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Network-centric business models for health, social care and wellbeing solutions in the internet of things

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ABSTRACT

In this multiple case study we analyze solutions based on connected devices in the context of health, social care and wellbeing. Based on the consideration that a solution is a combination of services and products, we build on the notion that business models can be studied at a firm-level and also at a network-level. The network-level analysis is used to motivate the reasons why solutions emerging at the intersection of the healthcare and the ICT industries benefit from collaboration among different actors. We conclude that the firm- and the network-level development of business models provide alignment in the business network and are useful to establish the relation that technological component have with overall solutions. Our findings suggest that some component bring novelty in the final offer without affecting the ongoing operation, while other component aim at improving the internal working processes, with minimal effects on the final offer to end users. We discuss the benefits of a network-level perspective for each case.

1. Introduction

In this paper we analyze solutions based on connected devices in the context of health, social care, and wellbeing. By connected devices, we refer to sensors and wearable devices connected to the Internet. These devices are a fundamental aspect of the emerging Internet of Things (IoT), which is sometimes referred to as the next revolution for the Information and Communication Technologies (ICT) (Porter & Heppelmann, 2014). Solutions based on the IoT generally include sensors that collect information which is sent and processed in cloud analysis engines. This information is then made available to different users and system.

Considering the IoT as an enabling set of technologies, they make possible the development of solutions that provide flexibility, scalability, and novelty for customers and end users. In the healthcare context, the IoT is perceived as a key enabler for a transition towards preventive care and wellbeing solutions (Free et al., 2013; Schraefel & Churchill, 2014); aimed at the automation of working processes, reducing healthcare expenditures, and enabling novel services for the self-management of health.

In practical terms, developing these services requires a combination of resources and competences from different fields (in particular, from healthcare sciences and ICT engineering). In other words, the value creation process is not limited to single firm boundaries; it is rather considered that value is co-created among different actors that belong to a network (Nenonen & Storbacka, 2010; Vargo, Wieland, & Akaka, 2015). As Hakanen and Jaakkola (2012) conclude, the effective co-creation requires customers and suppliers to understand and align preferences, needs, and capabilities. This is particularly relevant when solutions are developed at the intersection of different industries, where technology innovation needs to be combined with new concepts and ways to interact among actors (Bouwman, De Vos, & Haaker, 2008).

The benefits of collaboration in business networks are a well investigated area. The topic finds a renewed interest in the development of solutions based on connected devices and the IoT, where there is a clear cross-industrial interest. It is uncommon for actors in the ICT domain to enter the healthcare market without a strong collaboration with actors that are already involved in the healthcare domain, and vice-versa.

However, Nikou and Bouwman (2017) argue that studies on healthcare solutions based on mobile technology have had a strong focus on the technological component on business models, and non-technical aspects such as value proposition, organizing, and revenue models have not received the attention required. We agree with this claim and further consider that many solution developments lack a clear value proposition at early development phases, and are usually guided only by technology possibilities. Moreover, research on business models has given attention to concepts and approaches in strategic

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management, but empirical–contextual–research is largely missing (Bouwman, Molina-Castillo, & de Reuver, 2016). This is particularly accentuated on the use of business models in the development of services and solutions within business networks (Palo & Tähtinen, 2013).

Therefore, the overarching question guiding this research is *How can a network-level perspective be used in business model design for solutions based on connected devices in health, social care and wellbeing*? We consider multiple case studies in the areas of social care and wellbeing in order to provide an answer. We discuss, based on empirical data, how the business opportunities are addressed from a network perspective in solutions based on the IoT. We consider the emerging topic of business model development from a network perspective. Business models from a network-level perspective cover the creation of a common value proposition when there is resource dependency among actors from different industrial sectors. The case studies are analyzed considering the network level aspects of the business models, with emphasis on the actors brining a novel IoT component into existing services in social care and wellbeing. The main contribution of the paper is on empirical support for research on network level business model, which has been deemed a required work in this topic (Bankvall, Dubois, & Lind, 2016; Palo & Tähtinen, 2013).

Our findings suggest that the benefits of a business network perspective largely depend on how the technological components relate to existing services in the areas of social care and wellbeing. These technological components can either improve an existing service by automating internal working processes, or they can enable novel value propositions and convenience to end users. In general terms, the collaboration in the network can be used to improve the efficiency without an original intention to change the service offering, or it can be used to create additional value and differentiation in the service offering, without affecting the internal logic of the service delivery.

The remainder of this paper is organized as follows: in the next section, the theoretical background is presented, emphasizing the emerging notion of business models in networks. This is followed by a description of the research design method, including the selection of case studies, the data collection strategy and the data analysis process. Afterwards, the four case studies that build this research are presented in detail. This is followed by a cross-case comparison and analysis of the findings. In order to generalize our findings, we then compare our cases with other solutions available in the market. Finally, the conclusions and implications are presented in the last section.

2. Theoretical background

To study a business network perspective for digital technologies and connected devices, we consider that value emerges at the intersection of the resources and the capabilities from different actors (Jaakkola & Hakanen, 2013; Lusch & Vargo, 2006), including customers as co-creators of value (Lusch, Vargo, & O'brien, 2007). Also, we consider that the effectiveness of companies depends on how they implement business models that can address evolving customer values (Carbone, 2009). The study of the value creation process from the perspective of a single actor provides limited understanding regarding the value creation for the customer, since solutions are an ongoing combination of activities and resources among diverse actors who integrate their resources (Jaakkola & Hakanen, 2013) and labor activities (Ehret & Wirtz, 2010).

Normann and Ramírez (1993) refer to value constellations, or value networks, as a model to emphasize the perspective on the overall system, with focus on the value creation. The concept of value networks has been applied to the study of product, service, innovation, and knowledge flow (Basole, 2009). A similar concept regarding a constellations of actors is business ecosystem, which is originally defined by Moore (1996) as "the network of buyers, suppliers and makers of related products or services". This network is bounded within a socio-economic environment which includes the institutional and regulatory frameworks. The business ecosystem perspective makes emphasis on the interconnectedness and the interdependence among economic agents (Anggraeni, Hartigh, & Zegveld, 2007), where individual activities share the fate of the whole (Moore, 2006). It has been commonly suggested that a business ecosystem is developed around a core, which corresponds to shared and common assets, such as platforms, technologies, processes, and standards (Iansiti & Levien, 2004a, 2004b; Mazhelis, Luoma, & Warma, 2012).

We can draw parallels between the business or value networks (Halinen & Törnroos, 2005) and the concept of business ecosystem. The business ecosystem can be conceptualized as a group of interdependent economic actors which simultaneously create and capture value by combining its resources; it aligns around one or more central firms or platform (Moore, 1996; Muegge, 2011, 2013; Valkokari, 2015). According to Heikkilä and Kuivaniemi (2012), the key difference between business ecosystems and business networks can be seen in the variety of actors involved. While business networks are regarded as firms collaborating to deliver value to a customer, business ecosystems usually include competitors, suppliers, potential collaborators, public institutions, and investing firms. Nevertheless, other scholars suggest that they can both be indeed the same object of study (Anggraeni et al., 2007). Provan, Fish, and Sydow (2007) consider that, generally, networks are bounded by organizations that have a clear and common purpose. Contrarily, Muegge (2011) propose that business ecosystems are intentional institutions where organizations self-identify as part of it. On a similar take, Vargo et al., (2015) present a service ecosystem perspective as systems of actors integrating dynamic resources with mutual value creation.

Whether taking the concept of value networks or business ecosystem, it becomes evident that not all critical challenges can be appreciated at a firm level, but rather on the ecosystem or network level (Leminen, Westerlund, Rajahonka, & Siuruainen, 2012, Leminen, Rajahonka, & Westerlund, 2015). No single actor can stir an entire network (Håkansson & Snehota, 1989). We consider the Industrial Marketing and Purchasing (IMP) Group approach to study business relationships useful; because it sees everything as an interaction and emphasizes the associations among the resources, the activities, and the actors in a network. To this end, the Actors–Resources–Activities (ARA) model proposes that firms interact on three distinct layers: via actor bonds, resource ties, and activity links (Ford, Gadde, Hakansson, & Snehota, 2006; Håkansson & Snehota, 1995). The ARA model can be used as the underlying framework to represent the interaction across multiple organizational boundaries (Jaakkola & Hakanen, 2013).

In order to analyze how business opportunities are exploited by actors in a network, we consider the concept of business models. There are many definition of what a business model is, and it is commonly agreed that its objective is to exploit a business opportunity (Zott & Amit, 2010). Zott, Amit, and Massa (2011) have identified four views on the topic: (i) a unit of analysis, (ii) a holistic approach on how firms do business, (iii) a concept developed through firm's activities, and (iv) an explanation of value creation and capture. Zott and Amit (2010) discuss business models as *activity systems*, including what activities are performed, how they are linked, and who is performing them.

Chesbrough and Rosenbloom (2002) take on business models includes a value proposition and how a firm is organized and positioned to create a profit potential. For them, the objective of a business model is customer-focused value creation (Chesbrough, 2007). Osterwalder, Pigneur, & Tucci (2005) have a similar approach; their framework indicates that a business model should express the logic of a firm; describing the value a company offers to customers, the network of partners creating and delivering this value, and the logic generating profitable and sustainable revenues.

These approaches for business models include aspects such as the networks of actors and how the activities are distributed among them; they are focused on individual firms and only observe the network through that firm (Amit & Zott, 2001; Chesbrough & Rosenbloom,