

Designing a multi-sided health and wellbeing platform: Results of a first design cycle

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Abstract. While worldwide several health and wellbeing products and services are being developed to support people to live comfortable and independently in their home environment, widespread adoption of these smart living solutions is still not envisioned. A hindering factor is that users are not aware of possible solutions or where to find them, which could be solved through promoting solutions on shared platforms. Designing such platforms is challenging as multiple stakeholders need to be satisfied and start-up problems need to be overcome. Most theory on platforms is explored in ex-post studies and there is a lack of knowledge on how platforms should be designed and implemented. In this paper, we elicit functional requirements for the design of a multi-sided health and wellbeing platform based on interviews with both end-users and stakeholders. These requirements provide the basis for future design cycles in which, the development and actual implementation of a platform is foreseen.

Keywords: design science, service platform, health and wellbeing, smart living, matchmaking, stakeholders, social infrastructure

1 Introduction

Smart living services [1], aimed at people living at home, are not yet widely adopted [2-4]. Services can be seen as the non-material equivalent of a good, which is intangible by nature and is offered by a provider to its consumers as a value [5]. Two decades ago, Mark Weiser envisioned a world where numerous of interconnected intelligent devices and networks serve human in an unobtrusive way [6]. Despite the technological advancements in recent years [7] such vision still has to become reality in daily life [8] and can be explained by 1) the tools are missing for stakeholders to create awareness among end-users about existing solutions and 2) the highly fragmented market hinders end-users to find products and services that they need, and 3) the predominantly technological focus of service providers makes it difficult to understand how services fit end-user needs. Accordingly, a possible approach to solve issues like awareness, fragmentation and promotion, is to create a service platform (i.e., a social infrastructure) that connects providers and users of smart living products and services.

Our research is related to the European Ambient Assisted Living project Care@Home, that focuses on delivering connected ICT-based assistive living solutions involving multiple devices for elderly and enabling them to live an independent life as long as possible [9].

In this paper, we present the results of the first design cycle for the conceptual design of the platform, based on two series of exploratory interviews with potential end-users and relevant stakeholders in the Netherlands.

The paper is structured as follows: Section 2 provides a background on the health and wellbeing domain. In section 3 we provide an overview of the platform literature. In section 4, the method is described, followed by the results in section 5. Then, in section 6 the findings are discussed. Finally, in the last section the challenges and an outline of the next steps are provided.

2 Health and wellbeing domain

One of the main demanding markets in health and wellbeing is that of the elderly. The UN Population Division [10] foresees an increase of the global population over the age of 60 from 841 million in 2013 (11,7% of the world population) to more than 2 billion in 2050 (21,2% of the world population). Ageing population generates an increasing demand of healthcare resources due to the associated increase of chronic conditions. The World Health Organization, but also the European Commission and national governments promote the concept of ‘active ageing’ and define it as the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age [11]. There is largely consensus that innovative ICT solutions are required to both reduce costs and help people to stay at home as long as possible [12].

Although, technologies for smart living products and services are developing rapidly [13, 14], adoption of these technologies is not widespread. Generally, end-users are not aware of what smart living services are available and how these services could fulfil their needs. In addition, the highly fragmented market provides many services, but no integrated systems, which makes it difficult for end-users to find products and services. Moreover, especially in the health and wellbeing domain of smart living, end-users (i.e., elderly and disabled people) typically pass different stages of impairment, and they are often unaware as to what services they could use at what point in time. The predominantly technological focus of service providers makes it difficult for them to understand how services fit end-user needs. Especially technology-focused providers lack channels to reach users. Finally, besides end-users, there are other stakeholder groups, which need to be aware of health and wellbeing services (i.e., service and care providers, manufacturers, facilitators and government agencies).

In this paper, we focus on health and wellbeing services provided on the level of municipalities. The rationale behind this is that care services in the Netherlands, in which the study is conducted, are increasingly shifted to the municipal level. According to plans of the Dutch government, from 2015 onwards, the responsibility and the execution of healthcare will be even more shifted towards municipalities. Domestic help is being handed over to municipalities that will be free to decide for

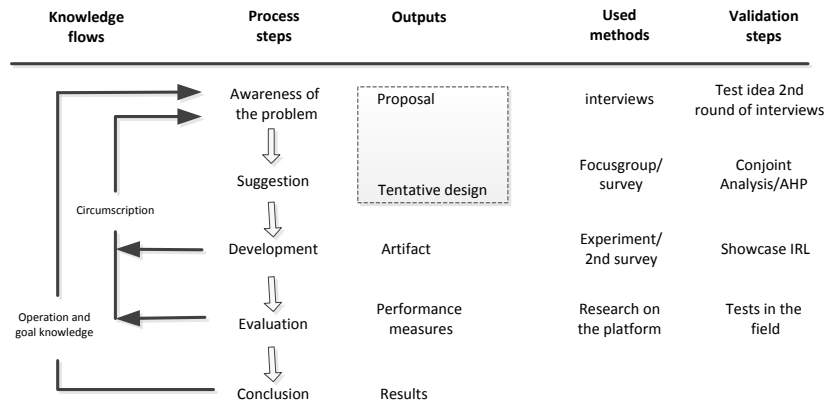
themselves how they will execute tasks and are accountable at a local level for their performance. A next step is ‘age at place’ either at home or in local communities rather than in care homes and other institutions. Although people prefer to stay at home as long as possible and deinstitutionalization is also based on the assumption that homecare services are less costly than institutional services, it also represents a major challenge, as increased support for homecare has to be provided somehow [15]. This transition will cause a paradigm shift in the Netherlands, because of the tension between keeping healthcare a universal good while harnessing costs [16]. Next to that it will have a huge effect on society and the social inclusiveness of elderly in particular. For that reason municipalities are searching for technical and organizational solutions to support them in the transition phase. For example, a service platform with monitoring features, that support the social intervention of citizens in the context of health and wellbeing, might be a helpful instrument.

3 Kernel theory: Platform theory

As this paper focuses on municipalities, service providers and end-user issues in establishing and governing a platform for health and wellbeing, we base the theoretical framework on concepts of platform theory from a multi-sided market perspective (i.e., different ‘independent’ providers provide complementary products and services on the platform [17]). Platform theory is relevant because it provides insights in 1) how service platforms come to exist and develop, 2) how to identify potential and patterns for collaboration and 3) how to organize users and form a foundation for their interactions. Platform theory enables us to clarify what has to be done when designing a service platform and how to involve different stakeholder groups in an early stage. Most of the theoretical and empirical research on multi-sided platforms has focused on mature platforms [18, 19] and less attention has been given to issues in starting up a new platform [20]. These issues include strategies for attracting different user groups of a platform and attaining a critical mass. From an economic point of view such a platform creates a multi-sided market and generally faces a critical mass constraint that must be satisfied if the business wants to be viable [18]. Therefore, the challenge is to find out if a health and wellbeing platform is a viable solution and generates value from bringing end-users and members of different stakeholder groups together. Platforms typically consist of features such as search functionality, payment administration, authentication, security, data-access and identity management. Previous studies show that the proliferation of platforms depends on several criteria such as satisfying multiple sides of the market [21], governing relationships with third party service providers [22] and maintaining a degree of openness in order to allow generativity [23]. Since trust in a platform and building up reputation are also important success factors, the process in which a platform is designed and stakeholders are involved is far from trivial. In summary, existing knowledge on platforms is merely based on ex post studies of successful cases and there is a lack of knowledge on the design of emerging platforms in the smart living domain [24]. In addition, the issues of how to involve and deal with external stakeholders during the design process is rarely discussed in literature on new service design [e.g., 25], service engineering [e.g., 26] or design science research

[e.g., 27, 28]. In our design, we consider the five stages of the typical design cycle from Kuechler and Vaishnavi [29] (See figure 1).

Figure 1. Extended version design cycle Kuechler and Vaishnavi [29].



Comprising the stages of problem awareness, suggested solution, develop the artefact, implementation and evaluation as an overview of the patterns (i.e., generalized system design elements) of the platform design. Although in the design cycle of Kuechler and Vaishnavi, just one moment is included to measure the performance of the design, we entered the used methods and added validation steps (i.e., performance measures) for every phase (i.e., design step) in the design cycle.

4 Method

4.1 Design science research

This paper is positioned within the design science research paradigm [30, 31]; a fundamentally problem solving paradigm that has its roots in engineering and the sciences of the artificial world [32]. Design science research attempts to solve a specific problem and to generate and empirically test a design theory that can be reused in solving a class of related problems. We adopt a specific design science research method called Action Design Research (ADR) after a term first coined by Livari [31]. ADR provides explicit guidance for combining building, intervention, and evaluation in a concerted research effort. ADR contains two basic activities: building an artifact for a specific purpose and evaluation on performance of that artifact. We adopt Action Design Research because it has a dual mission: 1) to make theoretical contributions and 2) to assist solving current and anticipated problems of practitioners [33]. We use this approach in conducting our research as it provides a scientific research framework for designing a service platform, but taking into account that designing the platform is an iterative and sometimes ‘messy’ process.

4.2 Interview method

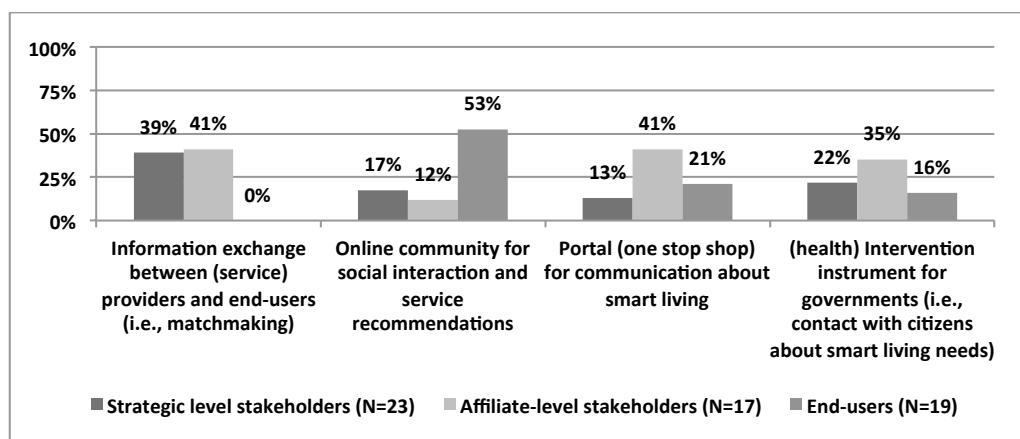
In an earlier paper [34], we explored the problem awareness (i.e., first design step) for health and wellbeing. Through 11 exploratory interviews with different stakeholders, we found that end-users lack awareness of what smart living solutions are available and how they could fulfill their needs. At the same time, we found that service providers find it difficult to reach end-users and to market and promote their products and services. According to the interviewees a platform should solve this mismatch between demand and supply. In this paper, we analyze 59 semi-structured interviews with potential user groups and various stakeholders, to develop a solution (i.e., second design step) for the problem elicited and to address the mismatch between demand and supply. The results were used for analyzing and testing the first design step. Interviewees were selected in three stakeholder groups that each represents a different side of the platform: Two external stakeholder groups, like 23 strategic level stakeholders (i.e., knowledge institutes, government and funding partners), 17 affiliate level stakeholders (i.e., service and technology providers) and 19 end-users (i.e., care providers and citizens) on the other side. First, the aim of the interview was explained: the practical problem on the mismatch between demand and supply in health and wellbeing and the suggested solutions. Next, three questions were posed to every interviewee, followed by follow-up questions and discussion: 1) What should be the main purpose of a health and wellbeing platform? 2) Who would benefit from such a platform? 3) What are critical design issues when developing such a platform? Interview reports were summarized and coded into categories.

5 Results

5.1 Main purpose of the platform

To the question: *What should be the main purpose of the platform*, four main answers were given. (See figure 2).

Figure 2. Main purpose of the platform according to interviewees.



Most often mentioned functions are **information exchange** between providers and end-users. This was especially mentioned by the strategic and affiliate stakeholders, but strikingly not by end-users themselves. Besides exchanging information about services and products, interviewees pointed out that automatically matching end-user needs and services offered would add value, i.e. a recommendation feature. Affiliate stakeholders were mainly interested to communicate their offerings to potential user groups, rather than communication among end-users themselves. An **online community** for social interaction was often mentioned by end-users. Such a community should not only help end-users to find and recommend applications to each other but also to check on each other's social wellbeing. The main rationale behind this function is the need for social cohesion (i.e., staying in touch with other elderly people and the outside world). A **portal for communication** about solutions was mentioned often as well. Such a portal would be a marketplace for solutions and a 'one-stop-shop' to access services. Features mentioned less often were an **intervention instrument** for the municipality to get in contact with citizens about needs for services and questions about health care legislations. However, this feature was suggested by all five interviewees from government organizations to support this intervention role from municipalities in case of the health and wellbeing of citizens.

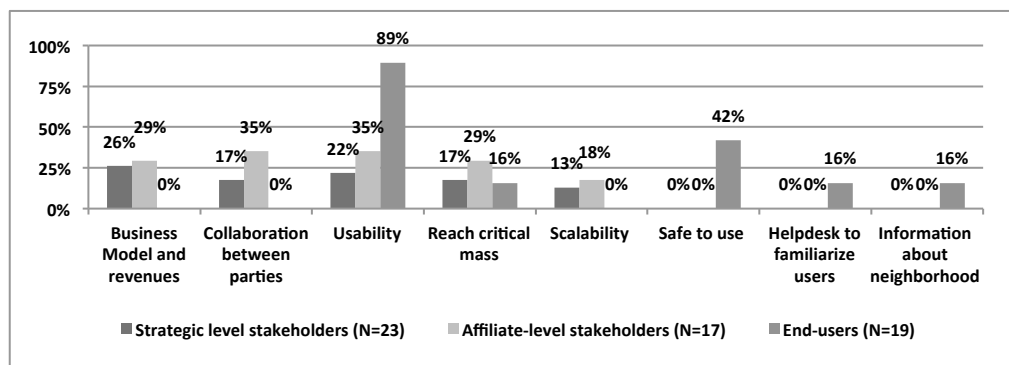
5.2 Benefited users from the platform

To the question *who would benefit from the platform* the strategic and affiliate stakeholders agree that the platform should be beneficial for both end-users and the industry. The platform could function as a 'one-stop-shop' for smart living needs and solutions, but also as an intermediary between the industry and end-users. The governmental interviewees argued that the platform should be merely beneficial for end-users only: like citizens in general, patients and elderly. End-users were more specific about the target group; they argue that the platform would be most beneficial for elderly who want to stay in their own home environment (i.e., ageing in place), citizens in general or patients with several impairments.

5.3 Critical design issues to start a platform

To the question *what are critical design issues* when developing such a platform the stakeholder groups had different opinions (See figure 3).

Figure 3. Critical design issues for developing a health and wellbeing platform.



The strategic level stakeholders were mainly concerned over how a service platform for health and wellbeing could add value to different stakeholders, i.e. what would be sustainable **business models** and how to achieve **revenues**. They were concerned about the organization of such a platform (i.e., **collaboration between parties**) and how to reach '**critical mass**' (i.e., a sufficient number of adopters of the platform, to support further growth). This group had less attention for the **usability** of the platform, although they mentioned that easy access to the platform through multiple devices is required. The affiliate stakeholders raised issues about the **usability** for the consumers of such a platform and how to deal with the chicken-and-egg problem to reach **critical mass**. They were skeptical about the **revenues** and **collaboration between different parties**, especially because of competitive considerations (i.e., linking content with databases, free-riding issues). On the other hand they consider that such a platform could help them to reach customers in the domain. The external stakeholders preferred a local (i.e., postal code based) but **scalable** platform, starting on a micro-scale before rolling out on a national level. The end-users had more concerns about practical issues, like the **usability** of the platform (i.e., ease of use, full filling needs, practical, accessible), **safety and privacy**, if the online platform combines online with offline information (i.e., information about gatherings in the **neighborhood**) and finally if there would be a **helpdesk** for the platform.

6 Discussion and interpretation

We propose an interactive service platform to 1) satisfy the requirements of end-users, service-providers and municipalities; 2) create awareness among end-users on what products, services and technologies can help them and 3) assist in matchmaking between (latent) needs and (yet unknown) services. The interviews lead to a first requirement elicitation from a stakeholder perspective. The main findings of the interviews were that a service platform could provoke various experts to be active in the health and wellbeing environment and that such a platform could be an accelerator for further developments and accelerate the diffusion process of applications in the smart living domain. According to the interviews the main purpose of the health and wellbeing platform, should be to provide: 1) an **online community** for contact, solutions, social wellbeing, interaction with the neighborhood and a digital marketplace for applications (consumer to consumer). The need for this functionality is driven by the need for social cohesion; and 2) an **information exchange platform** between providers and end-users (business to consumer), driven by the need for matchmaking between service providers and end-users; and 3) a **portal** for bundled services and solutions (business to consumer), driven by the one-stop-shop philosophy for 'ageing in place', where end-users can find all relevant applications in the smart living domain, but also can create a personal profile; and 4) an **intervention instrument** for the municipality (government to consumer) to get in contact with citizens about needs for services and questions about health care legislations (i.e., AWBZ, WMO legislations) and to get insight in transaction costs. During the alternating cycles of discussions this input from different angles lead to a

general first idea about a novel artifact that can be applied in the health and wellbeing domain. Although it is not clear yet if all features elicited by the interviewees can be included in one and the same platform, it is a feasible option to combine suggestions to create, retain, transfer and exchange information in the smart living domain. Ultimately, such a platform should 1) enable end-users to enhance their quality of life, and 2) support matchmaking between different stakeholders. While end-users stress the social and communication element of an online platform for health and wellbeing, providers focus on information exchange and transaction features. To attain a critical mass of both providers and end-users, the platform should thus integrate the communication, information and transaction features. Another potential tension results from the focus of stakeholders on the governmental level. The currently changing regulations on care in the Netherlands lead to a more narrow focus of government stakeholders on tools that support the regulatory transition. The results indicate that such narrow focus may not be acceptable by the more commercial providers and end-users. Our results illustrate the multiplicity requirements for platform functions, ranging from basic information exchange towards active recommendations for services and matchmaking, and from pure focus on transactions towards communication among users on one side of the platform. Strategic and affiliate stakeholders and end-users stress rather different design issues that warrant most attention for designing the platform. To a large extent, these differences can be explained through the interests and objectives of these stakeholder groups. However, the findings do suggest that a viable platform for health and wellbeing will require taking into account a variety of design issues.

7 Conclusions and next steps

This paper elicits four main features of a platform for health and wellbeing: 1) online community, 2) information exchange, 3) portal, and 4) (health) intervention instrument. It illustrates the multifaceted nature of platforms and the diversity of features they may support. Importantly, we show that different stakeholder groups emphasize different platform features as a focus point. This complexity is increased by regulatory transitions that make especially government stakeholders have a narrow focus on the platform features. The study contributes to design knowledge of digital platforms, by showing what could be possible platform features and indicating the critical design issues in the design of such a service platform. We argue that designing a multi-sided platform can only be done by addressing end-users' as well as external stakeholder needs in concert, and addressing the value proposition as well as the business model. Considering the first hunch of a matchmaking platform it demands collaboration of stakeholders 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 already partly covered by stakeholder groups (i.e., government, providers and end-user groups) that want to participate in the project. Next to that, issues such as access methods, but also user-adoption and usability are important topics.

Our future research aims to study this issue using Action Design Research (ADR) to develop design knowledge on how to develop and launch a multi-sided platform while dealing with end-users as well as external stakeholders.

To test if the interviews are rigorous and valid, multiple focus groups, a workshop and a survey will be conducted (i.e., mixed method) to validate the first two steps of the design cycle (i.e., awareness of the problem and first suggestion) and to elicit the technical specifications of the platform. Taken into account that we are at the start of our research, these steps will be used to develop the tentative design of a health and wellbeing platform and to prototype a social infrastructure based on agile scrum.

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