001. In South Korea's energy market, businesses are expected to adopt optimized solutions for saving energy, reducing greenhouse gas emissions, and regenerating energy. Early 2001, the Samchully Group launched a Task Force team to create a consumer-focused business structure and established Samchully ES for new business. According to its website[21], Samchully created a business model following the metaphor of 'Energy General Hospital'. This model centered around diagnosing and treating all the causes of energy issues through diagnosis, consulting, high efficiency material supply, construction and post management of energy facilities.
Samchully ES stepped into this market by providing solutions and services that help its customers reduce their energy costs and change their waste resources into useful energy. This involved a bif shift in the business focus of Samchully. Previously the company was a supplier of a utility (gas), with more or less a monopoly position in many towns in Korea, but now it entered a competitive market focused on energy efficiency equipment. As a consequence, Samchully changed its focus from supplier centered to more consumer oriented.

Samchully explicitly positions itself as a total solutions, a one-stop-shop type of business. It aims to have all necessary technologies available, and in addition, and very important to its proposition, Samchully has a very strong energy efficiency technology engineering capacity,

As a total energy solution company aiming to answer to any energy related need of its clients, it has many energy business areas, and this list of areas is still growing. Below is a list of its business areas: Photovoltaic Power, Waste-to-Energy Power Generation, Global Networks, Biogas Production, Geothermal Heat, Fuel Cell, Power Generation, Building ESCO /EMS, DR, ESS, Industrial ESCO, GHP / Heat Pump, etc. Energy efficiency and Regeneration, although the starting point in 2001 are no longer the primary focus of Samchully ES, but just one of the solutions offered.

Samchully ES experienced a strong growth in turn over and market share in recent years and is continuingly exploring the total energy solutions market for new business opportunities. More on this in a later section.

[21] http://samchullyes.co.kr/ Website only available in Korean

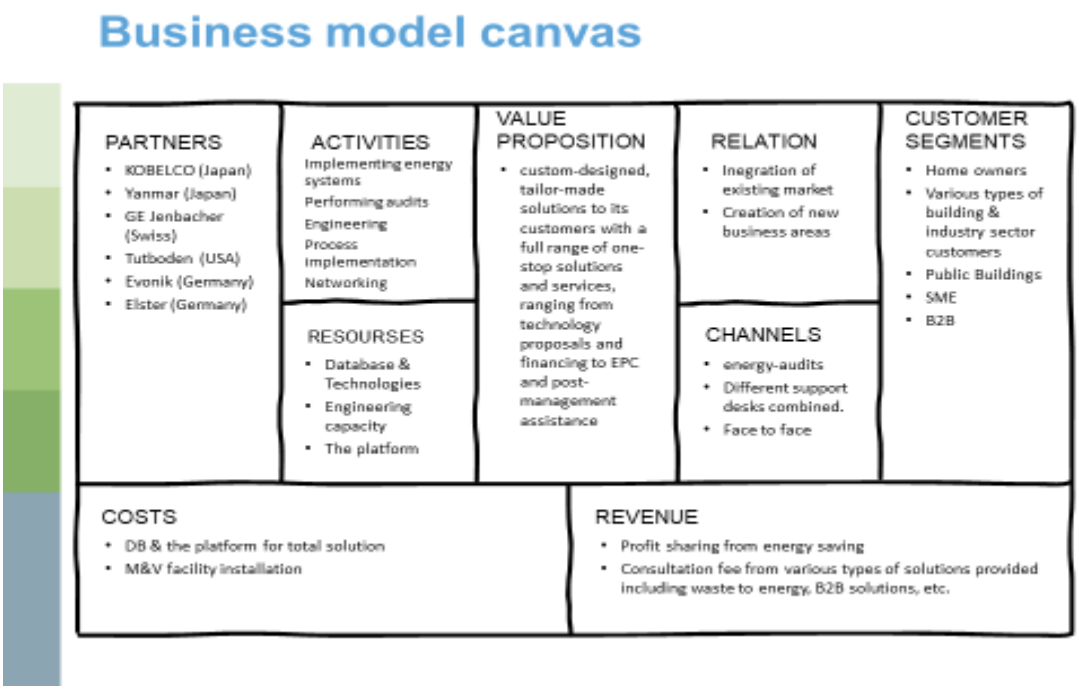


Figure 16: The Samchully business model canvas. Based on Osterwalder and Pigneur (2010).

Samchully's business Partners entail a great variety of global players. Each specialised in one of the energy (efficiency) technologies Samchully wants to be able to offer its customers. As such all these various types of partnership are formed with many companies in the international market to be able to provide total energy solutions. For example, Yanmar is well known for Yamaha Motor Machine Works since 1912. Samchully ES signed a partnership with Yanmar in 2001 for technology support from Yanmar in the area of CO2 emission reduction, GHP (gas heat pump) technology, etc. The following figure shows this type of cooperation and international network with energy and environment technology companies around the world.

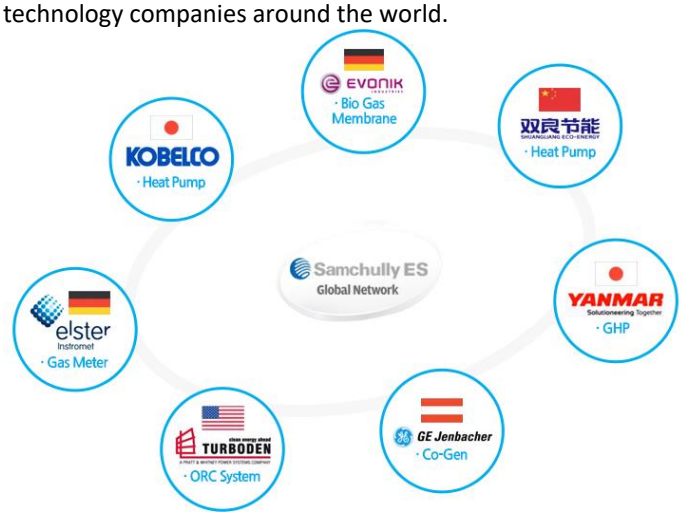


Figure 17 Global Network of Samchully ES

Source: http://samchullyes.co.kr/business/affiliates.jsp

Many types of customers are listed at the website for many energy fields, ranging from home owners to SMEs, Universities, Commercial and Public offices and more industrial customers such as production plants. These different types of customers also need a variety of high energy efficiency technologies including Gas driven Heat Pumps, building and industry energy solutions. Some of Samchully's projects

include plant projects focused on distributed co-generation energy systems, fuel cell power plants, etc., and environment-friendly energy business such as biogas, Industrial water treatment business.[22] Samchully ES provides in addition an online and offline customer service network for custom designed service provision[23].

- These customers often already had a prior relation with Samchully through its supplier role. The daughter company leveraged these existing relationships to enter and create new business areas.
- The channels being used to interact with the clients range from the very important physical audits performed at the customers facility, including analyses of processes and their energy needs. But the various support desks of Samchully are a clear channel for interaction. And finally, Samchully has face to face interactions with each client, to make sure that the one-stop-shop or total solution is fully tailored to the needs of the customer.

The activities that Samchully performs range from clear technology implementation, to engineering, to process management, networking, performing audits and in a way becoming a strategic partner for each client. Key resources for Samchully are its database for energy technologies, its engineering capacity and its global network and accompanying platform. Samchully ES claims that its state-of-the-art engineering capabilities and its other process facilitation skills have made Samchully ES one of South Korea's leading players in the areas of energy efficiency and reducing greenhouse gases.[24]

Based on the above it is clear that Samchully is a company with a strong technology base, which started out as a technology and energy supplier, but which in time did realise that its customers needed help meeting the necessary energy savings and efficiency requirements set by the Korean government.
As such Samchully grew into a company providing technologies but with add-on services that do focus on the use phase as well, not only on the interaction phase until transaction.

Samchully as a cost structure which is also clearly in between a product and service type of model, with many costs related to the database and technologies, but also costs for maintaining the platform that allows the company to deliver the total solutions, and several of the costs relate to the monitoring and verification processes and installation of facilities at the customers location.
The revenue model Samchully is using is very much service oriented, with a clear focus on the use phase; i.e. profit sharing from the realised energy saving, next to fees for consultation from various types of solutions provided including waste to energy, B2B solutions, etc.

Value Propositions

The bundle of products and services that create value for Samchully's customers can be summarised to be custom-designed, tailor-made energy efficient, environmentally friendly solutions for customers with a full range of one-stop solutions and services, ranging from technology proposals and financing to EPC and post- management assistance.
Interestingly enough the value proposition of Samchully is not described as realising energy savings for its customers, but decreased operational costs, easy process management, easier process quality monitoring, ensuring constant delivery to the clients of their clients. The energy savings almost become the means to achieve and pay for the rest of the services.

[22] For details, refer to http://samchullyes.co.kr/business/record.jsp

[23] For details, refer to http://samchullyes.co.kr/customer/agency.jsp

[24] For brochure, https://www.slideshare.net/stay_curious/es-42623968

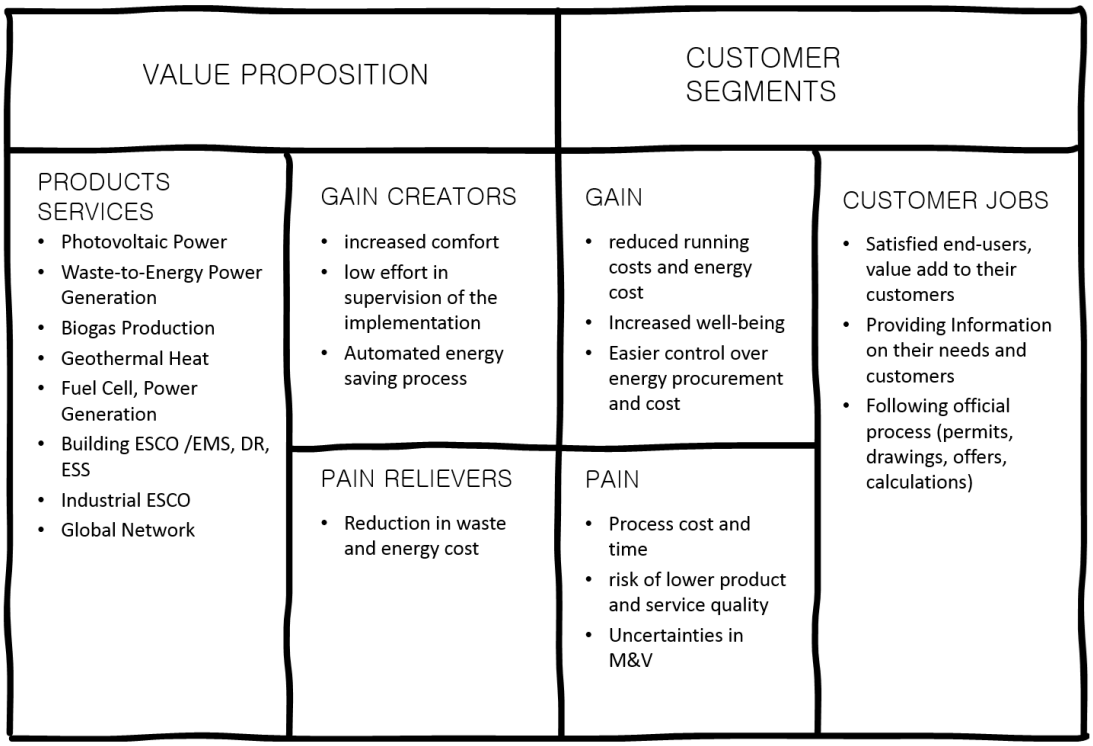


Figure 18 The Samchully customer value canvas. Based on Osterwalder and Pigneur (2010).

Dynamic Capabilities

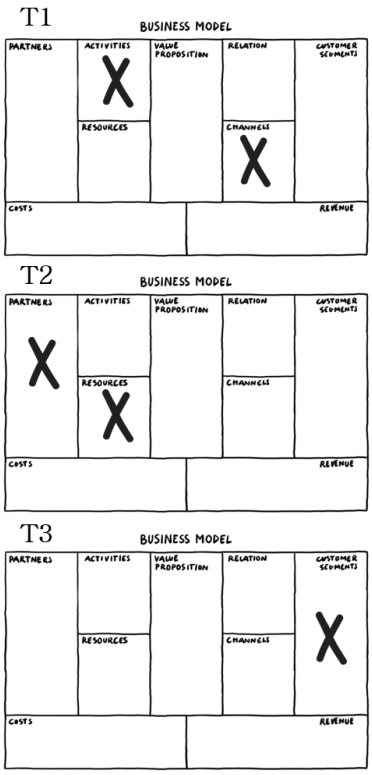
Based on the description above we can hypothesise that Samchully demonstrates several key capabilities leveraging success. In terms of user sensing, and technology sensing, it is clear that Samchully incorporates its user centeredness in may activities, from the user sensing activity of the audits at the facilities of customers, and the face to face meetings aimed at understanding what tailoring is necessary to meet the customer's specific requirements with respect to operations and process optimisation.

However, Samchully could even be said to be user following, in the sense that they expand their business based on the expanding needs of their customer base. Where Samchully initially was a clear technology provider or energy supplier company, it slowly built its business to be not only a tech and energy supplier, but aims to solve many more customer needs such as need with the official permitting and tendering process for new energy systems, organising the financing, sometimes in the form of an ESCO. And it is clear from the available material that Samchully performs well in turning the senses user needs into clear products and services, thus demonstrating good conceptualising capabilities.

One of the ways Samchully facilitates this conceptualising up is by means of the Samchully Energy Research Institute, an industry led think tank which was already set-up in 1990. At this institute research and development takes place. This institute also aids the sensing, by analyzing trends and thought leadership in the energy community.

The global platform and international partnerships Samchully has created to be able to offer any needed solutions to its customers testifies of good orchestrating capabilities. Whatever a customer needs, Samchully either makes sure in-house expertise is available or its makes sure it partners with the necessary expertise.

In terms of stretching capabilities, the figure below demonstrates a clear attempt of the company to create a service oriented focus in the whole company. After it realised it needed to start providing total energy solutions, existing separate activities in the company were grouped together, and separate support desks were combined to be able to provide a one-stop shop solution.



What changed?

- Existing activities will be grouped for integrated energy solution provision
- Different support desks should be combined for one-stop solution

- Expertise for new area solutions required, which in turn will expand the need for new business partners around the world
- Additional new resources are being added

What caused the change?

- Increased need for total energy solution

- Various types of new customer needs being realized

Figure 19: The Samchully entrepreneurial journey

The market performance of Samchully ES indicates its success at delivering the total solutions. According to Samchully, the key to the growth of Samchully ES's business model is to meet consumer expectations. It recorded sales of around USD10 Million in 2010, grew rapidly with sales of USD50, USD85 Million in 2012, 2013, respectively. For the year 2016, the sales record USD 145 Million.[25] Orders received by 2014 are reported to have exceeded USD 200 Million.[26]

Samchully ES is ambitious in terms of scaling up. Next to specialising in the provision of total energy solution Samchully ES is now expanding its business to the use of waste as energy and becoming a manufacturer of biogas with biogas-based power plants, and water processing plants.

Context

Samchully is rather ambitious in its aim to become a total solutions provider. And is very much aiming to become a true service company. Many of its business model building blocks are turning towards the service logic, and Samchully is in a clever way using the context of laws and regulation to follow demand, and adapts its proposition based on good user sensing. The South Korean government for example made the implementation of energy use diagnoses mandatory[27] as a means of enhancing the efficiency of high-energy-consumption businesses. And Samchully quickly followed with good diagnosis services. Samchully has many potential competitors from PV, EV, Bioenergy, Waste-to-energy, wind, etc. as their business area requires them to install more than one renewable energy sources. Society and institutional players are becoming more aware of the potential service of a one-stop-shop or total solution, but is not quite there yet. Issues around certification that is still focused on individual technical elements is a clear indication of this.

[25] Company financial statement, https://dart.fss.or.kr/dsaf001/main.do?rcpNo=20170327000301

[26] English Brochures, http://www.samchullyes.co.kr/common/download/brochure/2015_brochure_EN.pdf

[27] Refer to Article 32, Rational Energy Utilization Act

Product	Service
• Photovoltaic Power • Waste-to-Energy Power Generation • Biogas Production • Geothermal Heat • Fuel Cell, Power Generation • Building ESCO /EMS, DR, ESS • Industrial ESCO • Global Network	Total energy solution

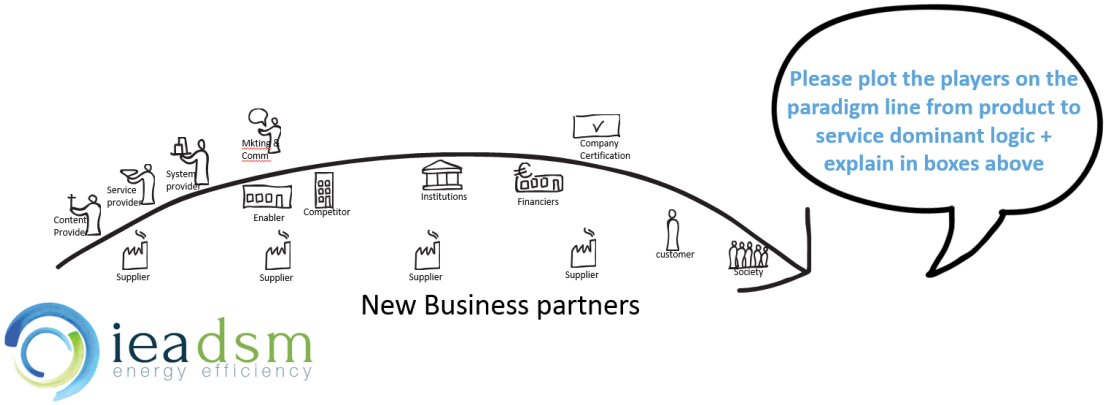


Figure 20: The position of Samchully and its stakeholders in the paradigm shift from product to service dominant logic.

Conclusions

To actually generate a change towards the much needed more user-centered energy efficiency services we need to learn from and experiment with business models that challenge the existing framework conditions, learn to deal with the constantly changing and inherently complex and uncertain framework conditions, and to overcome internal organisation barriers (Smith and Raven, 2012; Chesbrough, 2010; McGrath, 2010). However, not only is this internal business model alignment important. Within the stakeholder network of the firm differences are seen in terms of business model logic. The business models we analysed demonstrate a great variety of doing business, and we have analysed the different strategies. Four strategies can be discerned, which are discussed in much more detail in Deliverable 4.1 and D4.2 of IEA DSM Task 25: the international comparative analysis of energy efficiency business models and services. The four strategies are not clearly separated but more 4 positions on the continuum from product to service orientation. As such the business models can be at the crossroad between strategies.

The intuitive change

An interesting learning from the cases is that most companies seem to have experienced some sort of first –blockade- in the uptake of their business. When this is experienced, entrepreneurs make some intuitive or sometimes even explicit adjustments towards a more service oriented business. These adjustments are efforts to stimulate the uptake of the Value propositions. In the section below we discuss the four strategies that the cases demonstrate.

1. The first pattern is built around a specific manner to try to boost sales (and thus aimed at pushing the same proposition harder): through resellers and referrals. The basic technology or product does not change, neither does the value proposition, market or client segment. The only elements that witness significant change are the partners, activities and resources. Partners are aligned to be supportive of the provider and the proposition and help deliver the service as a product (SAAP). This type is often rather passive with respect to context, and to some degree unaware of the possibilities to influence context.
2. The second pattern we witnessed is that of reframing what is being proposed, and smart matching. In this type of pattern, the things that really change in the business model is a reframing of the value proposition, the understanding of the client, resources and client relationships. Besides that, the partners are now viewed as equal partners and are viewed as valuable resources. The rest of the business model building blocks remain the same. Partners are equal in service of the proposition. This strategy is a 'one off' business model, that is, a business that focuses on selling a proposition.
3. The third pattern is a shift from pushing a solution to becoming problem solvers. These businesses are usually trying to pivot the company away from direct consumer sales towards a business-to-business partner relationship. They aim to partner with a larger company, often offering a larger and more complex value proposition to end consumers. Here all elements of the business model change to some extent, where the clients and the value proposition and partners change significantly. In this strategy the product is delivered as A Service (technology is enabling). This strategy is a hard one to follow; the shift to servitisation is difficult mainly because key capabilities are naturally very underdeveloped by tech oriented companies. This raises the awareness that partners are essential and the client is more than a client but a valuable user and the use phase is a critical focus. This type is often either a stealth changer or an aware context changer.
4. The fourth pattern highlights businesses responding to needs from customers. Here the business model is designed around and even with the clients, having them even actively be

part of the business model as resources and partners. This type is often either a stealth changer or an aware context changer.

For Korea, the cases of Gridwiz, ECO solutions, Withlight, and Samchully were selected and examined closely as representing the categories of smart (home) management systems (product or service included), Renewable waste energy (product or service included), Lighting (product or service included) and Total solutions, respectively.

The Business model of Gridwiz case can be categorized as third pattern of a shift from pushing a solution to becoming problem solvers. But it is noted that the incentive structure is designed and provided by public sector for the efficiency improvement of power sector from customer centeredness. Gridwiz also adopted many of its solution from foreign experience while Gridwiz itself is accumulating its own technologies. But the case could also fall in the category of the fourth pattern of businesses models responding to needs from customers in the sense that the details of demand response resource aggregation method must adopt the customers need and demand.

For ECO solutions, a renewable waste energy case, its business model can be categorized as a combination of category 2 and 3, a combination of reframing what is being proposed and a shift from pushing a solution to becoming problem solvers. Start-up of new businesses in environmentally friendly civil engineering related projects based on its past experience on soil remediation and water decontamination is the typical example of reframing what is being proposed. Diversification of this civil engineering fields is another example of a shift from pushing a solution to becoming problem solvers.

Withlight, a B2B technology development oriented company for lighting measurement devices and equipment, produces all the products in accordance with the customer demand, but from a very strong technology or product focus. The services are developed to ease the process of transaction. Thus, this business model is clearly the case for second pattern of businesses responding to needs from customers. Customer in this case of Withlight, even actively becomes a part of the business model as resources and partners. However, since this business model is attempting to focus on the use phase, through the value proposition focused on measuring the actual working of the technologies, as such this category also has elements of the third category. One could argue this business model is in transition from the second to the third category.

Samchully ES, a total energy solution company case, can be a typical example of category 3 business model of a shift from pushing a solution to becoming problem solvers. Its business characteristics aim to provide total energy solutions such as business-to-business partner relationship, often offering a larger and more complex value proposition to end consumers, and in response, all elements of the business model changed to some extent, where the clients and the value proposition and partners change significantly are all fall within this business model category.

Not all firms can be said to have chosen one of the four strategies explicitly. Some are unaware of contextual influences on the business model and do not actually take a specific strategy, while in other cases the firm did not intend to make any changes, be they intuitive or not. Furthermore, the type of change that is made by the firm seems to strongly depend on the vision, insights and capabilities of the entrepreneur.

The change to more service oriented approaches was for instance made because of the skill to sense the needs of the user and conceptualize the necessary adaptations. Often such adaptions are made because of newly developed insights through the sensing of user needs or lessons learned from involvement and co-creation. More service oriented and user-centred business models create more abundant and more intense moments of interaction. Furthermore, different types of involvement are facilitated by these firms: not only do they interact with them (via online platforms or face-to-face), the user also tends to be involved as an asset in the business model and occasionally was the source of innovation in the business model.

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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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Also, visit the IEA DSM website: http://www.ieadsm.org