PLATFORM BASED BUSINESS MODELS IN THE FUTURE ENERGY MARKET

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ABSTRACT

Global markets are experiencing a paradigm-shift due to the introduction of new business models. In addition to this, the shift towards prosumers, customer friendly regulation and services and decentralized energy markets are now making their way into the energy markets. To address these challenges the Horizon 2020 project named INVADE is developing technology platforms and platform based business models in parallel to address these challenges. Our approach has been to study the effects of platform based business models in other industries, what platform based business models look like, how they work, and how they are currently developed in energy markets. The next step has been to confront the technical work packages and the pilot owners in the project to align theory with practice. This has produced tangible outcomes.

INTRODUCTION

The global markets are experiencing a paradigm-shift due to new business models. One of the strongest indicators of this shift can be found in the Forbes-list in 2006 and 2017. The worlds ten most valuable companies remained more or less unchanged in the decades before 2006, and they all used traditional business models. However, in the following decade, this changed dramatically, and in 2017 six new companies had entered the list, all using platform based business models. Not only did they enter, but they also occupied the top 5 positions. Surveys presented by [1] show that European industry compared to US and Asia is lagging due to lack of business model innovation versus technology innovation.

PLATFORM/ECOSYSTEM-BASED BUSINESS MODELS – THE BASICS

Platform and ecosystem based business models is not a new phenomenon. It has been around for centuries, and has been one of the best examples of how network effects work. To explain this, let us look at an example. A market square is a typical example of such a business model, and describes one of the most distinct features of a platform and ecosystem based business model; a platform where you *exchange* goods or services. But to start the network effect we need two more ingredients; the customers and the market vendors. So, starting out with a farmer selling potatoes, this will attract some customers. And since there is a growing number of customers, other market vendors selling carrots and fruits are setting up their boots, which in turn attracts more customers because of the wide selection, which in turn attracts more vendors selling flowers and so on. In a digital version of this, physical limitations like space and distance are no longer limiting the growth from network effects, and we see hypergrowth and a winner-takes-it-all effect when platform based business models enter new markets. According to [2], they are fueled by digital exponential growth mechanisms such as Moore's and Nielsen's law and the growth in IoT-units. Evans and Gawer [1] is referring to this digital network effect as the self-sustaining momentum of growth.

Another important observation is that the market square is an excellent description of a two-sided business model, where the customers represent the downstream part of the business model, whereas the market vendors represent the upstream part of the business model. The market vendors usually have to pay a fee to the market place owner, but in return they can have a direct customer relationship. The third observation is that market vendors are depending on the other vendors to attract customers, a phenomenon often referred to as an ecosystem. Atluri et al [3] list the development of an ecosystem mindset as the first of four prerequisites if you want to implement platform based business models.

The closest that we have come to this type of model within the electricity domain is recent work related to local energy markets. [5] proposed a concept for smart grids that embraced a set of local hubs in the grid where both local suppliers and consumers could trade electric energy across the grid. Use of lines in the grid and congestion issues where priced in. This favored local energy exchanges in peak periods. [6] created a peer-to-peer (P2P) trading concept directly inspired by the bazaar model described above. The P2P trading concepts, proposed by [7] and [8] present even more acute examples of this. [9] specifically addressed platform based concepts for the EMPOWER concept on local markets, but assumed a cloud based service with "man in the middle". INVADE builds on and combines ideas from this research. But its main ambition is to show how local markets and energy communities e.g. neighborhoods and microgrids can be consolidated to facilitate aggregation and trade in energy, flexibility and associated services. The concept that we propose can form an widespread ecosystem. It can be hosted as a cloud service, but can also be facilitated by blockchain technologies in a truly distributed way [10]. In our practical work, however, we proceed with a cloud based approach. The reason for this will be shown as we seek

to centralize some resources and consolidate and share an array of different data. Consequently, data constitute an important value booster.

Internet distribution of content and services (often called Over The Top) has dramatically changed the "middle man" of Osterwalder's excellent short-term definition of a business model in [4]; "A business model describes how you create, *distribute* and capture value". The marginal cost of distribution, and the elimination of physical distance and in some cases physical products (like CDs and DVDs) has made the whole business model disruptive. Whereas a disruptive product typically disrupts a competitor, a platform based business model has the capability to disrupt whole industries. This is exactly what has happened in industries like music (Apple and Spotify), transport of people (Uber), accommodation (AirBnB), marketing (Google) and more in the last decade after 2006. If we take a closer look at these companies, we will find that they all emerged from the IT and software industry, accompanied by a highly disruptive business model; the platform/ecosystem based business model. So what makes this business model so disruptive? One explanation has been suggested by [2]:
"*The higher number of digital exponential growth mechanisms a business model can absorb, the more disruptive it will become*".
Another distinct feature of this digital business model is the inherent ability of doing industrial shifts. Examples of this are Google moving from the advertisement industry to smart homes and AI, and Uber moving from transport of persons to transportation of goods (food), and eventually transport as a service. And the energy industry will not be an exception.

THE INVADE ECOSYSTEM

INVADE is not merely concerned with the development of a new technical platform to support flexibility markets and management. It also seeks to establish new business models to support future commerce based on such a platform. The concept should also be able to connect with existing platforms for local energy trade or flexibility management. Connectivity is a prerequisite for rapid growth and significant scalability. The concept will be tested with five pilots across Europe. At the end of the project the ambition is to insource other embryonic platforms developed by independent initiatives. The inclusion of such based entirely on commercial principles. The project has therefore emphasized the importance of parallel development of technical solutions and new business models. So far this has resulted in a a functional specification that is currently fused with the technical needs. This implies the following platform and ecosystem based business model to meet the future energy market. The following main requirements have been identified: The platform business model should be:

- multi-sided
- enable network effects
- absorb exponential digital growth mechanisms
- foster open ecosystems with focus on APIs
- customer centric and applicable for all participants in the energy market, and particularly with respect to the pilot sites
- generic – it should be able to support each pilot, but also be able of supporting (and explaining) other use cases, even the ones coming from new type of competitors.
- include the customer and her domain (devices, IoT, interfaces, agents) and be able to fit in a sharing economy structure.
- support digitalization in energy markets (analytics, machine learning, apps, big data, cloud, IoT, devices, Internet, ecosystems)
- flexible regarding activation (remove/turn off the parts that are not relevant) but also to enable extensions
- support flexibility in roles (different components can have the same role (even simultaneously), or the role can alternate (prosumer).

THE GENERIC MODEL

Our first version of a generic platform based business model applicable in the future energy market has been developed (Figure 1). It underpins the current development, technical as well as exploitation wise. As platform and ecosystem based business models depend heavily on Internet distribution, IoT and APIs (Application Programming Interfaces) in addition to the flow of energy in in the energy system, the model emphasize these elements. The generic model consists of multiple layers which communication need to support. At the leaf nodes of the hierarchy we find loads and generators. These include PV panels, batteries, controllable and dispatchable appliances, charging spots and electric vehicles. These are aggregated locally and can be used to improve self-consumption through local trade or alleviate grid operations [8], [9]. At a higher level, local energy communities are organized under one umbrella, which is offered by a local Flexibility Operator (FO). It can aggregate flexibility with the purpose of offering flexibility to the central market represented by the Balancing Responsible Party (BRP). Peer-to-peer trade operations proposed by [5] can also be facilitated. At the right hand side in Figure 1 we have depicted other ecosystems not developed by INVADE. We anticipate other ecosystems that can benefit from the latent benefits of a shared set of resources. Open initiatives, similar to the one represented by the more proprietary Tesla system is a case in point. The bold dotted arrows shows how the different ecosystems can bypass each other. Another thing to note is the third main component of the platform depicted at the center of Figure 1. Here a set of computational services can be found. This is the main asset of the global FO. This hub offers computational resources for forecasting, remote diagnosis of hardware.

In a system like this centralized data storage, curation and analysis have the potential to provide significant value for all connected. Other computational services include billing, financing, remote sensing and more.

regular demand-response operations have been installed. The local FO entity can connect directly to dispatchable loads through agnostic gateways. They can also connect to local EMS/HAS systems and be part of a more

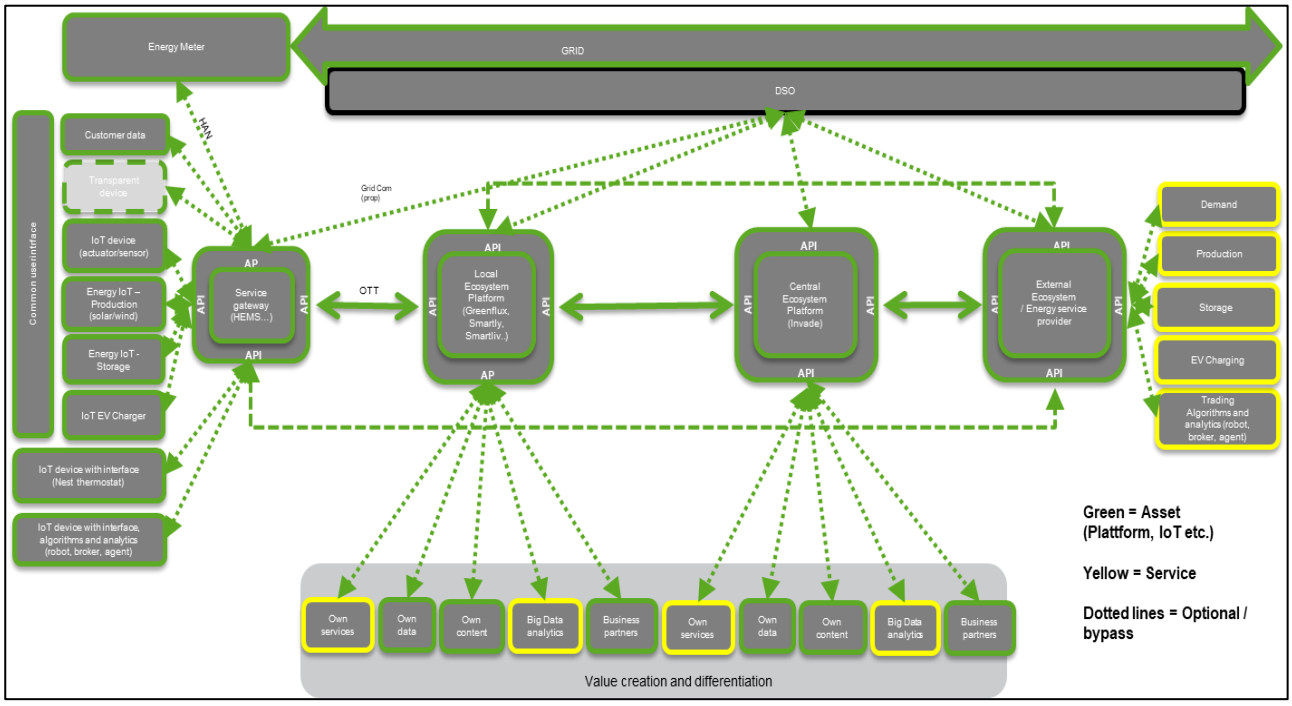
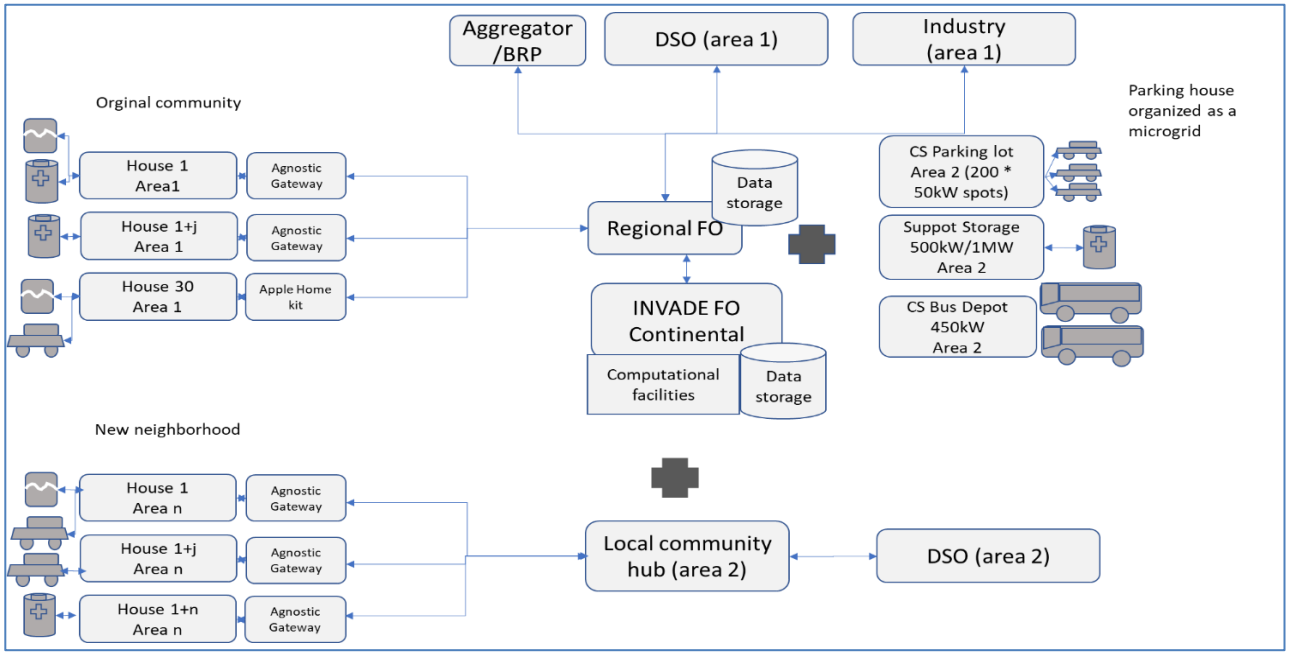


Figure 1 (above) The generic platform and ecosystem based business model

Figure 2 (below) A depiction of case study 1



CASE STUDIES

To illustrate the concept further we have depicted the use of the generic model for one of the pilots. This illustration also shows how we intend to connect to other, existing local ecosystems in the future. This is to show the scalability potential of the generic concept. A Norwegian FO has organized a set of households. Connections for

extensive user-centric smart house system. The service contracts that the FO offers participants are meant to reduce energy costs with TOU pricing. Here, the FO plays the role of a regular ESCO service. However, with a critical mass of households the FO can turn to the local DSO and offer similar services to alleviate the grid.

Different market designs have been proposed that shows how a community of households can become a self-balancing energy cell through peer-to-peer trade between prosumers, regular suppliers and pure consumers. These concepts illustrate on a local level what Uber and AirBnB achieve in transportation and the lodging business respectively. The concept can easily be extended to manage home charging of EVs through the OCPP v1.6 protocol. In the way pointed out by Bremdal (2017) local communities can be united under one management. This increases the attraction potential for third parties that see the united group of local communities as market for advertisement, products and services. The consolidation helps to aggregate flexibility services to a level where they can make a difference to balancing responsible parties (BRP) and the central market. This is shown in Figure 2. On the right-hand side in the same figure a commercial ecosystem is shown. This is a parking house with extensive charging facilities for private cars, taxis and electric buses. The whole system is organized as a microgrid with more than 500kWp production based on PVs and 1MW of battery capacity. It is designed to offer flexibility services in addition to its parking and charging business. The current idea is to insource this microgrid under the supervision of a different local FO, but under the supervision of an overarching entity that is labeled "Global FO". This will yield a whole set of new synergies. The local FOs can share forecast services, data repositories, remote technical services, billing and more. It is like two different stores transformed into departments in a supermarket or shopping mall. Benefits in terms of marketing and business attraction is expected to rise too. For the households and drivers selling flexibility will also benefit from economy of scale. A network effect is likely to happen at different levels. Another practical benefit for the residents in Area 1 who owns an EV is seamless roaming. It makes no difference whether charging is done at home or in the other parking area. Other residential ecosystems like Area 2 may exist as shown and can be insourced accordingly. Apps and software for monitoring energy use, agent based trade etc. developed for this area may be uploaded and shared by members of the others by means of the platform offered by the Global FO. This way the Global FO can offer complementary services to the local FOs. Such assets can also include non-energy specific like games and media resources. A fair degree of standardization and agnostic communication devices will allow the concept to scale up quickly.

CONCLUSIVE REMARKS

A generic platform based business models for the future energy market has been described. The rationale behind and the its potential implications have been discussed. The concept is currently developed in the H2020 project, INVADE. As work in progress it is too early to make firm conclusions. However, we intend to implement the local FO platform at each pilot sites in five places across Europe. A global FO will be established and other, existing ecosystems that are seeking empowerment through use of the facilities offered will in turn be invited to connect to the platform. We have argued how different local market concepts that have been proposed i.e. [5],[6],[7],[8].[9],[10] can be accommodated. We have also described how other ecosystems both new and existing can be insourced. One such option is currently negotiated as a seamless future extension to the Norwegian pilot to illustrate the business model's ability to scale up.

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