Acceptance and Effectiveness of Smart Home Solutions

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Abstract

Despite current developments in health care, demographics, and technology, the implementation and use of smart home technologies has so far not been as effective as possible. Possible barriers are a lack of incentives and vision on technology application, the complexity of technology and the financing structure, the multidisciplinary collaboration, and the user-technology interaction. This chapter describes recommendations to increase the effectiveness of smart home technology, which relate to a better user-fit, evidence-based practice, technological improvements, project organization, and the financing structure.

Keywords

Acceptance • Smart homes • Needs • Stakeholders • Organization

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Introduction

The positive effects of adequately implementing current and future smart home technologies in health-care situations are stated to be promising. However, despite the driving factors, such as developments in health care, demographics, and technology, the implementation and use of smart home technologies has so far not been as effective as possible. Technologies did not bring the expected benefits for the end-users or have been disused by them (e.g., Cartwright et al. 2013; Steventon et al. 2013; Sponselee 2013). Also, the care process appeared not to be as effective as expected and even more expensive than anticipated (e.g., Henderson et al. 2013, 2014). As a result, many projects have been canceled or postponed.

This chapter describes recommendations to increase the effectiveness of smart home technology, which highly depends on the acceptance and use of the technology and the benefits perceived by its users and end-users.

Hindering Factors for Smart Home Effectiveness

In order to increase acceptance and effectiveness of smart home solutions, it is important to define and understand which barriers hinder effective implementation and use. Although barriers may vary between projects, hindering factors often mentioned in the context of smart home technology involve a lack of incentives and vision on technology application in the care sector, as well as the complexity of the technology and the financing structure (Sanders et al. 2012; Sponselee 2013). Smart home solutions come along with investment, maintenance, and operation costs. While these costs are often covered by subsidy in the early stages of implementation, for (large-scale) implementation and use, there is a lack of financing structure. Additional hindering factors are the diverse stakeholders that have to cooperate in the field of smart home solutions and the, mostly older, end-users who have to interact with this new technology. The multi-sectoral nature of smart home technology disturbs the – financial – responsibilities, as well as the individual financial obligations.

Multidisciplinary Stakeholders

Problems with smart home technology can be partially ascribed to the fact that many stakeholders are involved (Bierhoff et al. 2008). Although the technology mainly originates from the information and communication (ICT) sector, the implementation process of this technology also involves the industry, security, care, and telecom sector. For further development of smart home technology, the educational, government, and care sectors are involved, while for exploitation of smart home solutions, government, finance (insurance companies), trade, and recreational sectors are involved. These sectors are not always used to working in a multidisciplinary fashion, and they may have different goals and aspirations regarding smart home

technology. However, due to future ICT developments, trans-sectoral innovation is needed, especially in the area of smart living (Baken 2010).

The multidisciplinary collaboration results in organizational, financial, as well as cultural issues. To decrease the perception differences between the stakeholders involved, an analysis of the expected and experienced effects of smart home technology for each stakeholder can be made (Sponselee 2013). The outcomes can then be communicated among stakeholders to increase awareness. For designers, for example, the effects may involve effective goals, whereas caregivers are mainly interested in effects on workload and quality of care, while care receivers are influenced by usability effects.

Technology and Its Users

An insufficient supply of technologies to solve the problems with smart home solutions in care situations is not the main issue. Actually, at a technological level even more is possible than yet applied in the so-called "smart" technology. There is however a technological need for a platform that enables communication between smart home services, devices, and applications (Brink 2013). The problem also relates to the usability and functionalities of smart home technology that do not sufficiently correspond to the actual needs of the care receivers and caregivers. Even though many researchers have stated that user requirements should be better taken into account in smart home projects, many tangible improvements are driven by improved technology (technology push). The actual users obviously need to get better involved in the development and implementation process of smart home technology. By involving the care receiver and the caregiver in the process, the designer gains more insight into the true perceptions of the stakeholders he or she is designing for. As a result, the list of functional requirements for a smart home system or a smart home project consists of more than just technological functionalities and should comprise all stakeholders' attributes, consequences, and values. In the implementation process of smart home technology, by taking a gerontechnological approach, the older end-users can be better understood. However, the design process must be considered as an ongoing cycle. After use, the stakeholders' expected effects change into actual experienced effects, which may be different and may modify the list of requirements.

Low acceptance and adoption of smart home solutions by end-users can thus partially be ascribed to the "gap" between what the technology can do or bring to the people and the actual need that these people have. This "gap" is actually the result of the "driving factors" for smart home solutions. Nowadays, society as well as government, industry, and care organizations feels the pressure of a society that is growing older. The "dependency ratio" is increasing, which means fewer people will be available in the near future to handle the growing amount of older people who are in need of care. To reduce the growing call for caregiving by professionals, people are encouraged to prevent or reduce the need for professional care, by self-management and self-care, and support by informal caregivers. Their autonomy

and independence can be supported by technology, for example, by smart home solutions. Unfortunately, the technology has often been developed from a care perspective, while it may also have other potential benefits related to welfare, well-being, or entertainment. Current smart home platforms however are found to support only 20 % of the desired applications for aging in place (Brink 2013). As long as platforms are not suitable, the needed applications and functionalities are less likely to be developed. The challenge for the industry, service providers, care organizations, and government is to articulate the needs of potential users, then develop and introduce technology that supports those needs or enhances them, and then – later on – add useful smart home functionalities to the accepted technology.

Although many researchers claim to know the needs of older people and many smart home technology projects state they have introduced technology that fits the needs of older end-users, the adoption of smart home technology on a large scale is lacking. Mohammadi (2010) found that producers of smart home technology think that older people do not know which technology is available and what the possibilities are, while the older people in her study were familiar with the technology but stated that the current functionalities did not fit their needs.

Now that we have clarified the possible hindering factors for the acceptance and effectiveness of smart home solutions, the following recommendations are proposed.

Smart Home Solutions Must Fit to Needs

The expectations of smart home technology being useful for home (health-care) situations are increasing, and the application is growing constantly. Meanwhile, it is still often unknown what the exact needs of the end-users are and therefore in what way the technology can be supportive. Acceptance of smart home technology is positively influenced by the compatibility between needs and the expected and experienced benefits (Sponselee 2013; Peeters et al. 2012). In a study by Sponselee (2013), a lack of fit was the main reason for rather low experienced benefits: participants were not yet in need of "distant care," while people with a certain need for care (e.g., dependent upon care by others/professionals) or support (e.g., being widowed) benefited the most from smart home solutions. To increase the effectiveness of smart home technology, beneficial functionalities for end-users with specified needs must be denoted. However, the translation of needs to system functionalities and applications requires further research and documentation.

At the same time, it is difficult to make a business case based on the promising effect of smart home solutions on *prevention*, i.e., on postponing the need for care by implementing smart home technology (while in fact, many smart home projects are based on this principle). On the one hand, a financial compensation for smart home solutions for people who are not yet in need of care is lacking. On the other hand, the (preventive) benefits are difficult to prove, as it involves long-term benefits (e.g., postponed appeal on welfare or care resources).

To increase the effectiveness of smart home solutions, it is important to define the envisioned target group. For technology designers it is relevant to understand who

the target group is. What goals are important for them, what are their needs, and thus, what benefits are expected from the technology? Also care organizations in telecare projects must be aware of the group of people they want to support with technology. For certain patient groups, technology can become part of the health-care provision process. However, not all technologies are useful for every group or individual. Based on the needs of the end-users and those of other users (e.g., (in) formal caregivers), a selection of technological functionalities should be made. Despite several attempts, no globally accepted overview of smart home solutions in relation to needs is available (e.g., an "availability matrix" (see World Health Organization 2010)). A possible tool to select smart home or e-health technologies is the WHO Compendium of innovative health technologies (World Health Organization 2014) in which health problems as well as corresponding solutions are described. A Dutch tool to select these functionalities is a model presented by Nictiz, in which IT platforms for distant care and welfare services are described along three layers: network services (bottom), platform services, and application services (top layer) (Krijgsman et al. 2012). The application layer consists of four categories of services, namely, comfort, welfare, safety and security, and cure and care. Such a model can be used as a means for discussion in the orientation phase of the implementation process and as a tool for so-called use cases. The technology can, therefore, better be implemented – first – for specific patient groups, with a specific need for care, like COPD, diabetes, or CVA patients, who already receive long-term care (Peeters et al. 2012) and have certain financial resources and who may already experience some benefits brought by the technology (better physical control, information availability, and less travel time for doctor or hospital visits (see, e.g., Evers et al. 2009; KNMG, NCPF and ZN 2012)). Dutch policymakers, for example, are focusing specifically on telemonitoring for patients with diabetes mellitus and chronic heart failure, as well as teleconsultation for dermatology, as the best effects are found for these target groups (KNMG, NCPF and ZN 2012; Schippers 2012). With the current amount of older people suffering from these diseases and the expected growth of people with these diagnoses, the technology may help to reduce the pressure on care organizations by focusing on these specific patient groups.

To increase the acceptance and use of smart home solutions, we thus need to understand what the needs of people are and how technology might substitute or support these needs. It is therefore important to accord the end-user a central role in the development and implementation process. By assessing the end-user's needs, smart home functionalities can be defined that fit those needs, in order to increase technology acceptance. Different methods can be used to assess the end-user's needs in relation to smart home solutions, ranging from workshops, role-play, and demonstration facilities to in-home experience. Although these methods differ in their usefulness to obtain the end-user's needs (Sponselee 2013), it will help to define people's needs in relation to smart home solutions. For some researchers in smart home projects, it might be surprising to find that people's needs are not merely care related. People in their third age, for example, who may have minor physical restrictions, are still (socially) active and want to participate in society (Sponselee 2013). Besides medical or care-related needs (possibly for the future), safety and

security needs may be expressed, e.g., in the scope of social support and surveillance. As a result, social networks appear to be important. On the other hand, despite the need for (social, mental, or physical) support, older people want to stay in control, by selecting their own support, facilitated by accessible information and proper communication. Technology is considered as a means to achieve this, although specific technology requirements have to be taken into account in order to benefit from the technological potential.

More Benefit Evidences Are Needed

There is a lack of evidence of the (beneficial) effects of technology use for specific groups. It is, for example, still rather unclear what the effectiveness of smart home functionalities is for older people, patients, (in)formal caregivers, and care organizations (see also Black et al. 2011; Peeters and de Bie 2012). Without a defined fit between functionalities and benefits, a paucity of empirically demonstrated evidence of benefits, and a lack of evidence of cost-effectiveness (Black et al. 2011), there is no chance of a feasible business case.

In a study along 75 older users, a screen-to-screen telecare system was found to have beneficial effects on the well-being, feeling of safety, feeling of independence, and independent living (Sponselee 2013). However, these benefits differed along persons, depending on their needs and depending on the functionalities of the system. This demonstrates that personal needs should be collected as identifiers for smart home solutions to achieve eventual benefits of the technology interaction. The telecare system under study, for example, was most beneficial for people suffering from lung diseases, from rheumatoid diseases, and with mobility and hip, leg, or back problems, while people who were divorced or widowed benefited more than singles and married couples. Despite the multiple functionalities provided by the telecare system, the personal alarm was mentioned to be the most important functionality of the system, in parallel with the fact that people could immediately and directly come in contact with the care center.

More tests of beneficial effects are required to test whether goals are met at the end of a smart home technology implementation, preferably in a randomized controlled trial (Evers et al. 2009; Black et al. 2011). Therefore one should define at the beginning of such trial or project what effects are expected, and how this can best be measured. This also includes selecting the target group in which best effects are expected. A helpful tool is offered by Nictiz, who published a white paper on the arrangement of e-health applications, considering the users, the technology, and the care process (Krijgsman and Klein Wolterink 2012, see Fig. 1).

The second problem of a lack of evidence is that much knowledge on the effects of smart home solutions is not sufficiently available to others (see also Peeters and de Bie 2012). The knowledge on technologies and functionalities in home care is increasing but still fragmented. This knowledge needs to be collected, made available, and distributed – in a tangible way, beyond scientific conferences – to all stakeholders interested in implementing smart home technology. It is necessary to

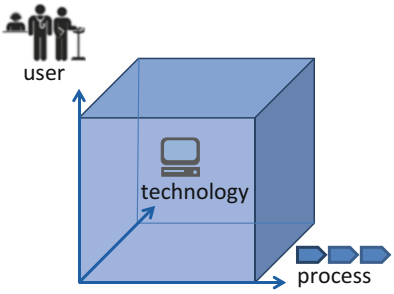

Fig. 1 Three dimensions along which e-health application can be classified (Krijgsman and Klein Wolterink 2012)

educate people for a new profession, both technology and care oriented, being able to bring this knowledge to whom it may concern (e.g., the development of a telecare wiki by J. Grin and P. Stevens (2012) and an eHealth Guide under development by the Dutch Patient Consumer Federation (NCPF) (KNMG, NCPF and ZN 2012)).

The Technological Challenge

Despite the innovation initiatives, technical problems are still a major barrier for successful implementation of smart home solutions. The technology to be implemented must function at all times and, moreover, should be accessible. The technology must be tailored to the situation and skills of the users, involving user-friendly interfaces, comfortable technology interaction, and non-stigmatizing design. Daily constraints such as memory loss, low vision, and hearing difficulties (common constraints coming with age) might also obstruct the effectiveness of the functionalities of the smart home technology.

For increased acceptance and effectiveness, technical problems, such as malfunctioning devices, power loss, and connection failures, should be avoided. Regarding accessibility, the smart home interface must fit the technology generation it is designed for. When the envisioned users were in the third age (active retired), the system should be designed according to the electromechanical technology generation (Docampo Rama 2001). A Windows-menu-layered interface design thus does not meet this requirement. In addition, interfaces are often not designed for people who have hearing loss, have low vision, or are somewhat forgetful. As a result, many functionalities may not be known and used, as it does not exist in the mental representation of the interface of its user.

To overcome the problems illustrated above, technology providers must be aware of and communicate the limitations and possible (connection) problems of their technology at the beginning of the implementation. Extensive user testing by the technology providers – to increase awareness – as well as the development of a flexible interface design is required. Smart home system design also needs accessibility requirements for the hearing impaired and for the mentally impaired: synchronization of sound and picture, subtitles, and visual feedback can help the hearing

impaired, while people with dementia or mild cognitive impairments need as less interaction with the technology as possible and otherwise as intuitively as possible.

While the technology is not working without problems and interfaces cannot be used solely on intuition, it is important to provide support and training. Without support, problem situations during the use of the smart home solution lead to de-motivation and a high probability of abandoning the system. Training on how to use the technology is needed at all levels: people who interact with the system at home, family members who remotely receive information, and nurses who interpret incoming data. One should realize that older users need more guidance during pilot tests than younger people, while caregivers need to be motivated to use technology in the care process. The best way to increase the acceptance among caregivers is to include the use and implications of smart home technology in the curricula of social and nursing studies. Eventually, there must be an educational specialization in the field of care and technology for this envisioned profession.

Smart Home Technology Organization

The project organization around the implementation of smart home solutions is complex. One of the problems of implementing smart home technology is the idea of stakeholders that innovation solely involves the implementation of these new technologies. Implementing smart home technology is more than a technological innovation. It particularly involves a process innovation. The introduction of smart home technology in (home) care influences the structure of the individual care and welfare organizations, while it often leads to new collaborations between healthcare, welfare, and service organizations. New working protocols need to be developed that fit the new processes.

An implementation process, in theory, proceeds with the following steps: (1) technology testing, (2) pilot (focusing on acceptance), (3) organizing underlying processes, (4) implementation, (5) and use. However, effective testing of technology and technology acceptance in practice are only useful in case the technology is on a process level already partially organized. People comment or react negatively on "the smart home solution" when the organization of processes is not properly organized, although the technology might be acceptable. In this case, the technology is not accepted, while it might have been accepted in case the processes were experienced positively.

For a successful implementation, cooperation of multiple partners is necessary (e.g., KNMG, NPCF and ZN 2012; Schippers 2012). When a company, housing corporation, or welfare or care organization decides to implement smart home technology in their business, the first thing to do is to bring together all other stakeholders involved. The innovation is not the implementation of technology alone; it involves cooperation with other businesses to provide new or other services. It is important to innovate through a multidisciplinary, and preferably interdisciplinary, project team (cocreation). As stakeholders may have different goals and interests, it is important to communicate these expectations in workshops or other

meetings in which project goals are defined. It should be clear what effects each stakeholder wants to achieve by implementing new technology. Setting goals and knowing what benefits are expected are necessary to make decisions later on regarding functionalities of technologies and also to evaluate whether project goals are reached at the end.

The implementation and design route should also be more iterative. The stakeholders involved must be aware of the fact that (Sponselee and Schouten 2012):

- Choosing technology is not the only (important) step toward innovation.
- Implementation is a process that takes time and involves a change in care processes as well.
- In parallel with the technological innovation, the process innovation involves revising processes and informing and training care professionals, in order to increase acceptance in the workplace.
- End-users need to be well informed about and supported in the implementation process.
- The process needs a proper overarching coordination.

The implementation of smart home solutions thus involves a range of steps to be taken, related to the multiple stakeholders. In Table 1 an example is given of the implementation steps and corresponding responsible stakeholders. The implementation steps on the left are partially based on earlier studies (e.g., the importance of articulating and communicating the goals of stakeholders at the beginning of a project; Sponselee 2013). Table 1 serves as an example of a tool that can be used in projects to determine steps and responsibilities of stakeholders involved and discuss, communicate, and agree upon these. The stakeholders will vary depending on the project.

For Example As aging in place is a current trend/development, a local care organization may want to extend their services, by connecting to older people living independently at home, offering remote care on demand. They seek for partners that offer welfare services (to support independent living). A housing corporation may also want to extend their services, as their tenants become older and more care dependent. These three partners should start their collaboration by communicating each individual vision on implementing smart home technology (1). In a successive step other stakeholders involved should communicate their goals, from their own perspective and for whom, as all partners may have different goals (2). The needs (of clients and formal and informal caregivers) that are expected to be supported by means of the intervention should be determined (3), as well as the expectations (4) and the possible role technology may play in this intervention (5). Next, the technology should be considered as part of the services, processes, and protocols that may need revision (6). Then, an implementation plan can be developed by several stakeholders (7). As a result, new responsibilities and roles of the partners should be considered (8). Providing information and training to professionals and end-users is part of the implementation process (9). Several partners should take responsibility

Table 1 Checklist for telecare implementation: implementation steps and stakeholders' responsibilities

	1. Care organization	2. Welfare organization	3. Government	4. Research	5. Developer	6. End-user	7. Family	8. Housing corporation	9. Insurance company	10. Local government	11. Informal caregiver	12. System integrator	13. . . .
1. Vision	X	X						X					
2. Goals	X	X			X	X	X	X	X	X	X		
3. Needs	X	X		X				X					
4. Expectations	X	X			X	X	X	X			X		
5. Role of technology	X	X				X	X				X		
6. Telecare as part of care process	X	X				X	X				X		
7. Implementation plan	X	X			X			X					
8. Organization/ roles?	X	X				X	X	X		X	X		
9. Information/ training	X	X	X	X	X								
10. Service/help desk	X	X			X			X				X	
11. Costs	X	X	X	X	X	X	X	X	X	X	X		
12. User-friendliness	X	X		X	X	X						X	
13. Personal preferences/ needs	X	X			X	X					X	X	
14. . . .													

for information and help desk services (10). In addition to the implementation plan, stakeholders should calculate internal costs/benefits in a business case, resulting in costs for individual end-users as well (11). The user-friendliness of the interfaces should be tested and preferably adjusted to the user group (12), providing variations according to personal preferences and needs (13). For each step, it should be clear which stakeholders take responsibility.

A Financing Structure Is Required

Costs associated with smart home technology implementation are related to investments, maintenance, and operation. These costs are often borne by funding agencies only in the early stages of implementation. However, for continuation of implementation and use, there is a lack of financing structure. Also for large-scale implementation of smart home technology, a transparent and comprehensive structure is needed, to answer all questions individuals have, concerning their financial obligations.

An additional financial problem is that investments and financial benefits often do not appear in the same economic sector. While care organizations invest in telecare, hospitalization, medication, or other health-care needs may be prevented, resulting in reduced costs for insurance companies and local and national government.

National and local government as well as health-care insurance companies must consider their role in the structure and take their responsibility.[1] The financial system in the Netherlands, for example, is currently under construction to make the technology better accessible for everyone (screen-to-screen care for long-term care is structurally financed from January 2012 on; telemonitoring for people with chronic heart failures, telehealth for persons with diabetes, and teleconsultation will be financed structurally in the near future (KNMG, NCPF and ZN 2012); video consultation will be financed likewise physical consult with medical specialists (Dorresteijn 2012)).

Another solution involves a paradigm shift, which will probably take longer, but is inevitable. Especially Dutch citizens are accustomed to the so-called welfare state: the government will take care of you whenever you are in need of something. Due to the enormously increasing care expenditures, this welfare state can no longer be preserved. The Dutch government is already economizing the long-term care, and also domestic help is no longer be compensated for (Ministerie van Volksgezondheid 2012; Rutte and Samsom 2012). People will have to realize that they are responsible themselves for more and more services that were previously provided by the government.

[1]In the National Implementation Agenda (NIA) eHealth, the Dutch health insurance companies (ZN) state that e-health will become part of the contract policies (and thus financial structure) with care organizations (KNMG, NPCF, and and ZN 2012).

Overall Conclusions

The recommendations presented here correspond highly with other current research (e.g., Sol 2012; van Ginkel et al. 2012; Claassen and Willems 2011): involve the older end-user or patient to come to needs-driven innovation, develop a thorough plan beforehand with all stakeholders involved, write a business case, test the concept before implementation, and include and take care of the implementation process. Another important conclusion is the need for support and training of care professionals, including the latest technology in care education, in order to get potential care workers acquainted with smart home solutions, as well as including the care application field into technical studies, in order to slightly bridge the gap between developers and users of smart home technology.

Smart home solutions appear to be beneficial depending on personal situations or for specific user groups, e.g., for people who are mobility impaired, who need medication on a daily basis, or who receive specific therapy. Care organizations as well as researchers have to invest more in defining user needs and effect studies. Effects to further study in randomized controlled trials, for example, are increased well-being, increased quality of care, and elongation of independent living, from an end-user perspective. Beneficial effects for caregivers or care organizations may be related to quality of care, reduced pressure on care, financial profits, or adequate reply to care demand. What smart home solutions are best to achieve these benefits should be considered thoroughly in advance.

References

Baken NHG (2010) Sectoroverstijgend innoveren: Van Mijn business-case naar onze value-case! [PowerPoint slides]. Retrieved from TNO website. http://www.tno.nl/downloads/Presentatie_businesscase_valuecase.pdf

Bierhoff I, Panis P, Leonardi C, Mennecozzi C, Not E, Pianesi F, Zancanaro M (2008) Involving all stakeholders in the design of innovative domestic products and services: the NETCARITY experience. In: Cunningham P, Cunningham M (eds) Collaboration and the knowledge economy: issues, applications, case studies. IOS Press, Amsterdam. ISBN:978-1-58603-924-0

Black AD, Car J, Pagliari C et al (2011) The impact of eHealth on the quality and safety of health care: a systematic overview. PLoS Med 8(1):e1000387. doi:10.1371/journal.pmed.1000387

Brink M (2013) Future-proof platforms for ageing-in-place. Doctoral dissertation, Eindhoven University of Technology, The Netherlands, 978-90-386-3391-6

Cartwright M, Hirani SP, Rixon L, Beynon M, Doll H, Bower P, Bardsley M, Steventon A, Knapp M, Henderson C, Rogers A, Sanders C, Fitzpatrick R, Barlow J, Newmans SP (2013) Whole systems demonstrator evaluation team (2013) effect of telehealth on quality of life and psychological outcomes over 12 months (whole systems demonstrator telehealth questionnaire study): nested study of patient reported outcomes in a pragmatic, cluster randomised controlled trial. BMJ 346:f653. doi:10.1136/bmj.f653

Claassen R, Willems CG (2011) Evaluation of the implementation process of customized care by lifestyle monitoring in: everyday technology for independence and care – AAATE 2011. In: Gelderblom GJ, Soede M, Adriaens L, Miesenberger K (eds) Assistive technology research series, vol 29., pp 152–160. ISBN ISSN 1383-813X

Docampo Rama M (2001) Technology generations handling complex user interfaces. Doctoral dissertation, Eindhoven University of Technology, The Netherlands

Dorresteijn M (2012) Videoconsult krijgt zelfde bekostiging als fysiek consult. Zorgvisie, Nov 26, 2012. Retrieved from http://www.zorgvisie.nl/ICT/15357/Videoconsult-krijgt-zelfde-bekostiging-als-fysiek-consult.htm

Evers H, Blijham N, Willems Ch (2009) Zorg op afstand, literatuurstudie naar internationale ontwikkelingen en kennis over effecten. Utrecht, Vilans. Retrieved from http://mgrzorg.nizw.nl/smartsite.dws?id=136590

Ginkel M van, Scharft A, Kalverboer K (eds) (2012) Zorg voor de Toekomst. Retrieved from http://www.zorgvoordetoekomst.com/userfiles/files/Boekje%20ZvdT%20-%20definitieve%20versie.pdf

Grin J, Stevens P (2012) Ontwikkeling van een wikipedia van zorgpraktijken met een plus. Tussen- of overgangsrapport, oct 2012

Henderson C, Knapp M, Fernández JL, Beecham J, Hirani SP, Beynon M, Cartwright M, Rixon L, Doll H, Bower P, Steventon A, Rogers A, Fitzpatrick R, Barlow J, Bardsley M, Newman SP (2014) Cost-effectiveness of telecare for people with social care needs: the whole systems demonstrator cluster randomised trial. Age ageing. 2014 Jun 20. pii: afu067. [Epub ahead of print]

Henderson C, Knapp M, Fernández JL, Beecham J, Hirani SP, Cartwright M, Rixon L, Beynon M, Rogers A, Bower P, Doll H, Fitzpatrick R, Steventon A, Bardsley M, Hendy J, Newman SP, Whole System Demonstrator Evaluation Team (2013) Cost effectiveness of telehealth for patients with long term conditions (whole systems demonstrator telehealth questionnaire study): nested economic evaluation in a pragmatic, cluster randomised controlled trial. BMJ 346:f1035. doi:10.1136/bmj.f1035. Erratum in: BMJ. 2013;346:j2065

KNMG, NPCF, Zorgverzekeraars Nederland (2012) Nationale Implementatie Agenda (NIA) eHealth. Retrieved from http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/rapporten/2012/06/07/nationale-implementatieagenda-e-health-nia/nationale-implementatieagenda-e-health-nia.pdf

Krijgsman J, Klein Wolterink G (2012) Ordening in de wereld van eHealth (Whitepaper ID number 12013). Retrieved from http://www.nictiz.nl/module/360/690/Whitepaper%20Ordening%20in%20de%20wereld%20van%20eHealth.pdf

Krijgsman J, Eertink H, van der Leeuw J, Zondervan R (2012) Praktisch model voor ICT-platformen bij welzijn en zorg op afstand (Whitepaper ID number 120011). Retrieved from http://www.nictiz.nl/module/360/648/Praktisch%20model%20voor%20ICT-platformen%20voor%20welzijn%20en%20zorg%20op%20afstand%201.0.pdf

Ministerie van Volksgezondheid, Welzijn en Sport [VWS] (2012) Beleidsagenda 2013. Retrieved from http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/begrotingen/2012/09/18/beleidsagenda-2013-vws/7620-a4-beleidsnota2013-web-v2b.pdf

Mohammadi M (2010) Empowering seniors through domotic homes: integrating intelligent technology in senior citizens' homes by merging the perspectives of demand and supply. Doctoral thesis, Eindhoven University of Technology, Eindhoven, The Netherlands

Peeters J, de Bie J (2012) Bevindingen oriënterende gesprekken stakeholders. Overzichtsstudie NIVEL Technologie in de zorg thuis en zelfzorg, presentation at onderzoekersoverleg Actiz, Utrecht, June 2012

Peeters JM, de Veer AJE, van de Hoek L, Francke AL (2012) Factors influencing the adoption of home telecare by elderly or chronically ill people: a national survey. JCN 21 (21–22):3183–3193. doi:10.1111/j.1365-2702.2012.04173.x

Rutte M, Samsom D (2012) Bruggen slaan. Regeerakkoord VVD-PvdA. 29 Oct 2012. Retrieved from http://www.rijksoverheid.nl/regering/documenten-en-publicaties/rapporten/2012/10/29/regeerakkoord.html

Sanders C, Rogers A, Bowen R, Bower P, Hirani S, Cartwright M, Fitzpatrick R, Knapp M, Barlow J, Hendy J, Chrysanthaki T, Bardsley M, Newman SP (2012) Exploring barriers to participation and adoption of telehealth and telecare within the whole system demonstrator trial: a qualitative study. BMC Health Serv Res 12:220. doi:10.1186/1472-6963-12-220

Schippers E (2012) Kamerbrief over eHealth. Ministerie van volksgezondheid, Welzijn en sport, 7 June 2012. Retrieved from http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2012/06/07/kamerbrief-over-e-health.html

Sol H (2012) eHEALTH eNOUGH? or pHEALTH? Presentation, University of Groningen, Nov 2012

Sponselee AAG, Schouten BAM (2012) Randvoorwaarden: acceptatie. In: van Hoof J, Wouters E (eds) Zorgdomotica. Bohn Stafleu van Loghum/Springer Media, Houten, 9789031392322

Sponselee AAG (2013) Acceptance and effectiveness of telecare services from the end-user perspective. Doctoral dissertation. Eindhoven University of Technology, Eindhoven, 978-90-8891-643-4

Steventon A, Bardsley M, Billings J, Dixon J, Doll H, Hirani S, Cartwright M, Rixon L, Knapp M, Henderson C, Rogers A, Fitzpatrick R, Hendy J, Newman S, Whole System Demonstrator Evaluation Team (2013) Effect of telehealth on use of secondary care and mortality: findings from the whole system demonstrator cluster randomised trial. BMJ 344:e3874. doi:10.1136/bmj.e3874

World Health Organization (2010) Medical devices: managing the mismatch: an outcome of the priority medical devices project. WHO Document Production Services, Geneva. ISBN:9789241564045. Retrieved from http://apps.who.int/iris/handle/10665/44407#sthash.D2ebuHTx.dpuf

World Health Organization (2014) Compendium of innovative health technologies for low-resource settings: assistive devices, eHealth solutions, medical devices. WHO Document Production Services, Geneva. ISBN:978 92 4 156473 1. Retrieved from http://apps.who.int/iris/bitstream/10665/108781/1/9789241564731_eng.pdf?ua=1