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Smart Homes as Service Platforms for New Healthcare and Energy Services

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1. Introduction

Industry transformation and convergence create new possibilities, business opportunities and even new industries. Many factors can be identified as reasons for transformations in industry branches in international level. The change drivers include e.g. fast growth and development of international trade and growth, participation of very different countries with various cost levels in international change and trade, quick evolution of international logistics and tremendous changes in information change and transmission and fragmentation of value chains to value networks. Particularly in small countries the clusters have fragmented and even their parts have been unbundled to pieces in different counties as part of globalization.

On national level fragmentation and unbundling are striking features in transformations of industries. When each company or network on international level seeks for a most favourable structure or position compared to the actors or networks of other countries, the national actors or networks seek besides for competitive advantage also efficient cost structure compared to competitors via network structures. When considering value networks the attention is often paid only to material and service flows. However, the functioning of the value networks requires also capabilities, rules of games and procedures of actions from different parties of the network, and economical aspects from point of view of each partner of the network.

In this research, especially elderly care, heath care, electricity distribution and intelligent concept have been discussed. Quickly observed, these are very different and heterogeneous group of activities. The common factors in these fields are the networks, their build-up and management. We use the smart home as combining platform that integrates these networks together.

The concept of smart home has been analysed in literature mostly from technology perspective. The aim of this study was to analyse the smart home concept from services perspective, as a platform for service integration. The research problem in our study was how the services integrate through this kind of service platform. We use the Service Dominant Logic (see etc. Lusch & Vargo, 2006; Vargo et al., 2008) as the theoretical framework for the study. The research process follows the of future oriented business mapping process (see e.g. Immonen et al., 2010; Pynnönen & Kytölä, 2008), where first the

plausible future business scenarios are formed. Then second the service elements and service models are analysed. Third these elements and models are combined into service systems by opening the actors and their relationships and business models. The main implication is that regulator should guide the technology development to be refocused from development of specific technologies to integrated platforms, which support diffusion of both home systems and related service businesses.

We have structured the chapter so that first we review the resent discussion of service dominant logic which we use as theoretical framework for this study. Second we introduce the emerging smart home business from the service platform point of view. In this section we also introduce the two service models and highlight the resent developments in these businesses in Nordic market and especially Finland. Third we open research findings of the case service models and discuss their integration to the service platform of smart home. Fifth we discuss the conclusions and implications of this study.

2. Service dominant logic

The core arguments of S-D logic are constituted of several rules; (1) service is a fundamental basis of exchange, (2) products are distribution mechanisms for service provision, (3) value is delivered through co-creation between the firm, the customer and networks, and (4) intangible capabilities, skills and knowledge are the primary source of competitive advantage (Vargo et al., 2008). Service in this context is understood as a process of doing something for another party in collaboration by integrating internal capabilities into external ones to co-create value (Vargo & Lusch, 2008).

2.1 Service systems

Focusing attention into service processes unavoidably impacts on the competitive basis of a firm. In order to create value in this economy of service systems, the firms have to understand the new logic of creating value. In service systems, the value creation is more complex than in product based economy. It is called the systemic nature of customer value. The systemic nature of customer value means that the value delivered to the customer is dependent on several different but intertwined service and product functions, and is most possibly created by a network of firms (Pynnönen et al., 2011). These systemic functions are often technology platforms that connect separate services together e.g. internet application stores, smart phones or smart home systems. Also in S-D logic one of the key arguments is that physical products are acting as distribution mechanisms for services (Lusch & Vargo, 2006; Vargo et al., 2008). The role of systemic functions is important as they are the key to boost the value of the service system.

Competing by a service is much more than including value-add features into products; rather, the competition shows in the customer's willingness to pay for the integrative capabilities of the firm in this view (Lusch et al., 2007).

A service system can be divided into two parts: (1) the service infrastructure and (2) customer service operations (i.e. the implementation of a service process) (Flieβ & Kleinaltenkamp, 2004). The smart home concept we use in this chapter, and the services integrated into this platform, are good examples of this kind of service system. The infrastructure determines the

firm's capability to manage operations for required outcomes. The service process and the supporting and processing resources constitute the service business model, which integrates external resources into a complete service product (see Figure 1). During service operations, the customer contributes to production by offering information, rights and physical objects. Processing and supporting resources are built on the firm's internal resources and the external value network (suppliers) of the company (Fließ & Kleinaltenkamp, 2004). The service process itself is an intangible entity that comprises technology, know-how and intellectual properties, and aims to the integration of resources (Tadelis, 2007).

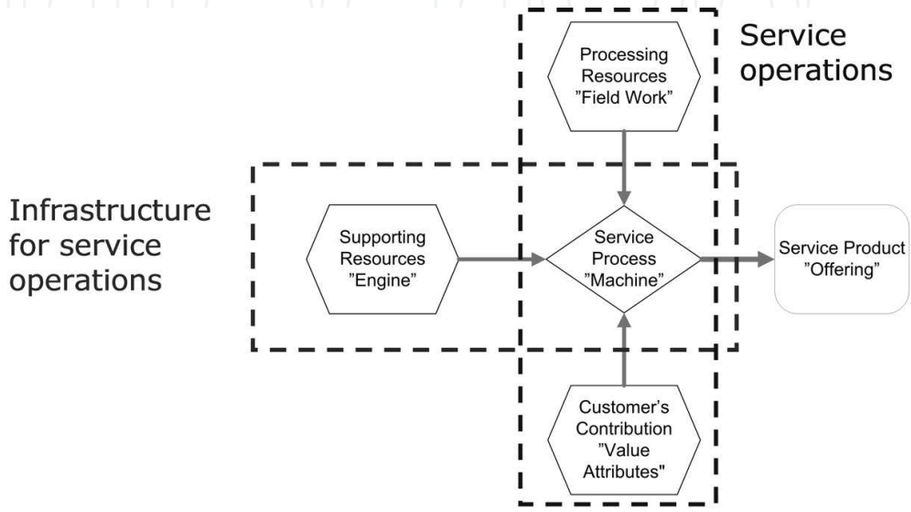

Fig. 1. Service production model (adapted from Flieβ and Kleinaltenkamp, 2004; Tadelis, 2007)

The service production models merge activities which may be operated by external actors. Our argument is that designing service models is always searching for appropriate value networks at the same time. S-D logic expects that some prime service integrators are included in the service provision networks, which have power to steer offerings. The literature suggests that such integrators should avoid high rates of investments in manufacturing processes to retain responsiveness, and the successful actors should have directs link to the market place and customers (Lusch et al., 2007). Overall, it is probable that retailers become the pivotal link in the value network which makes them potential prime integrators in service provision.

2.2 Structure of the public service provision

In the public sector, it is important to consider that the roles of the buyer, client and supplier need to be clearly differentiated. Local authorities have to identify the characteristics of the provided services and to match those with the needs of citizens, who are paying for the services directly or through taxation. The key point of actions is translating the specific needs into technical specifications to be included in contracts (Ancarani, 2009). Therefore, the development of service provision is a complex interconnected multi-stakeholder system in which service providers, authorities and clients communicate with each other. The system is illustrated at a general level in Figure 2.

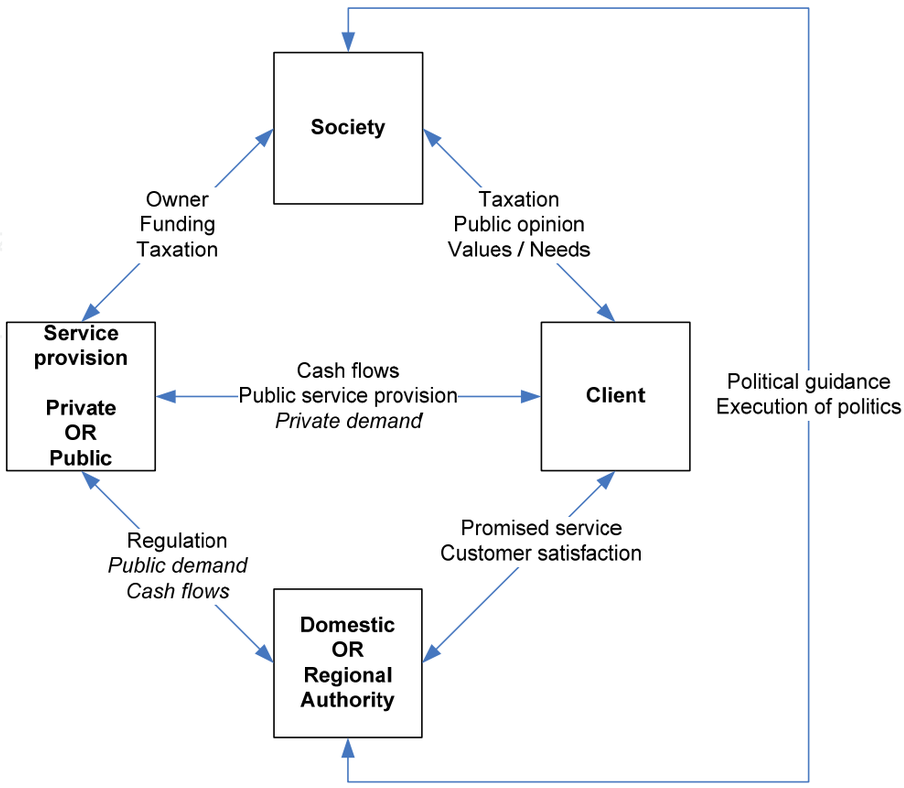

Fig. 2. Roles and interactions of actors in public service provision, adapted from (Ancarani, 2009; Walker et al.,2006; Aschhoff & Sofka, 2009; Edler & Georghiou, 2007)

The two most important elements of the model are interactions between the end-user and the authority, and the authority and service providers. Regulation projects the needs of end-users (e.g. consumers), creating signals for monopolies to develop product and service offerings toward society's expectations, which may change the premises of operations. In the future, public monopolies are expected to operate in a more service-oriented manner. Thus, the integration of offerings from multiple service providers becomes a focal operation principle (Vargo et al., 2008; Janssen et al., 2009). Public organizations need to orchestrate sources of supplies in the new operation environment when it operates as the core actor of the service provision network (Vargo et al., 2008). Managing such trends is a topical issue in European countries in multiple spheres of authorities. However, mechanisms for the controllable creation of private market offerings are still obscure, which may lead to a significant risk of opportunism.

3. Smart homes as service platforms

A good example of a service platform is the smart home concept. We use the smart home concept as an example of a service platform and two different service models implemented on that platform to explain the role of platforms in service networks. The service models used are:

1. The smart energy networks (smart grids)
2. The intelligent medical management concept

At first these services seem to have nothing in common but as they are both provided to peoples' homes and need an ICT operating system with data network integration, they start to link together. Before analyzing the service concepts, we define the concept of smart home and analyze the key driving forces of the emerging smart home business.

The smart home has been seen as a potential solution to cut the costs of health care and energy in modern societies by increasing the efficiency of services and empowering people to take part into the service creation (Chan et al., 2008; Skubic et al., 2009). However, cutting costs is not the only advantage brought about by technology; it also enhances the comfort and well-being of the people in general (Skubic et al., 2009). The main driving factors for the growing interest towards smart homes are the rising costs of health care and energy. We use the Finnish market as an example of the recent developments in the costs and market development.

The most urgent issue in the Finnish health and social is rapidly raising costs which are caused by aging of citizens and inflexible service structure. We claim that a critical issue in the service structure is lack of solid view into service needs of aging citizens, lack of reasonably designed service infrastructure and missing discussion between specialists in different sectors. In Finland, the number of aging citizens has grown from 780 000 in year 2001 to up to 880 000 (13%) in 2007. The growth of older age segments has been faster than the average growth of the population, which has led to an increasing proportion of the age segment of over 65-year olds from 15.2% to 16.5% of the population. At the same period (years 2001-2007), the expenses of elderly care have grown by 35% from €1 157 million to €1 492 million even though the growth of demand has been 13% which significantly exceeds the changes in the aging population, growth of demand and rate of inflation.

The second issue is the rising expenses of medical care. Medical expenditure in 2007 in the Finnish health care system was nearly €2 billion of which prescription pharmaceuticals for outpatients amounted to €1.6 billion, which is over 70% of the total expenditure of medical care (National Institute for Health and Welfare, 2009; Statistics Finland, 2009). The growth in the expenditure has been significant. The medical expenses presented here are not the whole truth about latent problems, because administration, logistics and other indirect cost categories are not included in the figures. It is notable that a great amount of growth is focused on the prescription drugs of outpatients which are the potential users of novel technologies. Therefore, health care actors are calling for new solutions for medical care management creating attractive potential for offerings which improve medical care management at present.

The second issue driving the development of smart homes is the European Union. EU legislation drives the market towards smart metering and smart grid solutions. The aim of the EU is to empower consumers to participate on both saving the energy and producing the energy. The energy and network providers are also seeking new business opportunities from the emerging smart grid technology. But there is also consumer demand for the new electricity saving technologies and services. The energy prices have been rising all over the world. In Finland the electricity price (EUR /KWH) has grown from 0,76 in year 2001 to 0,98

in year 2007 (29%) (Statistics Finland, 2009). The new services allow for example monitoring the electricity consumption more closely and help to change the consumption habits. The more advanced services allow for example households selling the extra electricity back to the grid and thus help to balance the total energy costs.

Regardless of the buzz around the smart home and ubiquitous solution, no common definition for the business model exists at the moment. Smart homes can be approached from at least two views. The concepts are often defined either as intelligent solutions at homes to support daily living or as solutions the primary purpose of which is to provide a comfortable life for residents in a home environment. Furthermore some authors have provided more specific definitions regarding the features of the smart home concept:

- Any living or working environment that has been carefully constructed to assist people in carrying out required activities. (Chan et al., 2008)
- Acquires and applies knowledge about the environment and its inhabitants in order to improve their experience in that environment. (Cook & Das, 2007)
- Built entities in which various products and services interoperate by means of Information & Communication Technologies (ICT) to constitute a product environment. (Peine, 2009)
- Uses sensors and other devices and telecommunication features to enhance residents' safety and monitor their health and overall well-being. (Demiris et al., 2008)
- Monitors the activities of the person within their own living environment along with how they interact with home automation devices, and based upon these interactions and their current sequence of activities the ambient environment can be controlled and adapted to provide an improved living experience for the person. (Nugent et al., 2008

By definition, the smart home concept should be considered a bundle of technologies, services, and information and service provision resources which constitutes an intricate environment, i.e. a value network of firms with different resources which provides value for its common customer. We approach the topic from the perspective of service-product offerings which improve security at home, prevent loneliness by fostering social contacts, and support home care providers to develop appropriate performance. A general construction of the studied concept is presented in Figure 3.

Generally the smart concept has been so far ambiguously communicated to customers. The marketing of smart homes has concentrated on the single functionalities and technical features of solutions, lacking a wider construction that provides benefits for the customer.

Information gathering and sharing among a network of organizations involved in service network will require significant renewals from the supporting infrastructure. Therefore, innovations should focus on the systems that integrate the services to the homes. The transformation of elderly care and energy services, however, requires adopting new capabilities for orchestrating operations in the future as well as developing a broad home living concept that should be forged through co-operation among firms from various industries. Also the services need some integrated marketing. Generally the smart concept has been so far ambiguously communicated to customers. The marketing of smart homes has concentrated on the single functionalities and technical features of solutions, lacking a wider construction that provides benefits for the customer.

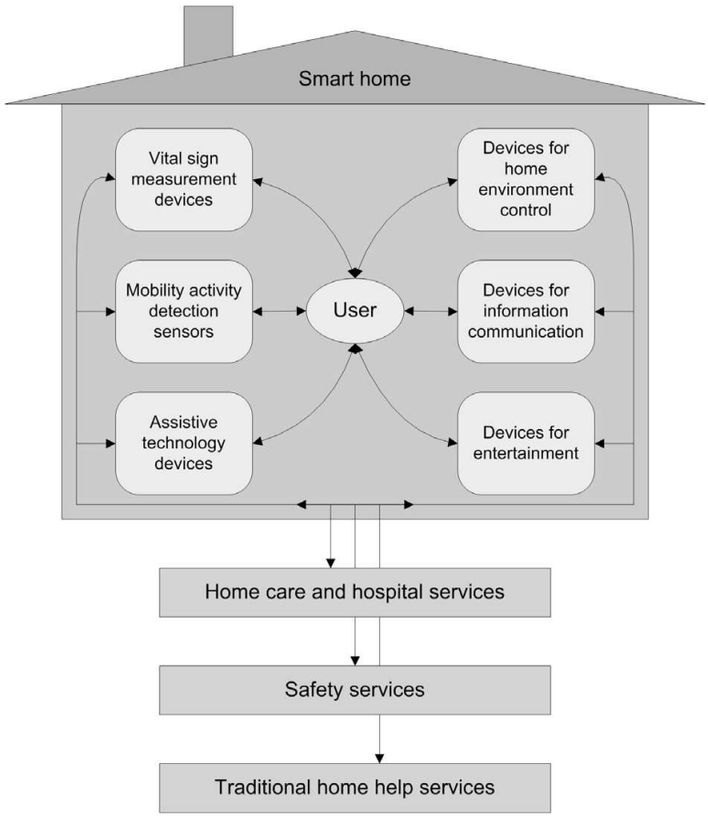

Fig. 3. Illustration of a general smart home construct (adapted from Chan et al., 2009)

4. Smart home service models opened

The emerging new industry and home centred thinking enables several new business models and simultaneously challenges the old ways of doing business. Because the smart home as a service platform integrates several businesses together, the total amount of different service models can be quite big. We have chosen two service concepts that we use to demonstrate the nature of the services that can be integrated into this platform. We have used a process of future oriented business mapping (see e.g. Immonen et al., 2010; Kytölä et al., 2011, Pynnönen & Kytölä, 2008), where first the key driving forces of the business are mapped to form plausible scenarios of the developments. Second step is to analyse the service elements and service models that are enabled by these scenarios. The third step is to combine these elements and models into service systems by opening the actors and their relationships and business models.

4.1 Smart energy metering

To open the smart energy services we have conducted a future oriented study among the energy experts (Immonen et al., 2010). The primary aim of the study was to increase and harmonize understanding about the future challenges in the field of energy metering and related services. This study introduces the future oriented analysis of smart energy metering services that are using the smart home platform. The results are based on a group decision

process arranged with energy specialists. The most important drivers were proposed as follows:

- Climate change and progressive demands for efficient use of energy
- Demand for increased functionality of electricity markets
- Distributed energy production and virtual power plant
- Advanced technologies – support for intelligent customer interfaces
- Increased use of energy and raised unit prices

The second target of the research was going beyond from the state of the art to define the key characteristics of future service systems. The idea was to find out the potential roles of installation and maintenance service providers and increase understanding about the architectures of competitive service concepts. The collected ideas consist of both larger service systems and single services, but also characterize the key resources and capabilities of services (See Immonen et al., 2010 for total list of service ideas). A further analysis of the ideas reveals three groups of services which have a fairly unambiguous relation to targets set by the regulator, and which will unavoidably have impacts on distribution network companies. The selected categories, on the other hand, create the most significant concerns for electricity distribution companies. The most remarkable service categories are:

- Reporting of energy consumption
- Ruidance for consumers of energy
- Consumption control services

The recognised services will also challenge the distribution network companies in the future to develop appropriate models to merge requisite functions or services into their routines. On the one hand, distribution network companies are capable to develop particular services locally with public support. On the other hand, energy metering services will not belong in the core functions of companies. Thus, the services would possibly be offered by specialised operators. The most important advantage of the latter option is the fact that services would be developed reasonably to meet customer needs without the limitation of local monopolies. In any case, the service concepts will be outlined similarly, despite the production structure or involved value network actors. The form and scope of smart energy metering services depends on three things: firstly, the decisions of distribution network companies, secondly, the given incentives by legislation, and, third, the development of technical standards. Different forms of service concepts are outlined in the following chapters, where service ideas are analysed in the light of optional scenarios.

4.1.1 Business scenarios of energy metering concept

The structure of the future business environment in the energy sector mainly depends on political decisions (sanctions, guides, standards, etc.) as well as technology selection among the network companies. Government policy is an especially important factor, because distribution network companies operate on secured monopoly positions without the threat of substitutes, which leads to low bargaining power for customers and insensitivity to customer needs. Therefore, it is necessary to develop such policies that reflect real customer preferences and protect customers against the misuse of monopoly positions.

The state of future service concepts and business models may depend on the actions of domestic and European regulators, and the appropriate focus of economic support on service development (Strbac, 2008). Basically, two possible scenarios can be outlined for future business environments on the energy sector: (i) the market environment, which is incoherent and does not offer efficient service platforms and standardized technologies; and (ii) the purposefully regulated environment, where standards and system interfaces have been developed to support system integration, customer needs are recognized and service platforms offer wide support for flexible concepts and the regulator supports new service business creation (Kärkkäinen et al., 2006; Kirjavainen & Seppälä, 2007). The proposed scenarios are:

Scenario 1: Pessimistic view

- Technology and business models stay unconsolidated and business branches are driven by local monopolies.

Scenario 2: Optimistic view

- Advanced technologies, consolidated standards and open business networks will become dominating regime.

Scenario 1 represents a pessimistic forecast for the development of Finnish national and Nordic smart energy metering activities and related service markets, which can come true if recognized threats become dominating in the Nordic electricity industry. Metering systems are not harmonized, and the monopolistic behaviour of the distribution companies directs the development of the energy markets. The major reasons behind this development can be found from small distribution network companies which have no incentives to renew their network data systems due to relative high investments. At the same time, a lack of standards and uniform national system requirements hinder the development of metering technology and services. This leads to a situation, where a lot of parallel systems are utilized and network companies are in a risky lock-in relationship with suppliers. On the other hand, the incoherence of technologies keeps unit prices on a high level and, partially, prevents the exchange of metering data between market actors (Kärkkäinen et al., 2006). Thus, the future government actions in the Nordic countries have a critical role, when the flexibility of electricity markets will be developed.

Scenario 2 presents an optimistic view of the future developments in the electricity markets, which has been created by decreasing the influence of the recognized threats and reinforcing opportunities offered by intelligent metering. The main result of this scenario is a description of the competitive environment, where most of the obstacles for marketplace development and competition are removed. Thus, the following future states have been realized: The regulator has redefined standards, and the national system requirements for smart energy metering have been released, which enables harmonizing the systems and decreases problems at the interfaces. The focus of financial support also has a role in directing the development. Renewing processes and utilizing purchased services in the network companies should be supported, if metering service markets are to be emerged. The harmonized technology platforms decrease network companies' dependency on suppliers and the unit prices of smart energy metering because of faster development of new solutions and the more efficient markets of technology. The development creates,

together with renewing of operations, a fertile ground for growing service business, which is not bound to the local or national level but is international business, where operators are able to implement generic service platforms.

System integration between smart energy metering and smart home automation systems is an important aspect of this scenario, because it enables a method to control energy consumption and intelligent solutions for energy saving among small consumers. There the development gap is rather high and rules of competition differ radically between ICT and the energy sector, because energy business is regulated and ICT companies are competing in the open markets, where end users are determining the demands. Therefore, operators for smart home systems are the core resources, when system integration is implemented.

4.1.2 Future value networks of smart energy metering

Optional value networks are constructed to achieve the requisite capabilities to perform actions related to specific services. It is expected that the requisite performance level of an actor has a crucial role for market openings if industry evolution creates capability gaps to incumbent firms.

In practice, distribution network companies aim at long-term asset management strategies that rely on an assumption of stability in the industry. Improvements in the business processes and structures are mostly expected to be incremental. Indeed, the risk of dramatic changes in the industry is usually low because of the monopoly position of distribution network operators. Thus, firms have low dynamic capabilities, because established positions only allow concentrating on incremental improvements. Thus, if requirements to reduce the service level radically occur in the industry, it may lead to significant structural changes and the emergence of new business branches. The final implications of energy metering for the industry architecture in energy distribution depend on features which may be materialized in the service system.

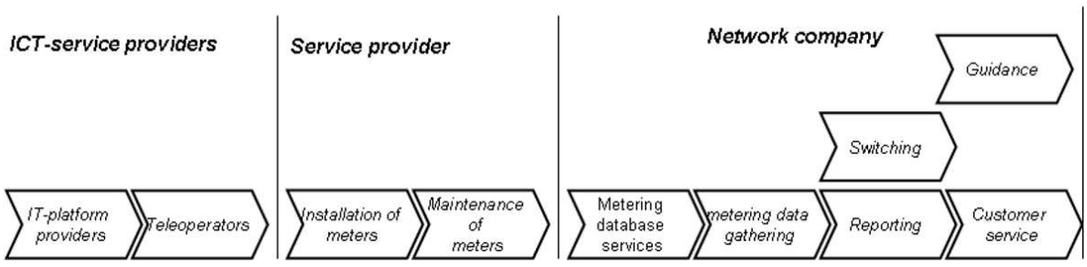

Fig. 4. Expected value chain in Scenario 1

In Scenario 1 can be seen as the continuum of the current market situation and therefore, the basic level requirements for metering and guidance services will not require enormous investments. Therefore, Scenario 1 is not likely to lead the industry toward a reconstruction process, which indicates a strong position of the distribution networks companies as solution developers. Distribution network companies are likely to build services that are outlined based on the needs of a local monopoly company. This means less customer

oriented actions, and probably poor opportunities for external service providers to develop generic business platforms. It can be expected that new services occur in the installation and maintenance of metering systems, which is current practice in distribution network companies in network construction for instance.

Scenario 2 (Consolidation) includes more radical change, when both the physical infrastructure (meters, software and communication) and the method of customer service may transform so remarkably that it creates prospects for new service providers in the field. The most important drivers for the described change are global service models, the authorities' aim at standardized technology platforms and complex interconnection between home systems. Such development pressures distribution network companies to redesign their architectures, because limited market areas of local monopolies tend to lead to financial limitations for investments in developing requisite services.

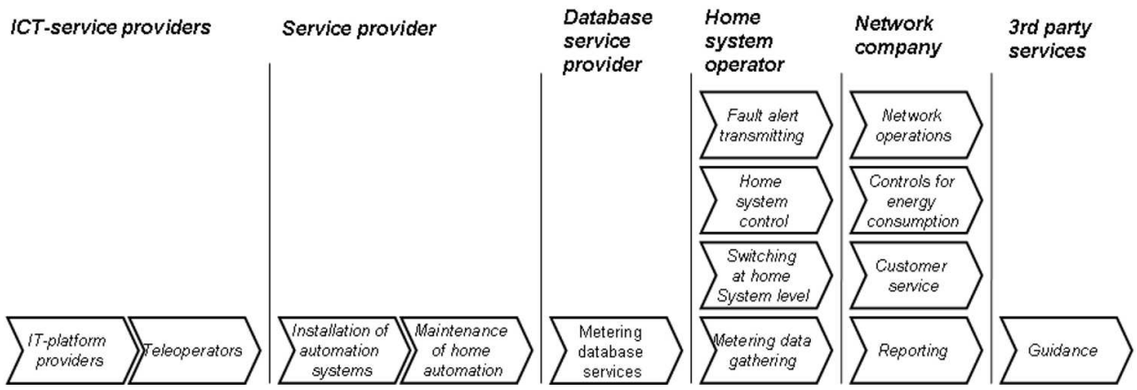

Fig. 5. Expected value chain in Scenario 2

The most important architectural changes in the value chain may occur among the operating and maintenance activities of intelligent metering systems. New prospects emerge, especially, if some dominant platforms for the home system infrastructures are developed. The new market potential is opened for the actors that collect information from the integrated home system, and deliver it to different purposes for multiple actors. In this case, electricity distribution companies may outsource fault alert transmitting, energy saving controls (switching), systems control, and metering data gathering operations for specialized service providers. The divergence of metering operations (i.e. installation, data reading, maintenance, and customer support) may have a crucial role for the convergence of home technologies, because an external service provider is likely to develop generic platforms to gain revenues from global markets. Data base services for energy metering may provide options if domestic authorities set unambiguous standards for storage information. On the other hand, metering information storages may hold such information that private ownership is not a convenient approach. The private information sources may limit information sharing for guidance and consultation purposes, which has a significant role in steering overall energy efficiency. In this, supporting service providers, public or private, to develop information sharing platforms have a role, because a sustainable change in customer behaviour requires both technology platforms and accurate information to create personal incentives.

4.2 Intelligent medical management concept

There is a widely recognized problem in health care services; how to arrange services in situation where unit prices are growing along with the demand. To open this problem we have conducted a future oriented large study among the health care specialists (Vanhala et al., 2011; Kytölä et al., 2011; Immonen et al., 2011). The primary aim of the study was to increase and harmonize understanding about the future challenges that are facing the healthcare sector and especially homecare services. This study introduces the future oriented analysis of the service system of intelligent medical management that also uses the smart home platform.

New solutions to the increasing problems have been searched for from the innovative use of technologies to assist the elderly to live at their homes instead of the need for institutionalization. One important part of the whole system is to rethink the pharmaceutical supply chain and home care: allowing the re-organizing of the supply chains through regulatory changes and increasing the use of technologies to assist the patients in home care.

The key drivers of the market development in new health care services can be summarized to following list (Vanhala et al., 2011; Kytölä et al., 2011; Immonen et al., 2011):

- Growing amount of elderly people in western countries
- Advanced technologies – support for intelligent customer interfaces
- Increased demand of homecare services
- Raising unit costs of healthcare services

The problems in this sector are not solvable by any single solution or service, but in the home care services there can be seen great saving potential that is enabled by automating services. The service areas that this kind of integrated service concept can best serve are maintaining personal health and hygiene, maintaining social contacts and improving safety at home (Vanhala et al., 2011).

4.2.1 Business scenarios of pharmaceutical supply

In developed countries the pharmaceutical supply network is well regulated and the participants and their roles well-known. This mostly forms the environment in which to operate. As the regulation has been quite unchanged, the roles and business models of individual participants have stayed mostly the same after their formation: the competition within the network has mainly come from inside the value network and there have not been pressures from outside the network. Some of the additional services have been formed to support the network, such as the information services that assist the patients in their treatment.

The cost side is mainly driven by the governments' will to decrease the costs or at least restrain the rising costs. Also, the government is willing to keep control of the medicine supply, especially the prescription medicines. On the other side the customers want to get better services and the health care personnel strive to improve the monitoring of the patients' treatment. To fulfil the requirements and development needs of all the parties, the whole pharmaceutical supply network faces challenges and all the participants in it try to match their offerings (individual business models) in the best possible way to fit the needs and the environment.

The current model moreover tries to be one-for-all, without paying any real attention to the customers and their needs. One of the issues with the current model is also that the resources available are in the wrong use: for example, home care personnel driving around or a pharmacist waiting for the next customer are wasted resources inasmuch as they are not doing what they are trained for. Also, the technologies affecting the health care value network can be easily utilized in other countries as well. These factors create a good starting point for studying the scenario further, and we suspect there are lots of efficiency improvements to be gained by splitting and reorganizing the current system. The scenario axis in our analysis is regulation. Either the current regulation holds and the market will have a very little changes, or the regulation is directed to allow a better optimized network structure for pharmaceutical supply and treatment.

Scenario 1: Regulated monopolies

- The health care services are operated by government supported regional monopolies and the pharmacies stay in control of the medical supply.

Scenario 2: Competition allowing regulation

- The competition is allowed in health care services and medical supply. Advanced technologies, consolidated standards and open business networks will change the business towards more driven by customer needs.

Currently drugstores are in a central position in the material, information and cash flow of prescription pharmaceuticals. Limiting the possibilities of delivering prescription pharmaceuticals to the shop (pharmacy) or public health care professionals (home care), the current legislation also demands that information be delivered to the customer about the prescribed medicine as to how to use them and about their effects by either of the two.

4.2.2 Future value networks of pharmaceutical delivery

We have mapped the networks in form of value chains to show the structure of business in the scenarios. The value network in scenario 1 follows the current situation in Finish market. The mapped business model of the intelligent medical management concept is shown in Figures 6 and 7. (See Immonen et al., 2011 for detailed analysis of the services)

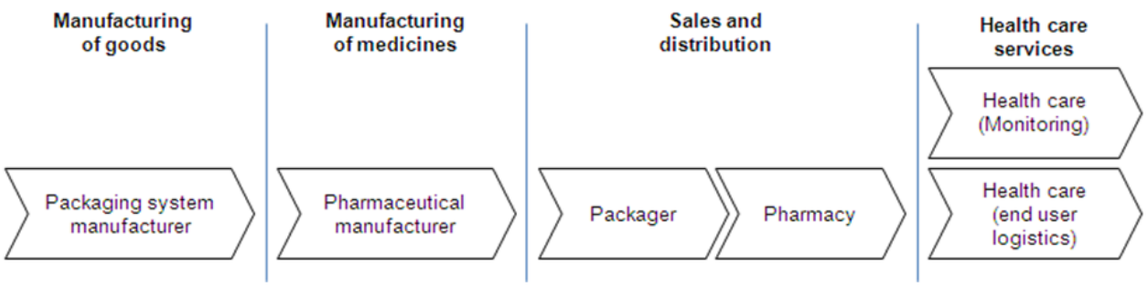

Fig. 6. The value chain of medical delivery in scenario 1

The current pharmaceutical delivery in Finland is arranged basically with two concepts. The first one is the traditional pharmacy and the other one is the home care concept which also needs the pharmacies. The ultimate difference between these concepts is the logistics of the

medicine to the end-customer. In the pharmacy concept the end-user picks up the medicine and in the home care concept a nurse delivers them to the customer's home. In the scenario 1. development path there can not be seen any radical changes in the industry. The industry seeks the leanest possible way to make profits and it usually means downsizing the services and therefore worse customer value.

The regulation that would allow competition and alternative operators in pharmaceutical delivery would create new business concepts. This would be the situation in scenario 2: competition allowing regulation. The analysis of intelligent medical management concepts (see: Vanhala et al., 2011; Kytölä et al., 2011; Immonen et al., 2011) resulted with two plausible service models:

- Medicines through postal services
- Self-service medicine store

The main issue in the new concepts is how the services are executed: by utilizing automated services that are enabled by the technology to replace most of the overlapping work of the health care professionals. In the *Medicines through postal services* concept the medicines prescribed by the doctor(s) are packed by the dispenser in a personal package which is then delivered by secured mail directly to the customer. The package contains the different medications, the compatibility of which is automatically checked before packaging, as well technologies to link the package and its contents to information databases to guide the usage, including alerts and monitoring. The *Self-service medicine store* concept relies on similar technologies to assist and monitor the usage, but the package itself has to be picked up from a store or kiosk where the vending machine recognizes the customer by an electronic ID and fetches the prescriptions from the database and gives the medicines to the customer. This can be operated by for example the pharmacies.

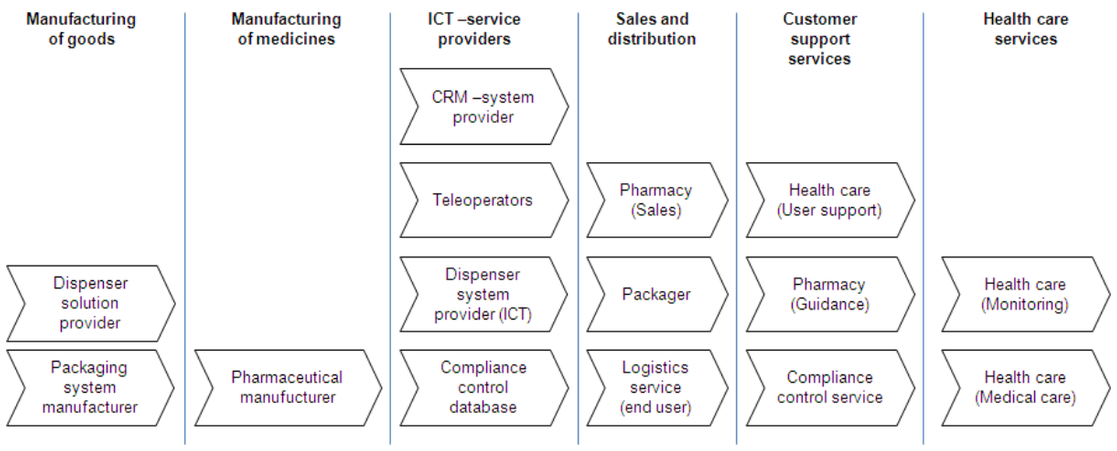

Fig. 7. The value chain of intelligent medical management

These new concepts create possibilities for new business which utilizes information and knowledge storing and sharing by different communication methods. To make the concepts even possible there are also opportunities for the system providers, which need to build the systems for these purposes replacing the old ones and connecting them all to a working concept. The most threatened single business in this scenario seems to be the

traditional pharmacy, as many of its current tasks and functions are either shared or moved to other operators or businesses. One such business could be the medicine information service that provides the customers with 24-h service about the medication they are using. It is still more likely that the traditional pharmacies stay in the future as well, but they need to reconsider their role within the network and make the needed adjustments, e.g. improve their efficiency by concentrating on their core functions, to stay in business in the longer term.

5. Conclusion

This chapter opens the emerging business area of home centred services. Especially we focus on smart homes as service platforms and we use health care and energy services as examples of services that can use that platform. This study contributes mainly on service management literature (e.g. Vargo & Lusch, 2008).

The smart home framework revealed links between conventionally distant business areas. Therefore, assessing actor networks of the smart home business was challenging, because available databases did not provide support the research. The business networks were researched from Finnish aspect using public information available on authorities and firm internet sites. We also used expert panels to validate the service mapping process. The analysis presented that public organizations dominate service markets leading private markets very fragmented. The smart home technology market is on emergent state and clear key actors do not exist at present. Actual public procurement politics that directs to purchasing specific solutions and low price without considerations about spill-over effects into supplying industries was suggested one reason for fragmentation. The public actors (i.e. health care organizations, energy companies, local and domestic authorities, and regulators) has important role in driving consolidation of the smart home business networks. Longer term partnerships with service providers for creating key suppliers, translating user needs into service and product specification, and appropriate standardizing of technologies are the expedients to increase competitiveness of service and solution markets. The key implication is that especially national regulation and funding of technology development should be refocused from development of specific technologies to integrated platforms, which support diffusion of both home systems and related service businesses.

Governments are in the position to adjust the regulation and subsidies towards chosen objectives. In most industrialized countries prescription pharmaceuticals are controlled by the governments the whole way from the manufacturing to the consumption and even disposal. This affects the competitive dynamics of the whole value network and may even freeze competition allowing the rise of the overall costs of national health care and energy supply, which fall on taxpayers, if subsidized like in many European countries. Therefore governments should investigate the different possibilities to arrange the electricity and pharmaceutical supply as well as the subsidizing of the use of new technologies to assist and control the service provision to keep the increasing costs in control.

Allowing the restructuring of the pharmaceutical supply network would radically change the current dynamics within the network. Each individual participant of the network and their own business model would need to adapt to the new situation. The companies within the network need the capabilities to take advantage of emerging opportunities. This

dynamics opens up possibilities for new entrances in the network, which fill up the roles required for the whole concept to work. Such are e.g. postal service providers, which possess the capabilities to transform their services to fit the traceability and security requirements, as well as information technology integrators, which can turn their existing capabilities to build the information systems for the assistance and monitoring of treatment. The old participants need the capabilities to either transform their former roles into new ones within the network, e.g. from a wholesaler to a dispenser, or to specialize further, e.g. from a pharmacy to medicine and treatment information services.

The smart home platform allows the management of different services and the energy services are a good example of this. The environment in which services contents are defined basis of end-user needs drives radical changes of energy metering, consumption control, and maintenance and fault situation management businesses. However, role of public sector and authorities should be analyzed carefully, because it may have impacts on service market functionality on long term. This concerns especially metering data storage, and other end-user information. For speculation, public owner of metering data may enable more open structures in the markets in which private sector utilize gathered data for service operations. Otherwise, fragmentation of user information may prevent successful implementation of optimization, monitoring and guidance services of energy consumption. Indeed, privatized metering data storage may lead situation in which a single firm create strong barriers for competition. In general, closed systems presumably lead higher prices, low functionality, and low diffusion of energy saving services for threat of customer lock-in, which is important obstacle for market emergence.

Finnish energy industry has recently launch research programmes on intelligent power grids in which energy metering has its role. Energy metering is researched in those programmes from techno-economic perspectives where specific needs of energy distribution are in pivot. Linkages between specific metering service structures and general intelligent home concepts are probably not in focal point, because actual research drives monopoly driven services. Thus, risks of inappropriate systems designs and fragmented information exist from the customers' point of the view.

Generally in this kind of future oriented studies utilising different group decision and expert panel methods, the results can not be generalized as such. The processes are repeatable but the results depend on the context and the respondents. This limits the reliability of the study. To increase the reliability of the results the further research should utilize for example pilot platforms and services and study the operating services.

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New Technologies - Trends, Innovations and Research

Edited by Prof. Constantin Volosencu

ISBN 978-953-51-0480-3
Hard cover, 396 pages
Publisher InTech
Published online 30, March, 2012
Published in print edition March, 2012

The book "New Technologies - Trends, Innovations and Research" presents contributions made by researchers from the entire world and from some modern fields of technology, serving as a valuable tool for scientists, researchers, graduate students and professionals. Some practical applications in particular areas are presented, offering the capability to solve problems resulted from economic needs and to perform specific functions. The book will make possible for scientists and engineers to get familiar with the ideas from researchers from some modern fields of activity. It will provide interesting examples of practical applications of knowledge, assist in the designing process, as well as bring changes to their research areas. A collection of techniques, that combine scientific resources, is provided to make necessary products with the desired quality criteria. Strong mathematical and scientific concepts were used in the applications. They meet the requirements of utility, usability and safety. Technological applications presented in the book have appropriate functions and they may be exploited with competitive advantages. The book has 17 chapters, covering the following subjects: manufacturing technologies, nanotechnologies, robotics, telecommunications, physics, dental medical technologies, smart homes, speech technologies, agriculture technologies and management.

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