Opening Up the Smart Home:
A Classification of Smart Living Service Platforms

Fatemeh Nikayin, Department of Technology, Policy and Management, Delft University of Technology, Delft, The Netherlands

Mark De Reuver, Department of Technology, Policy and Management, Delft University of Technology, Delft, The Netherlands

ABSTRACT

Emerging technologies like sensors, mobile devices and internet-of-things enable a new range of smart home services that go beyond simple home automation. The service platforms, on which these services run, are highly disparate based on different technological as well as organizational architectures. In this paper, the authors adopt a platform perspective to classify 42 major currently offered smart living service platforms. The authors analyze the platforms along two dimensions: where the intelligence of the platform is located in the technological architecture (i.e. at user's premise, in the cloud, on the network or in between) and openness of the platform toward third party service providers which has implications on potential network effects. The authors found that most platforms are located in the user's home and are kept closed for third party service providers, while only a few cloud-centric, open platforms exists in the market. The authors argue that smart living provides an interesting avenue for studying platform concepts given the diversity of the organizational and technological arrangements of smart living platforms and the conflicting views in literature as to how openness and technical architecture impact innovativeness and viability.

Keywords: Cooperation, Organizational Openness, Service Platform, Smart Home, Smart Living, Technical Openness

INTRODUCTION

We are entering the era of smart living in which advanced technologies like sensors and mobile equipment will bring information systems even closer to the homes of consumers (Arnrich, Osmani, & Bardram, 2011; Gaggioli et al., 2011; Vassis, Belsis, Skourlas, & Pantziou, 2010). For example, ICT-enabled energy management services can provide insight in energy consumption patterns and energy costs as well as enable controlling appliances from outside the home (Ren, Li, & Ji, 2011; Weiss, Staake, Mattern, & Fleisch, 2011). Similarly, interactive systems and positioning technologies enable various health-related services to enable patients or elderly to live independently at their home, ranging from remote monitoring, to assisting, supporting and emergency systems (Oh, Rizo, Enkin, & Jadad, 2005). There are also security services, as well as telecommunication services, like Interactive TV, HDTV

and video on-demand (VoD) services. As such, the vision of 'Smart Living' goes beyond the traditional view on smart homes of mere home automation (Spinellis, 2003) and involves several services that take advantage of in-home sensors, IP devices, mobile devices as well as indoor and outdoor navigation and communication services (Nikayin, Skournetou, & De Reuver, 2011). Obviously, what is "smart" depends on time (Weiser, 1996). In the 1980s, the "smartness" of smart home concepts merely involved predefined automation of appliance tasks. Since the year 2000, smartness involves much more flexible task automation adapting to the situation based on past usage data, user preferences and interaction with other devices. In addition, the (mobile) Internet make smart home applications accessible regardless of the device and location of the user (Barlow & Venables, 2003; Rohracher, 2002).

Although the application domains mentioned above may appear highly diverse, they all rely on similar sensors, IP-enabled home appliances, machine-to-machine communication infrastructure and personal information. Typically, service providers access these technologies through service platforms. While a lot of attention is paid to standardizing technologies underlying smart living services, the service platforms are still not interoperable and highly diverse across the industry (Peine, 2009). Moreover, the platforms differ both technologically and organizationally. Technologically, while smart living service platforms used to be located within the home, recently, platforms are increasingly moving towards the cloud thanks to the paradigm of platform-as-a-service (IBM, 2010). At the same time, telecom operators in various countries are looking to provide service platforms for smart living services within their core networks, in line with their strategy to dominate the in-home healthcare market (e.g. KPN; O2, 2012; Orange Telecom). Another difference between platforms is their openness towards third party service providers: while a number of platforms are basically stovepipe architectures that are limited to one single service

provider only, others provide open application programming interfaces (APIs) and software development kits (SDKs) and allow third parties to utilize the platform in delivering services. The organizational and technological complexity of smart living service platforms has hardly been discussed in literature as studies on smart homes and ubiquitous computing mainly focus on technology aspects (e.g. Nakajima & Satoh, 2006; Pan et al., 2010) and user interfaces (e.g. Park, Won, Lee, & Kim, 2003; Portet, Vacher, Golanski, Roux, & Meillon, 2011).

Platforms that allow third parties to deliver services are extensively discussed in the strategic management literature, especially regarding the trade-offs in opening up a platform (e.g. Boudreau, 2008, 2010; Eisenmann, Parker, & Van Alstyne, 2008; Hagiu, 2006; Rochet & Tirole, 2003). However, platform literature typically treats technology as a black box, except for a group of scholars that applied the concepts to the mobile telecommunications industry (e.g. Ballon, 2009; Ballon, Walravens, Spedalieri, & Venezia, 2009; Basole & Karla, 2011).

This paper classifies 42 state-of-the-art smart living service platforms and categorizes them regarding the openness (i.e. whether third parties are technologically and organizationally able to deliver services over the platform) and location of intelligence (i.e. whether the platform is located in the user's home, in the cloud, on the network or in between). The location of intelligence implies who has control over the platform which is an important issue in terms of the platform leadership discussion (Gawer, 2000, 2009; Gawer & Cusumano, 2008). The paper provides a first overview of platforms in smart living industry which may be repeated in the future to identify trends. We do so to explore the current trends in the domain and to provide a basis for further research in this domain. Doing so is important given that uptake of smart living services in the market is still highly limited, and deeper understanding of how these services are delivered over platforms may help to elicit hurdles for service providers to develop value-adding services.

Related Content

Setting the Dutch E-Government Interoperability Agenda: A Public-Private Partnership
Rex Arendsen, Sander Zwienink and Paul Oude Luttighuis (2011). *Interoperability in Digital Public Services and Administration: Bridging E-Government and E-Business (pp. 25-39).*
www.igi-global.com/chapter/setting-dutch-government-interoperability-agenda/45781?camid=4v1a

Examining the Role of Mobile Self-Efficacy in the Word-of-Mouth / Mobile Product Reviews Relationship
Christopher P. Furner, Robert Zinko and Zhen Zhu (2018). *International Journal of E-Services and Mobile Applications (pp. 40-60).*
www.igi-global.com/article/examining-the-role-of-mobile-self-efficacy-in-the-word-of-mouth--mobile-product-reviews-relationship/212693?camid=4v1a

Multi-Cloud Data Management using Shamir's Secret Sharing and Quantum Byzantine Agreement Schemes

Mohammed A. AlZain, Alice S. Li, Ben Soh and Eric Pardede (2015). *International Journal of Cloud Applications and Computing (pp. 35-52).*

www.igi-global.com/article/multi-cloud-data-management-using-shamirs-secret-sharing-and-quantum-byzantine-agreement-schemes/132811?camid=4v1a

A Graph-Search Based Navigation Algorithm for Traversing A Potentially Hazardous Area with Disambiguation

Xugang Ye and Carey E. Priebe (2012). *Innovations in Information Systems for Business Functionality and Operations Management (pp. 123-136).*

www.igi-global.com/chapter/graph-search-based-navigation-algorithm/64155?camid=4v1a