

# Designing a matchmaking platform for smart living services

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**Abstract.** Much of the literature on smart homes, smart living and eHealth focuses on either technology issues, such as home automation and sensor technology or the acceptance and adoption of smart home services. However, even smart home services that are technologically feasible and acceptable are not taken off as end-users cannot find them in today's fragmented marketplace with an overload of information. Basically there is a demand and supply mismatch. We argue that a matchmaking or brokering platform is required that helps end-users to search for smart living services and on the other hand support (service) providers promoting their products. In this paper, we propose a conceptual design for such a platform based on two series of exploratory interviews with stakeholders in the domain.

**Keywords:** smart homes, smart living, eHealth, (service) providers, service platform

## 1 Introduction

For 40 years smart homes has been considered a highly promising field. Traditionally, smart homes utilize several computing devices and appliances in order to automate and support domestic tasks [1], such as dishwashers and washing machines. Thanks to an increasing number of IP-enabled devices and technologies, like networked sensors, smart homes are changing from simple home automation systems towards more advanced ICT-enabled services, including wearable/implantable systems and assistive robots, [2], [3]. Healthcare providers find increasingly ways to utilize sensor networks and smart devices to enable elderly and disabled people to stay and live in their personal environment independently as long as possible, i.e. through eHealth solutions [4]. eHealth can be defined as the use of emerging information and communication technology, especially the Internet, to improve or enable health and health care [5].

The concept of smart living is broader than just smart homes and eHealth as it involves connecting our daily activities at home, along the way, or anywhere else, that can be supported by integrated ICT. In the last decade service providers from different industries (i.e. energy sector, security sector, telecommunication sector and health sector) have become interested to offer smart living services [6]. Services can be viewed as several

types of activities that supports value creation for consumers [7] and smart living encompass a wide range of different services. However, smart living concepts have not reached the mass market yet and failed to achieve anticipated results [8], [9]. Demand has been slack, mainly because of price/performance issues and the supply of smart homes technologies is not tailored to the needs of end-users [10]. Service providers find it difficult to create awareness among end-users about smart living. In practice end-users are often unaware of how technology can help them and (service) providers are unaware of the specific needs of end-users. In other words, a bridge is needed between the technology-focused smart home solutions and the demand and daily life of end-users. Although numerous researchers study the smart living domain from the perspective of users [11], [12] or technology, [13], [14], no research, to the best of our knowledge, addressing the match between (service) providers and end-users or the role of a common service platform in this domain.

The objective of this paper is to present the first results of a design project for a matchmaking platform between (service) providers and end-users in the smart living domain. This platform should not only create awareness among end-users on what services and technologies can help them, but also assist in matchmaking between (latent) needs and (yet unknown) services. The project falls in the design research tradition, which is a well-established sub-branch of information systems e.g. [15], [16]. We follow the design cycle as suggested by Kuechler and Vaishnavi [17], i.e. comprising the stages of problem awareness, suggested solution, prototyping, implementation and evaluation. In this paper, we include the first two stages: ‘problem awareness’ and ‘suggested solution’.

The conceptual design of the platform is based on two series of exploratory interviews with stakeholders in the smart living domain and is a first step in a research project in which such a platform will be designed, prototyped, implemented and evaluated in reality.

To achieve this objective the paper is structured as follows: section two provides a background of the changing healthcare. After that, in the third section we give a review of the problem description and the fourth section provides a first hunch of the platform. Finally, in the last section the challenges and an outline of the next steps are provided.

## **2 Background: Changing healthcare system**

One of the main demanding markets in the smart living domain is that of the elderly. The UN Population Division [18] foresees an increase of the global population over the age of 60 from 810 million in 2012 (11% of the world population) to just over 2 billion in 2050 (22% of the world population). The World Health Organization, but also the European Commission and national governments promote the concept of ‘active aging’ and define it as the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age [19]. If elderly become more vulnerable, it becomes harder to take responsibility themselves. This requires solidarity (not just financially) from society. Neighbours, friends, family, elderly themselves and

volunteers can help each other. Given these challenges, there is largely consensus that innovative ICT solutions are required to both reduce costs and have people live longer at home [20]. To overcome the societal health problems different approaches to integrate the medical and the social domains have been proposed. The Chronic Care Model by Wagner [21] and the expanded Chronic Care Model by Barr [22], is currently central to the formulation of European healthcare policy. They hold an important role for social support organisations, informal carers and their community, and indicate self-management and support by the community as key elements. The proposed paradigm shift in healthcare systems comprises a transition: 1) from mainly a mono-disciplinary to a multi-disciplinary care provision, 2) from a curative approach to preventive medicine and public health, 3) from institutional care to community care, and 4) from professional care to informal care [22]. Despite the attractiveness of the integrated and more bottom-up care system in terms of costs and patient focus, the fragmented healthcare market puts strong requirements on the elderly person in finding relevant services. In a situation where public (health) service will be minimized, end-users will increasingly be expected to find healthcare services themselves, and without support and guidance large groups of users will likely be unable to make informed choices on what services to use.

### **3 Problem description**

This section focuses on the first stage of Kuechler and Vaishnavi's design cycle: the definition of the problem. The problem description that the platform in this paper should solve is based on several steps of research. In 2011, we conducted eleven semi-structured interviews with stakeholders (i.e. decision makers on a strategic level from knowledge institutes, installation sector and service providers) in the smart living business ecosystem in the Netherlands. The interviews focused on the question why smart living and eHealth services were not taking off, and encompassed the broad area of services, consumer adoption, technology issues, business models, inter-organizational collaboration and knowledge sharing. Based on multiple rounds of coding, supported by qualitative analysis software (Atlas-ti), we found that two major problems were identified by the stakeholders. First, there is a lack of information and knowledge sharing in the sector. As a result, service providers and other actors do not collaborate and do not exchange best practices and typical business models to deal with smart living and eHealth solutions. Sharing knowledge and fostering collaboration in the smart living domain is thus required, taking into account that actors are from different sectors like health, ICT, buildings and technology installation. Second, consumers lack awareness of what kind of smart living services are available and how they could fill their needs. The highly fragmented market makes it difficult to find services, and the predominantly technological focus of service providers makes it difficult to understand how services fit end-user needs. End-users typically pass different stages of impairment and need for healthcare interventions at home, and they are often unaware as to what services they could use at a certain point in

time. At the same time, service and care providers find it difficult to reach end-users and to market and promote their products and services. A matchmaking platform would enable system integrators to create and provide integrated, comprehensive solutions to users. However, the platform does not focus specifically on service provision and context-awareness [23].

Except a few online service platforms that connect caregivers and end-users, there are hardly any interactive matchmaking platforms between (service) providers and end-users in the smart living domain in the Netherlands. Most of the existing platforms are aiming at end-users and caregivers from the profit sector ([www.zorgdienstenonline.nl](http://www.zorgdienstenonline.nl) and [www.mijnzorgnet.nl](http://www.mijnzorgnet.nl)). The platform [www.zorgvoorelkaar.com](http://www.zorgvoorelkaar.com) meets a part of the requirements about interactivity between end-users and more than one type of stakeholders in a way that there is a mix of caregivers in the profit and the non-profit sector to match with end-users. At least, in the best of our knowledge, there are no examples of matchmaking platforms that involve more than one group of stakeholders in the smart living domain (i.e. energy, ICT, building and health).

## 4 Suggested solution

This section focuses on the second stage of Kuechler and Vaishnavi's design cycle: the initial suggestion for a solution to the problem. In 2012, we conducted 59 more follow-up discussions with various stakeholders. The discussions were semi-structured conversations mainly aiming to explore the issues identified in section 3 and to look for possible solutions. All conversations were transcribed and bundled in a diary (program Evernote) and prepared to fit in a stakeholder analysis. This intermediate phase led to a first general idea about a novel artifact in the smart living domain. The interviewees came from three groups: 1) strategic level stakeholders (i.e. decision makers on a strategic level from knowledge institutes, health sector, government and funding partners): 31 interviews, 2) affiliate level partners (i.e. decision makers on a technical level from the industry): 16 interviews and 3) end-users: 12 interviews.

The strategic level stakeholders mainly argued how a matchmaking platform for smart living could add value to different stakeholders, the organization of such a platform and how to get both sides (i.e. service providers and end-users) on board. The interviewees from government suggested if and how a platform could support the intervention role from municipalities in case of health and wellbeing of citizen. Due to new regulations in the Netherlands, municipalities become in the lead to provide care to citizens. Therefore, the stakeholders from government were interested in a smart living platform that could support them. The affiliate level stakeholders raised issues about the viability of the platform and how to deal with the chicken-and-egg problem to reach 'critical mass' (i.e. to find a sufficient number of adopters of the platform, to support further growth). They were sceptical about cooperation between different parties and linking of content with database of providers. On the other hand the affiliate level stakeholders were enthusiastic

about the potential of a smart living platform. The end-users had more practical issues, like how you get access to the platform, why it should be online (and not offline) and last but not least, how easy such a platform could be reached and used. These concerns are not so easy to resolve. Therefore, in the next phase we have to think about how to deal with these issues. Also the chicken-and-egg problem needs to be taken in consideration, because suppliers are unlikely to invest without the assurance of access to a critical mass of end-users. End-users in turn are unlikely to join the platform unless they have confidence that complementary goods and services will be available. Although the angle of the conversations was a slightly different all the stakeholders agree on:

1. the need of a practical and easy-to use solution that could support the nationwide ageing problem
2. the opportunities for an one-stop shop for smart living (online and offline) to enhance the quality of life
3. the need to start with a small (local) but scalable matchmaking tool

The 70 conversations about smart living lead to a general first idea (proposal) about a novel artifact that can be applied in the smart living domain: to construct a smart living platform matching platform to enable end-users to enhance their quality of life.

## **5 Challenges and next steps**

Taken into account that this paper describes the start of our research, and our next step is to conduct a stakeholder analysis based on the interviews, it can be seen as a starting point addressing the practical gap between (service) providers and end-users in the smart living domain to design a matchmaking platform. To elaborate the first hunch of the platform demands collaboration of (service) providers in multiple sectors to contribute required resources and to find catalyst innovators to start and accelerate a catalytic reaction. To get multi groups on board at the same time to create value in an exchange platform is a big challenge. Moreover, issues such as access methods, information storage, control and protect data, but also user adoption are important topics. Next to privacy and security, also business models and pricing strategy provide further challenges. Last but not least the technical characteristics of the platform may have an impact to reach 'critical mass'. Our future research aims to study these issues using platform and design theory which provides a theoretical lens to build a smart living platform.

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