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COLLECTIVE ACTION IN A SMART LIVING PLATFORM ECOSYSTEM: THE ROLE OF PLATFORM LEADERSHIP AND PLATFORM OPENNESS

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Abstract

The growing popularity of mobile and internet-based services is increasingly changing the vision of smart homes from simple home automation to advanced ICT services which are accessible everywhere. Many small and large vendors and service providers across different industries are becoming more aware of the remarkable prospects in the smart living domain. Accordingly, several services bundled with different service platforms are emerging in the market, aiming at providing elderly-care, energy management, security or entertainment services. The overwhelming number of service platforms (mostly with proprietary standards and technologies) has made this domain even more complex and doubtful for users. While collective action between actors for developing common service platforms may solve the complexity and foster adoption of these services, the challenges of cooperation hinder many actors from joint attempts. In this paper, we study how inter-organizational cooperation for developing a common service platform for smart living services emerges. Specifically, we study the influence of platform leadership and platform openness on collective action. We do so by conducting a single case study on a unique collaborative elderly-care platform development project in Finland. The case was critical as it had all the required conditions (i.e. collective action for a common platform development project in the smart living domain) to test our propositions. The results indicate the important role of a central actor or platform leader in promoting and coordinating collaboration, even in the absence of strong interdependency in the ecosystem. We also found that most of the parties are motivated to cooperate for an open industry standard platform instead of a proprietary standard platform to allow easy integration of other services and devices to the platform. However, only under certain rules, the parties open up the business ecosystem and cooperate with new companies.

Keywords: Service platform, Collective action, Smart home, Business ecosystem, elderly-care

1 Introduction

Mobile devices are not just an access channel to a specific range of services but also become integrated in the traditional concept of smart homes. Smart homes used to equal home automation but may now also be enabled by sensor technology, mobile phones and small IP-enabled devices. As a result, truly adaptive and intelligent services are becoming integrated in several industries, like health /elderly care, energy management, security and entertainment. Such growing advancements in ICT has opened up a window from inside a home to the world outside (Barlow & Venables, 2003) and thus from 'smart homes' to 'Smart Living'.

Currently, several small and large companies and service providers are becoming aware of the tremendous opportunities in this field. Accordingly, there are several attempts to offer different types of smart services to customers. However, the rational approaches of actors for service offering have led to emergence of several closed service platforms for specific types of services (Nikayin, Skournetou, & De Reuver, 2011). Such isolated approaches cause several interoperability issues and thus result in failure of these services in the market (Peine, 2009).

Previous research on smart living and smart home concepts is heavily focused on the technology aspects of smart living services, including the design of a software infrastructure (Nakajima & Satoh, 2006) or the ethnographic study of usability and user experiences of smart living systems (Koskela & Väänänen-Vainio-Mattila, 2004). However, scant attention has been paid to the organizational aspects of provisioning smart living services.

In this paper, we take a closer look at the organizational issues. In particular, we focus on the collaboration opportunities and challenges for information service providers in this domain. While service providers could choose to continue their functional and technology architecture in isolation, they could also choose to reduce their costs by sharing basic functional processes, technologies and information and communication structure on a common service platform for multiple service offering. This paper aims to answer the question of how and why collective action for developing a common service platform emerges between parties in the smart living domain. Particularly, we study how characteristics of a platform ecosystem (i.e. boundary and leadership) influence collective action for developing a common service platform for smart living services. To do so, we conduct a single case study on a unique collaborative common platform development project in Finland. The platform aims to provide different types of elderly care services to enable independent living and also reduce the increasing cost of care services in the health care sector.

The paper continues as follows. The next section provides the theoretical background on platform and collective action theories and a set of propositions which will be analysed in the case study. After that, we provide an overview of methodology used for this study. Then, in the fourth and fifth sections, the description of the project followed by findings from the case will be presented. Finally, we discuss the results and limitations of the study and we explore possible avenues for future research.

2 Theoretical Background

In this section, we apply the concepts from platform theory and business ecosystem in collective action theory to explain how collective action emerges in platform ecosystems.

Gawer (2009, p. 45) defines a service platform "as building blocks (they can be product, technologies or services) that act as a foundation upon which an array of firms (sometimes called business ecosystem) can develop complementary products, technologies or services". As such, a platform not only coordinates interaction between two or more groups of platform users, it can also create innovation opportunities for outside complementary providers to create value-added services to the platform ecosystem. Such innovation opportunities depend on the degree in which the platform is open

or closed to outside parties. The platform openness can be seen from two perspectives. From a technical perspective, a platform could be open in terms of accessing to technical specifications and standards of the core components through an API (Application Programming Interface) or a SDK (Software Developers Kits). Note that accessing to APIs or SDKs might require paying licensing fees or it could be free of charge. From an ecosystem perspective, platform openness determines which roles (i.e. platform providers, service providers, application developers, and end-users) can participate on development, commercialization and usage of a platform (Eisenmann, Parker, & Van Alstyne, 2008a). Similar to technical openness, participation in the ecosystem might need membership fees or it can be free.

Making decisions on how much to open or close a platform and the ecosystem, which is typically done by the platform providers, is critical for the growth and sustainability of the platform (Boudreau, 2006; Gawer & Cusumano, 2002). Most of the time, it is in the interest of platform providers to close the platform from outside parties "to provide better barriers to imitation and better margins" (West, 2003). Moreover, opening a platform to outside contributors may intensify competition and reduce motivations of outside parties to develop innovative products and services around the platform (Eisenmann, Parker, & Van Alstyne, 2008b; Na, 2008; West, 2003). The ecosystem literature suggests that carefully selecting actors for a business ecosystem is crucial to make a balance between cooperation and competition in the business ecosystem (Den Hartigh & Tol, 2008).

In the collective action literature, excluding collective good from non-contributors has been debated to reduce the threats of free-riders and thus stimulate collective action (Cornes & Sandler, 1996). Such exclusivity can be viewed as an analogy to the ecosystem perspective of platform boundary. From these foundations, we propose that:

P1) The more a service platform is open, the less likely that collective action for development of the service platform arises between platform providers.

To be more specific, we study the impacts of technical openness and organizational openness of service platforms on collective action.

P1A) The more a service platform is technically open, the less likely that collective action for development of the service platform arises between platform providers

P1B)The more a service platform is organizationally open, the less likely that collective action for development of the service platform arises between platform providers

Much of the literature on platform theory discusses leadership as a key factor to foster the growth of platform and business ecosystem and encourage partnership around a platform (Gawer & Cusumano, 2002; Greenstein, 2010; Huang, Ceccagnoli, Forman, & Wu, 2009a, 2009b; West, 2003). The strategies of a platform leader in building trust and benevolent forms of power has been considered as a stimulus for cooperation around the platform (Perrons, 2009). Similarly, the importance of leadership strategies for creating and maintaining a business ecosystem has been highlighted in the business ecosystem literature (Iansiti & Levien, 2004; Moore, 2006; Yan, Yan, & Ma, 2009).

In the collective action literature, it is discussed that having a collective interest is not enough for collective action to happen (Olson, 1971) and the presence of leadership or entrepreneurship is a prerequisite to overcome start-up problem (Bianco & Bates, 1990) and mobilize collective action (Sandholtz, 1993). The leader's abilities to create incentives to attract contributors (Bianco & Bates, 1990) and select the most potential ones for collective action (Marwell, Oliver, & Prahl, 1988) makes the leadership of an important role for collective action. As such, our second proposition is as follows:

P2) In the presence of leadership in the platform providers' ecosystem, it is more likely that collective action for development of a service platform happens between platform providers.

Organizations within a business ecosystem are often dependent on resources and capabilities of each other to ensure sustainable productivity and innovation within the business ecosystem (Iansiti & Levien, 2004). In the collective action literature, resource interdependency can solve the problem of

free-rider (Sheppard, Barnes, & Pavlik, 1990) and ignite collective action for the provision of collective good (i.e. development of service platform). Therefore, we propose that:

P3) The more the platform providers are dependent on each other's resources, the more likely is that collective action for provision of service platform takes place among them.

In summary, the conceptual model is illustrated in Figure 1.

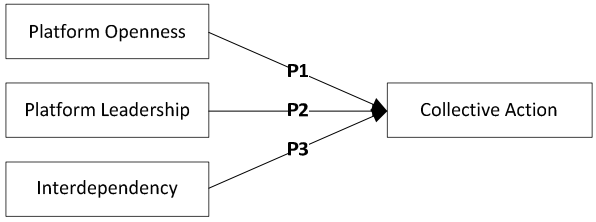

Figure 1. Conceptual Model

3 Methodology

This research deals with the main question of: 'how and why collective action for development of a common service platform emerges (or not) within a network of organizations (i.e. business ecosystem) in the smart living domain'. The case study method helps to provide a holistic and meaningful understanding of such complex social phenomenon and to answer questions of 'how' and 'why' (Yin, 2009). Moreover, it is a well-suited method to study a contemporary phenomenon in a natural setting where the knowledge of practitioners in the field are critical for developing and /or testing theories at their early stage of forming (Benbasat, Goldstein, & Mead, 1987; Cavaye, 1996).

Case study selection

We opted for a single case study design for this research to test our propositions. Typically, finding a collaborative common platform development project in the smart living domain is quite challenging as not much collaboration is going on in this domain. Therefore, a single case that meets all the conditions for testing the propositions would help us to determine whether the propositions are correct and if there are alternative explanations for the propositions (Yin, 2009). The conditions for choosing the case were: 1) Main focus on a collaborative platform development at least for a specific type of smart living services 2) More than five companies involved for the common platform development 3) The key informants of the case should be accessible for interview.

Active Life Home is a Finnish collaborative common platform development project for elderly and healthcare services, which are a subset of smart living services. The main purpose of the project is to enable the care and assistive systems and services of various companies to work coherently together. The project aims to solve two major problem areas for the users of assistive devices and information services: 1) To integrate the devices and related customer data into one common service platform and 2) to set up a marketplace where solutions of multiple companies are presented so that right combinations can be selected based on each customers individual needs.

Fifteen companies, developing assistive devices and related service packages like medicine reminders, alarms, notifications, activity and sleep quality trend analysis, and location tracking, participate in this collaborative platform development project in an attempt to integrate their specific services (currently running on separate platforms) into a common service platform to be used by care service providers and end-users. Furthermore, three departments of Aalto University are also involved in this project.

Data collection

In this study, we triangulated multiple sources of data including interviews and documentary information. Interviews are the main source of data and documentary information (e.g. emails,

announcements, written reports of events, proposals, progress reports) are the secondary source of data in this study. We did not merely rely on the resources available in the cases, but also consulted related documents and information available online, such as news or scientific publications by other researchers.

The unit of analysis in this research is the socio-technical system that comprises platform providers (i.e. organizations that are involved in development of a common service platform) and their platform-specific technologies. Although we collect data on organizational level, the outcome of the study and the results are on the network level.

Interview protocol

We interviewed 10 people, mainly decision makers and/or project managers who are involved in making strategic decision for the companies. We also interviewed people with technical background to discuss the issues of collaboration from technology architecture and infrastructure point of view.

Data analysis

First, we taped and transcribed all the interviews. Then, we open coded the transcripts using Atlas.Ti software; having theoretical concepts in mind and paying attention to other possible explanatory factors. Atlas.Ti helped us to improve the rigor of data analysis (Kelle, Prein, & Bird, 1995). However, we avoided too much relying on the software as it may lead to a quantitative data analysis rather than qualitative analysis (Seidel, 1991). In addition to coding, we used several memos to document our interpretations of the case. We also drew causal network diagrams to illustrate the causal relationship between codes to better explain the core concepts. For the causal networks, we used 'Code Family' in Atlas.ti to connect the codes that are conceptually related. After all, we fairly elaborated our findings through constant communication and discussion with one of the board members of the project.

4 Background of the case

In Finland, as in many other countries, the share on elderly people in the population is increasing and the need for their wellbeing and healthcare services is rapidly growing. At the same time the supply for these services is not increasing at the same pace due to increasing costs and shortage of trained personnel. Modern wellbeing ICT technology can assist in creating smart services which enable independent living for elderly people and assist care providers to work more effectively.

Active Life Village Ltd. is a non-profit company which has been founded to promote the creation and commercialisation of innovative ICT technology assisted wellbeing services. Active Life Home project is one of the main projects that Active Life Village is currently working on. The project, which is in the research and development phase, has been funded by Tekes (the Finnish Funding Agency for Technology and Innovation

Platform specifications

The concept of Active Life Home (ALH) service platform is that elderly people can use several devices which each connected to the information services of that specific vendor. The platform realizes integration on three levels: The user interface level (ALH Portal), the information level (Activity and Health Record, AHR) and the device level (Home Gateway, VALPAS).

The ALH portal has a user database of different user groups like elderly persons, their families, nurses, doctors and other caregivers, administrator, etc. The portal manages access rights to various services and provides single-sign-on to vendors own systems. The user interface has been implemented as portlets on the portal so the user has access to all services from one screen. ALH Portal is developed by Aalto University Media Laboratory and is using Liferay open source portal.

The AHR is a key integrator of data collected of the elderly persons and their devices. Each device vendor has opened its server APIs to enable collection of relevant high grained data into the common

database, AHR, provided by Playground Ltd. AHR, also accessible from the ALH portal, show the collection of data, the current status and recent events of a selected customer.

Most device vendors have some kind of home gateway which connects their devices into the server in their data centres. Elderly persons with multiple devices would end up in having multiple gateways in their homes. To avoid the added cost of gateways and their management, ALH framework is providing integration at home level, VALPAS home gateway which is developed by Aalto University.

Business ecosystem

Active Life Village (ALV), a non-profit organization, is the leader of Active Life Home project. The other participants have the following roles: 1) Vendors of devices, which monitor the health status of the person, create data and store it into their servers and display it for analysis, 2) Vendor of Active Health Record, Playground, which has a key role as an integrator of the data from other companies' servers, 3) Three Departments of Aalto University, developing the ALH Portal and the home gateway and modelling the overall platform architecture and business model of the ALH portal.

5 Results

5.1 Findings from the interviews

Platform openness and collective action

Regarding to technical openness of the platform, one interviewee responded that "the platform is open and free to those companies who are already members of the project". Another interviewee said that "It is open in a sense that it could be the industry standard interface platform", however, "it is not open in a sense that it is free[…] meaning that technically it has open interface, so that we can integrate new products or services on the IT system level to the platform", as put by another interviewee. Generally, most of the interviewees agreed that it is an open interface service platform based on open standards, but it would not be free. One interviewee mentioned that the platform could be licence-based, but the other respondents did not know how open it should be and how the pricing structure should look like.

With regard to the impacts of technical openness, a project manager at ALV said that "the companies are more willing to take part in the project when they know it is an open platform […] many of the companies have done closed platform development and they have seen that this is not the smartest way for the future". Most of other interviewees also perceived the platform openness as a "stimulating factor" for cooperation. However, one interviewee stressed that "I don't know if platform openness could make that much difference in the development phase […] that would matter if the platform could position in a market and in that case, it would be a good idea to open up the platform". Figure 2 shows the causal network for technical platform openness.

From a business ecosystem point of view, there are rules and agreements for organizational openness. A project manager in ALV responded that "for newcomers who would like to join, we need agreement of at least more than half of the companies to accept the new members". Moreover, four interviewees emphasized that a new member is only accepted if it complements their solutions or offer considerable benefits to the platform; otherwise "free-riding is not favoured at all". For instance, when the project was already halfway, ALV introduced a new company that could bring value to the project and then upon agreement of most of the current members, the new company could join the consortium.

According to a project manager in ALV, the organizational openness "could be a stimulating factor for cooperation […] because the way we have marketed the project for the members is that we need to have an open platform or industry standard…this actually implies that the companies were interested in that and thus they joined". Other interviewees said that organizational openness matters for us "to complement our service offering" and "having more credibility in the market". Figure 3 shows the causal network for organizational platform openness.

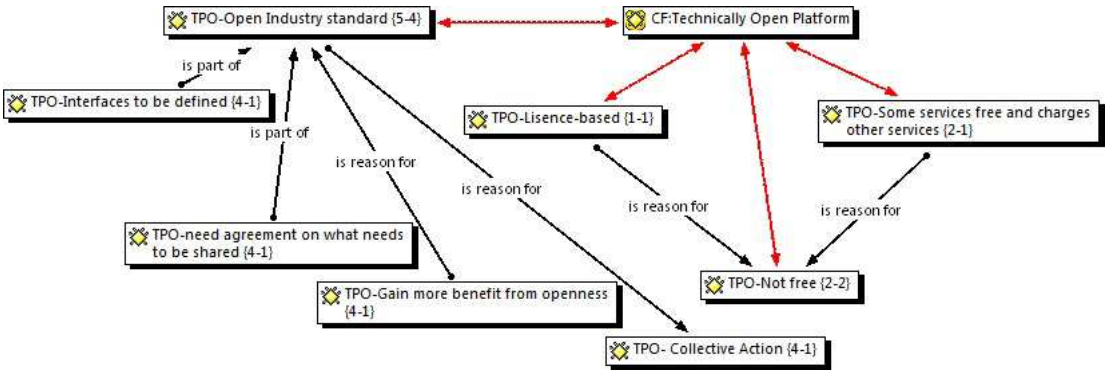

Figure 2. Technical Platform Openness (TPO: Technical Platform Openness; CF: Code Family)

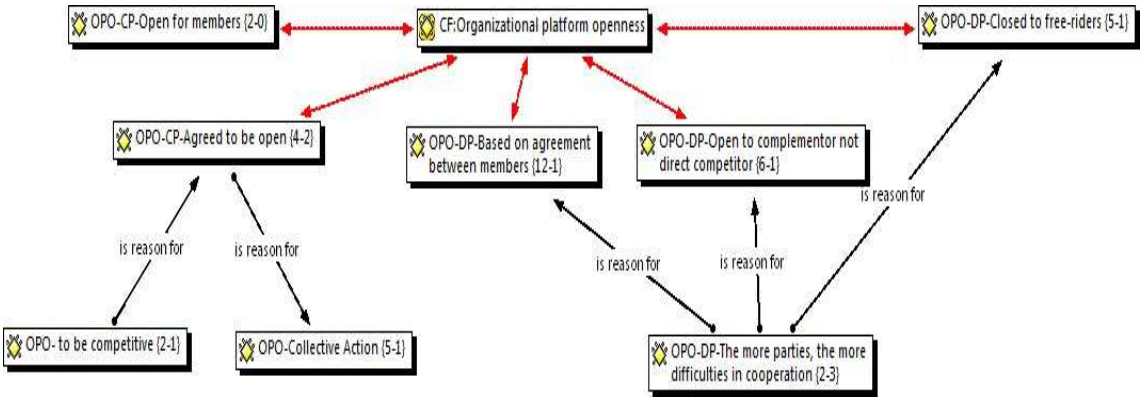

Figure 3. Organizational Platform Openness (OPO: Organizational Platform Openness; CP: Commercialization Phase; DP: Development Phase; CF: Code Family)

Platform Leadership and collective action

The participating companies in the project generally perceived ALV as the leader of this collaborative project. When we asked the interviewees about the specific role of ALV, they commonly agreed that ALV is the platform leader that coordinates the project, facilitates development, supports finance and does the marketing of the project. These responds were aligned with the responds of interviewees from ALV who saw themselves as coordinator, facilitator and driver of the platform development project.

According to the managing director of ALV, the mission of the company is to promote and support the common interests of the participants. They do it by "looking at different parties' and partners' interests and trying to align the interests so that we can work with parallel interests", as one interviewee said. Another interviewee put that, "they drive the project with soft values […] not hard values, like forcing the companies to participate and/or bringing lots of money on the table and say just do this plan".

Despite the general positive opinions of interviewees about the leadership of ALV, one interviewee emphasized that ALV does not have enough knowledge of what companies can really offer to customers and there is a lack of knowledge about customer requirements in the company.

Regarding the influence of leadership on cooperation, most of the companies agreed that the cooperation emerged just because of ALV and if there was not such central actor to promote and coordinate the project, it was unlikely that these companies just come together. Figure 4 illustrates the causal network for the leadership concept.

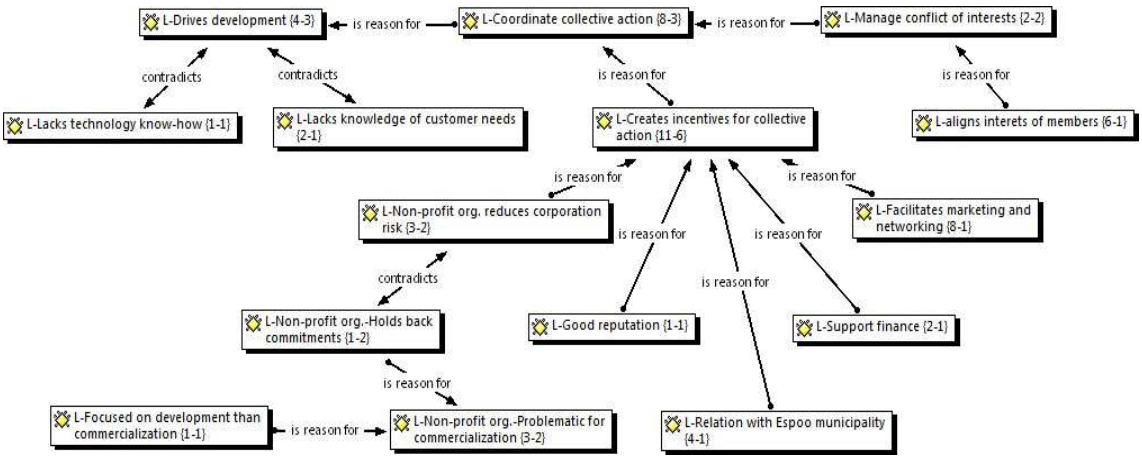

Figure 4. Leadership (L: Leadership)

Business ecosystem interdependency and collective action

The interviewees were quite sceptical about any interdependency among companies in the business ecosystem. In fact, they considered themselves "self-efficient" and "non-dependent on any company" for service offering to their customers.

However, when we asked them about interdependency for this particular project, they admitted that they need each other for the final platform solution, as one person responded "we would need our partners otherwise we cannot provide the final solution". Apparently, each of the companies in this project provides somehow different devices and services and we often heard interviewees saying that the common service platform is a key added value to their offering and gives them a distinct competitive advantage compared to other companies with similar offerings. This implies that all companies are dependent on each other. However, this is a kind of "loose interdependency" in which each company in this ecosystem can be replaced by other equivalent companies.

The interdependency was stronger for Playground Company and Aalto University. One interviewee from Aalto University said that we "need to know the interfaces of the devices and services" provided by companies so that we can develop the shared home gateway and the portal. For Playground, it is important to have at least "more than five companies" to do the integration. In fact, "Playground cannot provide any value to the customers without having several sources of data", as said by one of the interviewees.

According to the coordinator manager in ALV, there was no interdependency at the beginning and the interdependency appeared as a side effect of collective action, not an influencer of collective action. However, "the fact that the companies get finance from Tekes is critical and should not be ignored", said by one of the interviewees. Figure 5 shows the causal network for the interdependency in the business ecosystem.

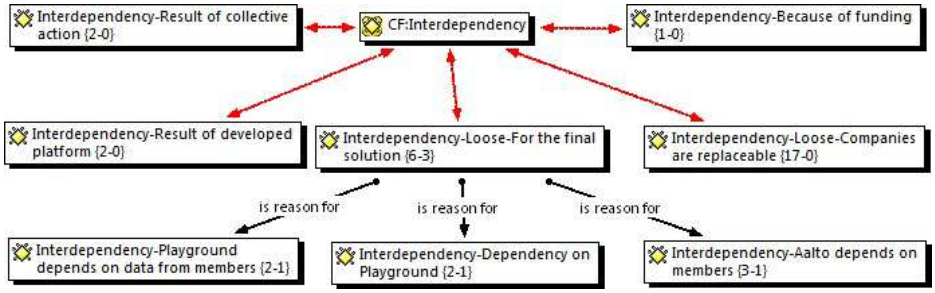

Figure 5. Interdependency (CF: Code Family)

5.2 Conceptual Analysis

Regarding the technical openness and access to the technical specification of the platform, we found from interviewees that the platform is meant to have an open industry standards interface. This means that in the beginning participants agreed that when the platform would be developed, new products or services can be integrated on the system level. However, for new companies, accessing to API would not be free of charge. When it came to using the platform's data by care providers, it was still not clear how the pricing structure would look like, but they generally assume that there would be charges for that. In fact, having a totally open and free platform (i.e. technical openness) was not favoured by the companies to participate in collective action.

Regarding the organizational openness, the companies generally considered ecosystem as open but under special conditions. They said that if there are interested companies *with value-added product or services and not direct competitors of any of current members*, then they are welcome to join and connect to the common service platform. Moreover, a new member would be accepted upon agreement of at least 50% of the current members, according to the project manager. This implies that the platform is not organizationally open. The participants are concerned with the free-riding issues and they tend to be picky about which companies they allow to take part in the development. *Therefore, there is a negative causal relationship between platform openness (i.e. both technical openness and ecosystem openness) and collective action thus confirming the first proposition.*

Proposition 1:Supported

With regard to the role of leadership in facilitating collective action, *we found a positive relationship as it was proposed in our second proposition.* The majority of the respondents was absolutely positive about the role of ALV as the leader of this platform development project. In fact, the cooperation emerged because of ALV. The companies got to know about the project from this central actor. This can also be explained by the fact that these are all small companies with not much visibility. So, bringing together these small companies together would not have happened without a central actor that promotes, manages and coordinates cooperation.

Proposition 2: Supported

We found loose kinds of relationships and interdependencies between partners. Although they need cooperation for the final integration of the platform, they do not have any tight interdependency between each other. This means that any company in the ecosystem can be replaced by another company providing similar solution, except PlayGround, as there is certain degree of dependency between device providers and Playground that provides the common service platform. From this finding, we conclude that *our third proposition is not supported as we saw that collective action emerged between these companies even in the absence of any specific interdependency at the beginning.*

Proposition3: not supported

6 Discussion and Conclusions

This contribution integrates insights from platform theory and collective action theory to examine inter-organizational cooperation in the domain of smart living. As mobile is becoming part of everyday life and cutting through each established industry, such collaboration issues between organizations will only become more important in the years to come. While previous research on smart home and smart living concepts mainly focus on technical aspects, this paper deepens our understanding of organizational issues in this domain. Furthermore, the paper aims to provide insight about factors that need to be taken into account by practitioner in the smart living domain when planning to start cooperation for a common service platform.

The main finding of the case is the prominent role of leadership is establishing collective action and developing a common service platform. This result is in line with earlier research on the importance of platform leadership in other industries, such as computing industry (Boudreau, 2006; Gawer & Cusumano, 2002). Additionally, we found that not just any actor can take the leadership role. Also, the strategic position of the leader of a collective action appeared to be crucially important. In this case, ALV has close relationship with municipality of Espoo city and in Finland municipalities are responsible for providing elderly-care services. As such, this makes ALV as a magnetic channel for many companies, especially small ones, to access to customers. In fact, this was also one of the important reasons for motivating companies to start cooperation with ALV and thus with other companies in the project. From these results, we could conclude that having a leader with cooperation-oriented strategies in a platform ecosystem can facilitate emergence of collective action for a common service platform in the smart living domain.

The organizational openness of a common platform also appeared to be important for cooperation, as the companies were concerned with threat of new competitors in the ecosystem. However, we saw that the technical openness of the platform had not been completely defined in the beginning. The only thing that the companies were clear about was that the technical specification of the platform and the interface would not be freely accessible for other non-member companies, but they did not know how it is going to be controlled (i.e. license fee or IPR policies). It is probably because the platform is still in the development phase and there is not a clear business model that explains how the platform should deploy in the commercialization phase. Still, we could see that a completely open platform (i.e. free with no control) is not encouraging and the partners are cooperating under an assumption that the platform would be closed to keep their competitive advantages over non-contributors. Therefore, we can conclude that setting organizational and technical boundary for a common platform persuades companies to participate in the platform development. The boundary does not mean that the platform should be totally closed, but there should be rules to keep competitive advantages of contributors over non-contributors (Eisenmann, et al., 2008b; Na, 2008; West, 2003) and discourage free-riding behaviour (Cornes & Sandler, 1996).

The interdependency between companies did not appear to be very determining for collective action in this case. However, we can not generalize that interdependency is not a vital factor for collective action. It may play an important role in commercialization phase when there are customers for the platform and thus partners are more dependent on each other to provide solutions for customers.

Nevertheless, this study suffers from two main limitations. First, we just focused on three aspects of collective action and we did not address other facets of collective action, like motivations and effects of heterogeneity of interests and resources (Marwell, et al., 1988). One direction for future research is to explore other explanations of collective action in the smart living domain. The second limitation, which is the drawback of all single case studies, is that we cannot provide a generalized conclusion from our findings (Yin, 2009). One way of solving this issue is to do multiple-case studies in future research to have cross-case comparisons. For instance, comparing energy and healthcare domains or comparing different countries for effects of cultural issues on collective action.

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