

Smart home care platforms: where is the added value?

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Abstract:

Due to changes in the demographic situation of most Western European countries, interest in ICT supported care services grows fast. eCare services that foster a better care information exchange, social involvement, lifestyle monitoring services, etc., offered via smart care platforms integrated in the homes of the elderly are believed to be cost-effective and could lead to an increased quality of life of both care receiver and (in)formal care giver. Currently adoption and integration of these smart care platforms is slowed down by several barriers such as an unclear added value, a lack of regulations or a sustainable financial model. In this work the added value of smart home care platforms is identified for the several involved key-actors such as the care receiver, the (in)formal care providers and the care organizations. In a second step several go to market strategies are formulated and are supported by the quantification of the potential impact on current care processes in terms of time and financial resources. Because the gap between the current way of providing home care and providing home care supported by a fully integrated smart care platform seems too big to bridge in one effort, a migration path is provided for stepwise adoption and integration of smart care platforms in the current way of home care provisioning.

1. Introduction

For years, researchers and politicians have been formulating the challenges that will arise due to the aging society of Western Europe. On top of that, those financial, cultural and medical challenges were amplified due to the financial crisis that struck Western Europe during the last five years. For many Western European countries this resulted or will result in a higher pressure on the care system while fewer resources will be available.

Changes in healthcare policies can be noticed in EU-member states in order to deal with these context challenges. Also, general interest in ICT supported care applications like remote fall detection applications [1], social contact enhancing applications, etc. grows exponentially. Although their impact is not always proven yet, many researchers see these applications as tools to improve the quality of care while reducing the cost of care.

The growing interest for these ICT supported care applications is confirmed by the numerous diversified, individual applications that are offered today. But because of their individual, not integrated and standalone characteristics, the current landscape is fragmented and fuzzy for users (for both care receivers and care givers). To tackle these issues of non- interoperability and non-integration for ICT supported home care applications; smart home care platforms (SCP) are being developed [2]. These SCPs allow integration, monitoring and data exchange between a set of home care applications and services that run of the central platform.

Their goal is to improve the quality of life for the patient while reducing the current cost for long-term care. In general, smart care platforms allow exchanging information between the care receiver and his or her (in)formal caregivers, or between the caregivers reciprocally. Furthermore, the integration of various sensors in the homes of care receivers that monitor some specific context variables (room temperature, movement of the person, bed detection, sound level, etc.) [3] allow longitudinal analyses that can provide meaningful insights in evolution of the condition of the care receivers and their daily life patterns.

Although SCPs are expected to offer an added value for all actors who use them, there is only little or no willingness to pay (WTP) from the care receiver yet. Also the impact on the business cases of care givers or organizations is not yet clear enough. The logical result of this is the difficult adoption of these high potential SCPs. Then the questions arise whereas SCPs really have an added value for all actors and why there is only a marginal WTP?

II. Objectives

The goal of this research is to identify the bottlenecks and added value for all actors involved, when integrating smart home care platforms in the homes of care receivers. Based on these identifications, several potential go to market strategies are proposed and quantified in order to determine viable and successful scenarios for a sustainable adaption of this type of innovative ICT supported care applications and platforms. At last a migration path is proposed in order to prepare the market by stepwise integration of the SCPs services. This validated migration path is believed to open up the market by bridging the gap between the current care situation without SCPs and the future care situation with completely integrated smart care platforms into the homes of the care receivers.

III. Challenges concerning the integration of smart care platforms

Integrating smart care platforms and eCare services in general faces some key challenges for adoption. Following challenges are recognized:

- **A lack of financial support**
Integrating eCare services often require efforts from professional care providers. Without a clear financial structure/ compensation, their motivation to adopt and support these services is low.
- **A complex value network for eHealth services**
Integrating smart care platforms demands an intensive collaboration of several care actors. That is in contrast with the current and fragmented way of the often polarized care provisioning. Often the cost/benefit allocation for these actors is distorted.
- **Privacy and legal issues**
Together with the use of ICT supported care services automatically questions on data security and privacy rise.
- **Added value is unclear, still needs to be proven or is hard to quantify**
Smart care platforms are new and innovative and therefore the impact of it is not proven yet. Also the will impact more the quality of care and quality of life, which is harder to measure and quantify.
- **Technological barriers**
Integrating technology into the homes of the elderly requires a minimum knowledge on how to use it. That will be challenging! Also there exist still issues on data standardization in order to guarantee exchangeability.

a. A lack of financial support

In an international research of [4], 80% of primary healthcare practitioners reported a lack of financial support for IT applications as a major barrier for adaption. Integrating innovative ICT supported care services (eCare services) does not only require upfront investments, but often results in changes or even completely new operational process for care provisioning. Financial structures to compensate care providers for these new processes are often not in place. The incentive to integrate eCare services is thus rather low for most care providers. A good example is telemonitoring patients with chronic heart failures [5]. Although the technical thresholds for all the users is low (daily blood pressure and weight measurement. The data is then sent to a central sever and in case of acute changes in the biomedical parameters, a general practitioner(GPs) or heart specialist is contacted.), the adoption of this service remains low. This is partially because the GPs and heart specialists are not paid for the remote diagnosis and treatment modifications.

On the other hand, together with the growing interest in eCare services, the number of request for reimbursement grows as well. So the decision makers should prioritize the allocation of reimbursements according to the impact on the quality of life of the patient and his or her (in)formal care givers.

As a final remark, Annemans [6] states that on a decision level, where decision makers decide on the reimbursements of treatments, there is a short time vision where there is too less attention to the long term cost-efficiency of all treatments.

b. The complexity of the eHealth value network

The health- and home care market in general, is often a fragmented and difficult market to operate in. Currently a very fragmented care offer is delivered. Different formal caregivers working for different facilities/services/organizations are providing care towards the care receiver. Although sharing care data between care providers and care organizations is more and more facilitated (and sometimes compulsory) by online platforms deployed by governments (e.g. online medication schemes [7], care need assessment tools [8], e-prescriptions [9], etc.), currently one cannot speak of complete inter-organizational collaborations.

Next to the fragmented care provisioning in many countries, also the care financing is a maze. Whether or not compulsory, basic care insurances often cover many care interventions but additional insurances are needed to cover the most expensive care. In many cases, federal organizations decide on the reimbursement of cure, care and care supplies, which can be extended by local governments.

This complex healthcare landscape becomes even more confusing once technology and digital health get integrated. During the process of this research project, it became clear that the value network of digital healthcare is so complex and fragmented that the creation/adoption/consumption of a digital smart care platform asks for extensive partnerships (with non-care providing partners, e.g. service integrators, mobile telecommunication providers, hardware developers, etc.) and collaborations to get digital adopted and marketed within the healthcare sector.

The complex value network is often characterized with an unbalanced cost and benefit allocation. Often is the investing actor not the one which will benefit the most. These distorted cost/benefit allocations need to be solved in order to guarantee a sustainable business case, otherwise disadvantaged actors could slow down or even block the adoption of the service.

c. Privacy concerns & legal issues

Privacy is another barrier hindering implementation of ICT in healthcare. Since EMR (electronic medical records) and other digital health innovations are web based, many physicians and patients fear that medical data may not be secure. And this fear is even more the case when wireless internet is used to transmit these data to various locations [10].

To counter these privacy concerns, governments impose strong regulations on ICT adoption in healthcare. Various laws related to fraud and abuse, malpractice, data security and other create a difficult and uncertain climate for healthcare providers in implementing ICT. This is the same case for new innovative health entrepreneurs entering the market.

d. Added value of such services still needs to be proven

Although healthcare is in need of new business models and there is a big buzz on digital healthcare innovation, there is still little proof on the added value of new eCare services. This is a reason why policy makers, healthcare practitioners, patients and other stakeholders are a bit restrained on the adoption and reimbursement of it. Typically reimbursement could be considered when significant scientific evidence is available (cfr. evidence based medicine). This poses a chicken or egg duality for eCare services like smart care platforms since its adoption, and therefore also its expected impact, is to be slowed down by a lack of reimbursement.

Another major characteristic of eCare services is that the added value in many cases is purely qualitative. Care supporting services often lead to an increased quality of care, increased peace of mind for the care receiver or care provider, increased social involvement and an increased quality of life in general. This type of qualitative impacts is hard to measure and quantify. There exist methodologies to quantify these qualitative benefits such as QALY [11] but often these methodologies do not cover all impacted aspects.

Further research on cost-effectiveness, value calculations and user experience research will have to prove the added value of digital healthcare.

e. Technological barriers

Integrating smart care platforms also poses a significant technological barrier. On the one hand the end users, being the care receiver or the care providers need to be at least somewhat educated to use and work with new ICT supported care services. Also using the smartphone, tablet or television as medium to interact with the smart care platform is a completely new given for many people. Proper education and time will be needed in order to expect that the users are ready to work with a smart care platform.

On the other hand, there exist many standards and data formats to exchange care related information or to communicate with different sensors. Many hardware providers use an own standard to protect their technology or use a subset of international standards such as HL7, Dicom, etc. [12]. Luckily efforts on standardization is still ongoing and fostered by many initiatives such as Continua Health Alliance [13]

IV. Methodology

The proposed migration path for integrating smart care platforms into the current care landscape and to tackle the various challenges results from following three-step research approach: 1) Added value identification and business model analysis, 2) Go to market strategy formulation and impact quantification and 3) formulation of a migration path. Following figure 1 gives a schematic overview.

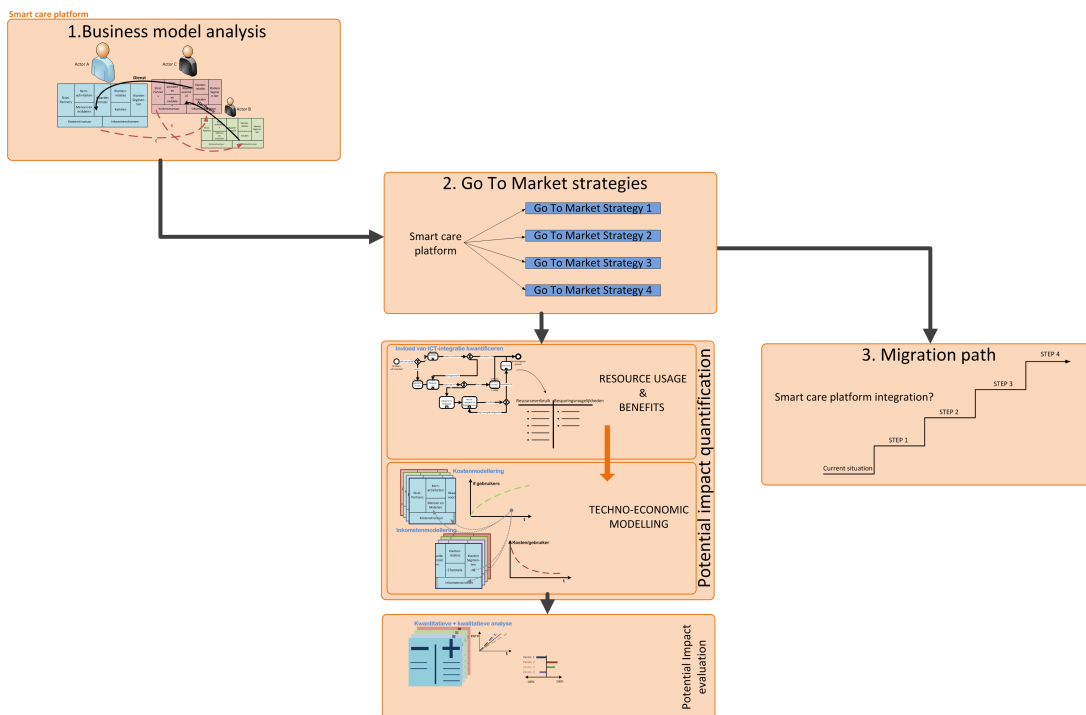


Figure 1: Schematic overview of the methodology

1) Added value identification and business model analysis

Interviews with care organizations and smart care platform providers were conducted in a first step to identify the added value or potential impact for each actor. Results of previous research on user experience were consulted and workshops with care professionals were carried out. This step resulted in A) a clear formulation of the needs of each actor, B) the added value SCPs could offer to (partially) overcome these needs and C) initial quantitative inputs such as installation costs, services fees, hours invested in billing etc.

Several collaboration techniques were used to gather the essential information. Amongst them are: care process decompositions, the time allocation spider charts, and administrative process breakdown scheme, etc. (Further in this work, a more detailed description can be found.)

2) Market entrance scenario formulation and impact quantification

a. Market entrance scenario formulation

Knowing the added value of the smart care platforms is a first step, but delivering the eCare services in a complex network of actors is another challenge. In this second step, we provide potential answers on questions like: who will distribute and install these platforms? Which business model will be used (bundle vs. modular packs)? Which actor will educate the users, both care receivers and care providers?

To be able do so, the three realistic go to market strategies (see go to market strategies in section research outcome), based on market trends and resulting from interviews with smart care platform providers, are described in detail via value network and value stream analyses. In short this means that all necessary roles, being the tasks

and responsibilities that are needed to be executed in order to deliver the product/ service to the end consumer, were identified and allocated to one or more actors. An actor is the organization/ person or firm which is responsible for one or more roles. Mapping all the actors on one or more roles clarified some important issues that will need to be tackled in the future.

An additional fourth scenario describes the assumption that the integration of smart care platforms really leads to an increase of Quality of Life (QoL). This effect can only be assumed since no form of testing and impact validation was part of the scope of this project. Under certain assumptions, one could calculate the increase in QALY's (quality adjusted life years) per user [11]. In this way, one is able to formulate the societal value of smart care platforms.

b. Scenario quantification

Additionally, the impact of integrating a smart home care platform at home on the business case of the involved actors will be quantified (e.g. decrease in time for billing process/scheduling tasks, potential increase in Quality of life adjusted years (QALY's) [11], etc.). Combining the qualitative and quantitative impacts gives the total impact of making use of a smart care platform for a particular actor.

3) Formulation of a migration path

In a third and final step, the gap between the 'AS IS' situation for home care delivery today and the ideal and futuristic 'TO BE' scenario is topic of interest. During the project, research indicated that the 'AS IS' situation, characterized by a complete scattered landscape of care provisioning, offered by many different care actors such informal, formal care givers and care organizations, is not ready for a complete integrated smart care platform in the homes of elderly.

The gap between the current situation and the desired scenario seems too big to bridge in one effort, therefore several intermediate targets are proposed that form together the migration path towards the 'TO BE' scenario, which stands for the complete integration of smart care platforms in the organizational and operational processes of care provisioning. The migration path as such is proposed as a realistic integration strategy for smart care platforms.

V. Research outcome

In what follows, the proposed methodology will be applied to smart care platforms in order to determine the added value for several actors and to formulate several go to market strategies. Also one particular go to market strategy will be described in detail and the potential impact will be quantified.

4) Description of the functionalities of smart care platform

Many examples of previous and ongoing projects on smart care platforms can be found in literature [14], [15], and [16]. In essence their functionalities can be categorized in four different themes:

- **Sharing care information**, and according to the role based rights of the involved actors, one can add, change, erase or annotate particular information of the care receiver.
- **Providing care supporting services**. Examples of these services are online meal delivery services, providing care journals and care agendas, alerting specific care actors, etc.
- **Monitoring services**. Examples are lifestyle monitoring services, which monitor daily life activities via a series of sensors such as: movement, pressure sensors to detect bed or couch presence, accelerometers to detect falls, light, noise, temperature, humidity, smoke detectors, weighing scales, etc. Via these sensors all kinds of biometric or context information can be captured. Analysis of the sensor data allows evaluations of the lifestyle trends.
- **Social life supporting services**. Making video calls with friends or relatives, or being able to share some memories with family are just some of these services that support the social life of the elderly.

Many smart care platforms provide some of the above services whilst others provide a basic set of services which can easily be extended by adding modular services [17]. The smart care platform, called O'CareClouds, which is the focus of this research, is a complete cloud based platform. The basic service set of O'CareClouds does provide several services to foster better care information sharing and social connectivity (e.g. consulting and annotating the shared care record, time- and task registration of the care givers, care agenda and a smart task list, social calendar, smart messaging service, service catalogue for additional O'CareCloudS services). Additionally, modular lifestyle monitoring services can be added by installing the necessary sensors.

5) Added value identification and business model identification

Addressing the needs of the involved actors is a first requirement in order to present a potential interesting offer for them. In what follows, the main users (being the care receiver, the informal care providers (such as family members, partners or friends), the formal care providers and care organizations) together with the added value for them and a description of how of an integrated smart care platform fulfils their needs is provided.

To determine the added value for both the care receiver and the informal care giver, results from user research within the O'CareClouds project are used, combined with the outcome of (in)formal interviews and workshops with various stakeholders.

a. *Added value for the care receiver:*

- A direct result of an integrated smart care platform is that the care receiver immediately has more control of the organization of his or her care. Care receivers can consult and complete their own shared care record. This leads to a strengthened involvement and empowerment of the care receiver.
- The improved possibility to share care information between the involved care actors will lead to higher quality of care and could lead to a higher state of peace of mind because they know that someone is looking over their shoulders.
- Depending on the go to market strategy, integrating a smart care platform with lifestyle monitoring services after hospitalization could lead to a higher state of self –management. Being more self-manageable as a care receiver means that you are less care dependent. Therefore the possibility exists that a care receiver can live in, and stay in his or her own home, whilst now many care receivers need to go to an intramural or day care centre because their care needs are too big to live qualitatively in their own not- adapted homes.
- A social calendar, which presents all social activities which are interesting and adapted to the situation of the care receiver could lower the barriers for social contact and decrease the chances of social isolation.
- Many care supporting services and devices exist already! But being informed of their existence is the real challenge. A catalogue of compatible supporting smart care services could lower this knowledge barrier. The smart catalogue could suggest care services, particular interesting for the care receiver.

b. *Informal caregiver (family caregivers, friends, neighbours, volunteers, etc.):*

- A better care task coordination will lead to an improved quality of care/work atmosphere. Less stress, less unexpected tasks, increased state of peace of mind, etc. could all be results of a better coordination and communication between all the care givers.
- Being better (and real time) informed as care giver about the care receiver and his or her actual situation will also lead to more appropriate care (e.g. when there was an abnormal incident earlier that day, etc.).

c. *Formal caregivers (physiotherapist, general practitioner, cleaning help, etc.) & Care organizations (day-care revalidation centres, home care organization, etc.):*

To identify the added value an integrated smart care service could reveal for a care organization, several methods were used. First, based on user scenarios, a decomposition of the current care process is done. Then, (with a blue colour) it is indicated how the current process could be triggered by smart care platforms. At last, (with green) the impacted current process steps were identified. These steps will not only require some hardware and interaction with the platform, but will result in additional time investments.

User scenario mapping on care process task, TE-layer and technological layer.												
User scenario	Phase	Phase	Phase	Phase	Phase	Phase	Phase	Phase	Phase	Phase	Phase	Phase

Figure 2: Decomposition of a current home care process.

In order to validate these findings and get data on the expected amount of additional time invested, a first interview with people of the care organization took place. The goal of the interview was to identify in which process steps the most time was invested and where most efficiency increase could occur. This was done via the spider chart below that represents four stages of the care delivery process and the continuous overhead process. (see figure below)

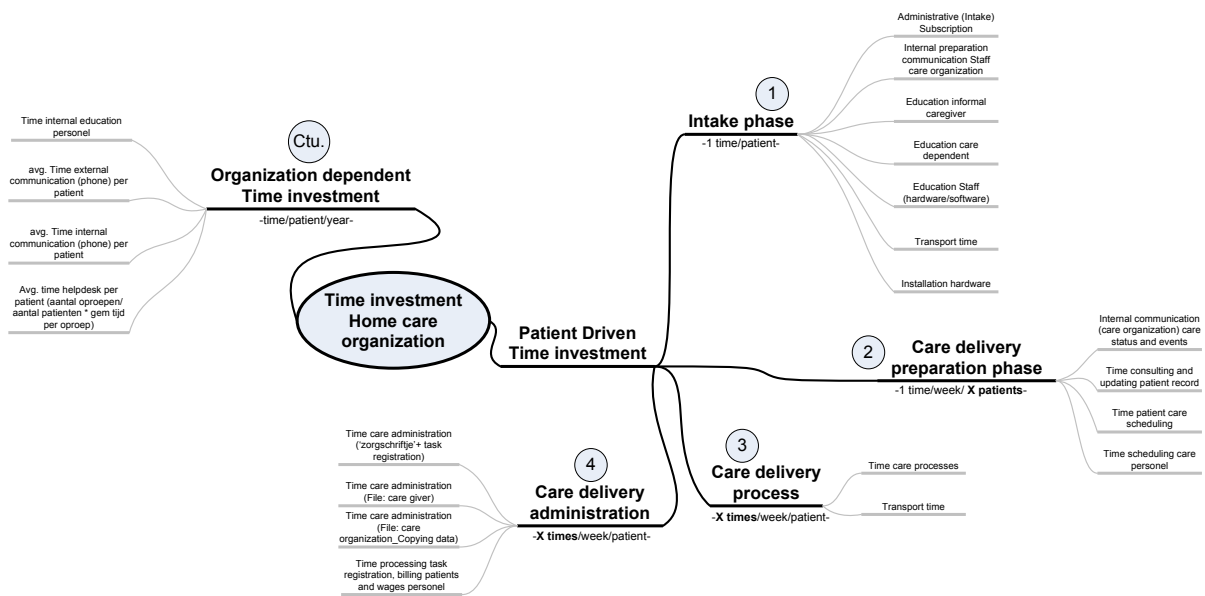


Chart presents the care organization blocks potentially impacted by the integration of an OCCS system. Every block is expressed as avg. time investment per patient

Figure 3: Time allocation in the provision of care

The complete process of care delivery by a care organization is divided on the one hand into patient driven process steps; 1) the patient intake phase, 2) the preparation of the care delivery, 3) the actual care delivery and 4) the care delivery administration. On the other hand, there is also the overhead time investment needed to run the organization as well.

The major conclusion that can be drawn is that a smart care platform will only marginally impact the first three patient driven phases. But all process blocks which require administration tasks can benefit a lot of such a system. In specific the billing for care delivery and the (re)scheduling of it proved to be processes that are characterized by intensive manual labour in many care organizations. Apparently due to the not integrated informatics systems, a lot of manual rework and double work needs to be done. These findings are crucial since they shift the focus of the quest to identify the added value from having the availability of a more complete care context to a focus on administrative time investment.

To conclude following value adding issues were detected:

- Using (and/or integrating) smart care platform functionalities in existing planning and billing software of the formal caregivers could lead to significant decrease in administration time. Administrative time gained at the home of the care receiver will result in more time for qualitative care (more added value for the care receiver).
- A better care task coordination will lead to an improved quality of care/work atmosphere. Less stress, less unexpected tasks, increased state of peace of mind, etc. could all be results of a better coordination and communication between all the care givers. (idem informal caregivers)
- Being better (and real time) informed as care giver about the care receiver and his or her actual situation will also lead to more appropriate care (e.g. when there was an abnormal incident earlier that day, etc.). (idem informal caregivers)
- Whenever there is a delay or a change in the shared care schedule, every relevant care actor immediately could be informed via the smart care platform. So calls of nervous care receivers when the care giver is late could belong to the past.
- Integrated smart care platforms allow a smoother switch between professional care colleagues from the same care organization because of the available care context the platform can provide (e.g. in case of sickness, etc.). Also during standby duties of non-care organization connected formal care givers

Table 1 below summarizes the key smart care platform users, the added value for them and the type of it.

Table 1: Added value for the key users of smart care platforms

<i>Actor</i>	<i>Added value description</i>	<i>Type of added value: Qualitative/ Quantitative</i>
Care receiver	<ul style="list-style-type: none"> • control of the organization of care • strengthened involvement and empowerment • higher quality of care • higher state of peace of mind • higher state of self –management, less care dependent • lowered barriers for social contact and decrease of social isolation • better informed of existing and practical care support services 	Qualitative Qualitative Qualitative Qualitative Qualitative Qualitative
Informal Care giver	<ul style="list-style-type: none"> • better care task coordination • improved quality of care/work atmosphere • Less stress, less unexpected tasks, increased state of peace of mind, etc. • Being better (and real time) informed 	Qualitative Qualitative Qualitative Qualitative
Formal Care giver & Care organization	<ul style="list-style-type: none"> • better care task coordination • improved quality of care/work atmosphere • Less stress, less unexpected tasks, increased state of peace of mind, etc. • Being better (and real time) informed • Smoother switching between care givers (e.g. sickness, etc.) • Significant decrease in administration time (scheduling, adapting schedules, billing, etc.) • Reassuring care receivers when delay during care visits 	Qualitative Qualitative Qualitative Qualitative Quantitative Quantitative Qualitative

The importance of distinguishing between qualitative and quantitative impacts lies on the capability to quantify the impact. Regardless which actor will invest in the installation and the use of a smart care platform, a clear cost benefit analysis can't be presented when there are only qualitative benefits.

Conclusions as 'improved quality of care', 'less care stress', 'better work atmosphere', etc. are all examples of qualitative impact factors not only for the care receiver but also for all his or her care givers. In contrast, formulating direct quantitative impacts is much less straightforward to do. Depending on the care needs of the care receiver, actors will use and interact more with the smart care platform. The platform will send messages and updates about the care receiver. Reading and handling those messages will take time from the care givers in general. At the other hand, using a smart care platform should lead to a better care coordination and care information sharing, thus users could for example gain time because of the better administration. The amount of time invested in the system and the time gained by using it is always unique and depends on the care receiver and

his or her (in)formal caregivers. It can be assumed that direct quantitative benefits, increase in time for care, less miles, etc. are marginal for the care receiver.

For care organizations the situation is different! Both types of impact factors are important. Better insights in the home care situation through more detailed care information can only lead to more quality of work and work atmosphere.

On the other hand, an adjustment in the care planning process could lead to significant time savings in the overhead processes. This is an important given since a care organization is responsible for many care givers, so potentially a significant amount of time can be saved but would also require a significant investment from the care organizations.

Care organizations are expected to have a crucial role in the integration, adoption and scaling of smart care platform systems. The added value for this actor must be very clear! Therefore not only a description of the qualitative impact is interesting, but also a cost benefit analysis is needed in order to indicate whether or not investing in this kind of platforms is cost effective.

6) Go to market strategies

The goal of this section is to discuss on possible approaches to get smart care platforms to the market. Three possible scenarios were found for market entrance. A fourth reimbursed based market scenario was formulated as well, but is considered as non-desired since reimbursement of care is under heavy pressure and could be non-sustainable in the future. For one particular go to market strategy, firstly the value network that will try to detect all necessary actors together with their roles is formulated. Secondly, the value streams between every role are indicated. Thirdly, the potential qualitative and quantitative impacts of the integration of smart care platforms in that particular scenario are calculated. To conclude, a SWOT analysis is provided for that scenario.

Following four go to market strategies are identified:

1. Smart care platform provided by the care organization

The smart care platform gets sold by the integrator to the care organization, which in its turn offers the service to the final client. Apart from having a competitive advantage over other care organizations, interviews showed there does not seem to be added value (yet) for the care organization. Willingness to pay from the customer's side seems to be the biggest hurdle to create a sustainable business model.

2. Smart care platform provided by service flats

The smart care platforms are offered by the service flat owners and their usage costs is included in the general service flat rent. It was noticed that there is still a technology adoption gap for elderly and, apart from having a competitive advantage over other service flats; there is little added value for the service flats to integrate the expensive technology because the real benefits of the system are addressed to other actors.

3. Smart care platform as billing and scheduling tool for care organizations

In a third scenario this work tries to address the issue of a lack of added value for the care organizations. Taking into account the input from care organizations we developed a scenario where we stepped away from the key focus of smart care platforms, but used a billing & scheduling tool as starting point. According to care organizations these current processes demands major administrative and time intensive efforts.

4. Smart care platform with government reimbursement

The last scenario was developed to show how the business model would look like if smart care platforms are offered by the care organization but supported by government reimbursements. It is clear that this is not a desired scenario, as reimbursement strategies are under heavy financial pressure and is no guarantee for a long-term sustainable business model for smart care platforms.

In this work, only the third go to market strategy will be discussed in detail.

a. Value network and value stream analysis

The added value for key actors such as care organizations and care providers is not clear enough in order to guarantee a sustainable adoption. Therefore focus is shifted from a smart care platform as care supporting system to smart care platforms as efficient time and task registration and care reschedule tools. Therefore smart care platforms are expected to save a lot of administrative time (see further: impact quantification). In this go to market scenario, the care organization subscribes to the smart care platform billing and rescheduling functionalities. No other care actors are necessarily involved or have to invest in smart care platform services or hardware.

Task registration and gathering billing information could be easily added to the smart care platform functionalities, also since these platforms also foster better care information sharing amongst the care actors, rescheduling the care agenda would become easier.

Focusing on the billing and rescheduling processes seem a bit an undervaluation of all the possibilities an integrated smart care platform but it has two main advantages:

- The billing and care rescheduling processes of many care organizations are often still very administrative, time intensive and therefore costly. Tackling these issues is of real added value for these actors.
- Care providers and members of a care organization are not always familiar with the latest ICT technologies. Instead of releasing the full functionality of smart care platforms at once, what can be overwhelming, a controlled and stepwise introduction of functionalities that makes their job less administrative intense is expected to result in better adoption of the technology.

Before diving into the scenario of interest and quantifying the potential impact, it is needed to give an overview of the generic roles and actors that are detected during this research and collaborative workshops with all key partners. The figure below presents the value network for offering smart care platforms as billing and scheduling tool for care organizations. The colours indicate which actor is responsible for which role. In the value stream mapping, the value exchanges (financial, etc.) between these actors are presented.

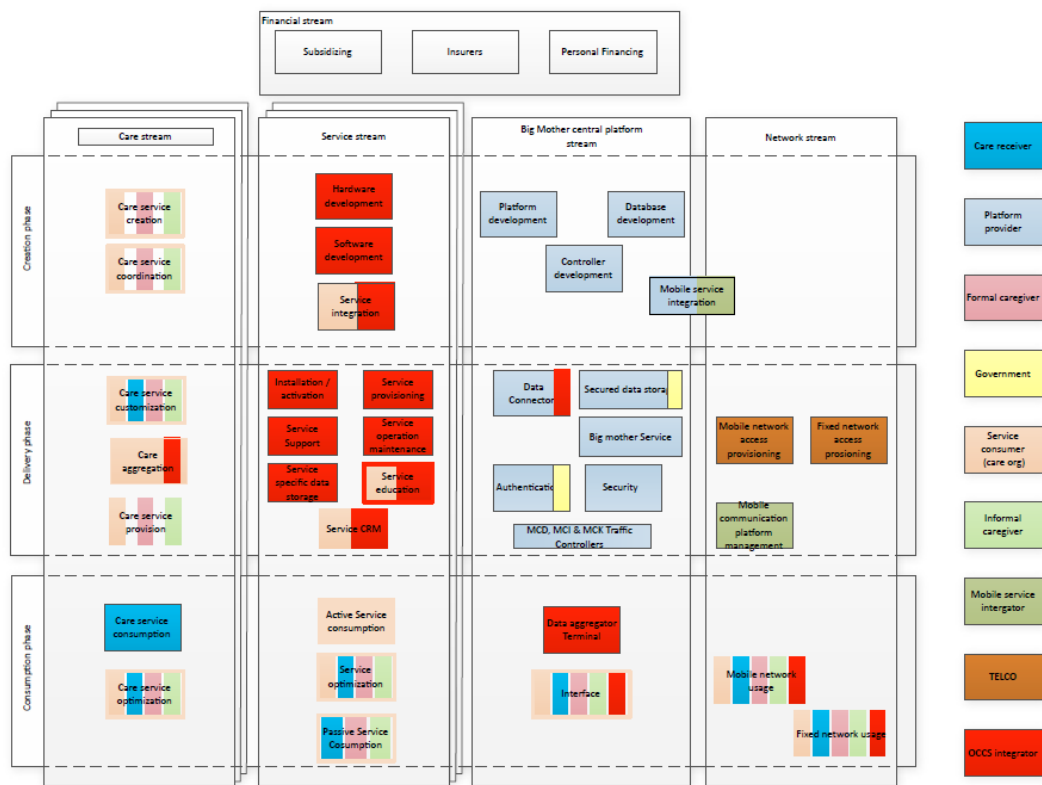


Figure 4: Value network configuration for go to market scenario 3

Following tables give an overview of all detected roles.

Table 2: Description of all the roles in the care stream

<i>The care stream is the value creation stream that deals with the creation, delivery and consumption of care services (all services related with care, wellbeing, home help, etc.) in order to support people to live as long and as healthy as possible in optimal state of wellbeing in a safe living environment (home or neighbourhood).</i>		
Creation phase	Care service creation	The business role responsible for the creation of services related to care, wellbeing, home help, etc. to support people to live as long and as healthy as possible in optimal state of wellbeing in a safe living environment (home or neighbourhood) Example: the creation of a meal delivery service at home
	Care service coordination	The business role responsible for the creation of integrated care services in order to be able to deliver integrated and demand-driven care
Delivery phase	Care service customization	The business role responsible for customizing the care service to the needs and preferences of the end consumer (care receiver, informal caregiver, etc.) Example: personalization of the meal based on personal food preferences of the care receiver (soup without salt for example)
	Care service aggregation	The business role responsible for aggregating and integrating the care services (with existing and futuristic delivering channels) Example: the care receiver can order his/her preferred meal via a tablet at home
	Care service provision	The business role responsible for the actual delivery of care services to the end customer (care receiver) Example: provision of the ordered meal at home of the care receiver by the meal deliverer
Consumption phase	Care consumption	The business role responsible for the use of care services by the end consumer. Example: the care receiver eats the delivered meal
	Care service optimization	The business role responsible for improvements in the care service based on the feedbacks received during the care service consumption phase. Example: food delivered is not eaten, and nurse notice this. Other meal support service should be considered.

Table 3: Description of all the roles in the service stream

<i>The service stream is the value creation stream that is related with the creation, delivery and consumption of ICT services to support care</i>		
Creation phase	Hardware development	The business role concerned with the development, manufacturing and retailing of the hardware equipment. Example: development of gateways, sensors, displays, etc.
	Software development	The business role concerned with the development and integration of software components for care purposes. App development can be done by public users, private companies or group of app developers. Example: development of software so people can order via an online software program the meal of their choice
	Service integration	The business role responsible for integrating smart care platform services in existing back-end systems of the adopting actor (e.g. providing integrated software to care organizations that keep existing client files in account)
Delivery phase	Installation / activation	The business role responsible for the technical installation of the hardware within the care receiver environment Example: technical installation of different sensors in home environment for a monitoring service (e.g. sensor in the fridge monitoring when/how often the fridge is opened)
	Service provision	The business role responsible for the provisioning/delivery of the ICT service(s) Example: the smart care platform and its services are continues and with high quality of service delivered to the care receiver and his or her network of caregivers
	Service support	The business role responsible for supporting end customers (care receiver, caregiver, etc.) and resolving issues in case of problems (contact centre, help desk, etc.) Example: when there is a problem with the service, the end users can contact a contact centre for service support
	Service operation and maintenance	The business role responsible for the scheduled operations and maintenance of the ICT components. Example: yearly maintenance of the batteries in sensors, something is wrong and a technical person is send to the house to solve the problem if not possible from a distance (checking software updates already done)
	Service specific data-storage	The business role responsible for the storage and delivery of service specific data. Example: The storage of additional profile date of a friendship book

	Service education	Training of Caregivers: the business role responsible for educating and instructing the caregivers (formal and informal) making them capable of using the service. <ul style="list-style-type: none"> • Training of Care receivers: the business role responsible for educating and instructing • the care receivers making them capable of using the service.
	Service CRM (customer relationship manager)	The business role responsible for dissemination and marketing of the service towards the stakeholders. Example: Keeping the end user up-to-date on new service improvements, care packages, price changes, reimbursement policy etc.
Consumption phase	Service consumption	Using the ICT supported care service. Dependent on the user this could be: <ul style="list-style-type: none"> • data interpretation: Interpreting the data that result from the service and acting on that. • data creation: providing information as service input
	Service optimization	The business role responsible for improvements in the ICT service based on the feedbacks received during the service consumption phase. Example: In case of difficulties whilst using the interface of the service, the actor responsible for this role will be responsible for enhancing the ICT interface for a better user experience.

Table 4: Description of all the roles in the Big mother central platform stream (smart care cloud server)

<i>The Big mother central platform stream describes all the roles that form the central platform needed for the customer unique care and service provisioning. These roles are service independent and always available within the smart care system.</i>		
Creation phase	Platform development	Developing the smart care platform with all its basic services
	Database development	Designing the database system that is dedicated to the smart care platform
	Platform Controllers Development	Developing all the needed controllers for the MCD (Meta Care Data), MCI (Meta Care Information) and MCK (Meta Care Knowledge) traffic between the actors.
Delivery phase	Secured data storage	Managing and operationalizing the databases that are needed to for the smart care platform
	Data connector	Providing the piece of software that translates the various data standards to others in order to allow easy data exchange in the form that fits the service the most.
	Big mother service / Semantic communication bus / data connector	Managing and operationalizing the smart care platform. All data, raw of reasoned passes is communicated via the semantic bus
	Security	Providing the software to allow safe data access and data usage
	Authentication	Providing the software to allow safe authentication
	Access management	Operationalizing and managing the databases and service to provide user management
	MCD, MCI, MCK Traffic controllers	Managing and operationalizing the traffic controllers for the Meta Care Data, Information and Knowledge
Consumption phase	Data Aggregator Terminal	Providing the Terminal/box that captures all external hardware signals and translates the data in a chosen standard
	Interface	Providing the dedicated interface device (TV, Smartphone, Tablet, etc.) for interaction with the platform

Table 5: Description of all the roles in the network stream

<i>The network stream aggregates all the roles needed for the provisioning of the interconnection between different users and devices connected directly or indirectly, wireless or wired with the smart care platform.</i>		
Creation phase	Mobile service integration	The integration of mobile services in the creation phase of the big mother platform.
Delivery phase	Mobile network access provisioning	Providing access to the mobile Telco network
	Fixed network access provisioning	Providing access to the fixed Telco network
	Mobile communication platform provisioning/management	Managing the platform output according to the type of receiving device, user rights and network type
Consumption phase	Mobile network usage	Making use of the mobile network
	Fixed network usage	Making use of the wired network

The involved actors in this go to market strategy are presented below:

Table 6: Description of the key-actors involved in home care provisioning

<i>The care receiver</i>	The actor who needs and consumes care services.
<i>The informal caregiver</i>	Is in most cases a person close to the care receiver and gets not paid for their care services. The informal caregiver has usually had no or little education in providing care. For example: family members, neighbours, friends, volunteers etc.
<i>The formal caregiver</i>	Is an actor who is paid for their care services and has had training and education in providing care. For example: nurses, doctors etc.
<i>Care organizations</i>	Are the organizations that organize formal care. They receive funding from health authorities to provide health services. Health care organizations include both non-profit and for-profit organizations.
<i>The OCCS integrator</i>	Is the developer that turns the smart care platform into a tangible product and brings it to the market. To create the final version of the product, the integrator will use its own expertise, but will also use input from external parties (for example: the integrator can buy the hardware from a supplier, will use the services from a software developer etc.)
<i>OCCS Service provider</i>	Is a care service provider or facilitator (e.g. Care organizations, Service flat owners, etc.)
<i>The OCCS Platform provider</i>	Is responsible for the smart care platform back-end system, the maintenance and support for it. This forms the heart of the smart care platform.
<i>Mobile services integrator</i>	Is responsible for handling the mobile communication with the smart care system, the maintenance and support for it.
<i>Telco provider</i>	Provides access to data communication network.
<i>The government</i>	Demands specific user identification before they provide access to some specific data platforms such as e-Health or Vitalink [7].

Below the value streams of this billing & scheduling tool is presented. This tool will be marketed in a B2B scenario, where an integrator will sell the tool to care organizations.

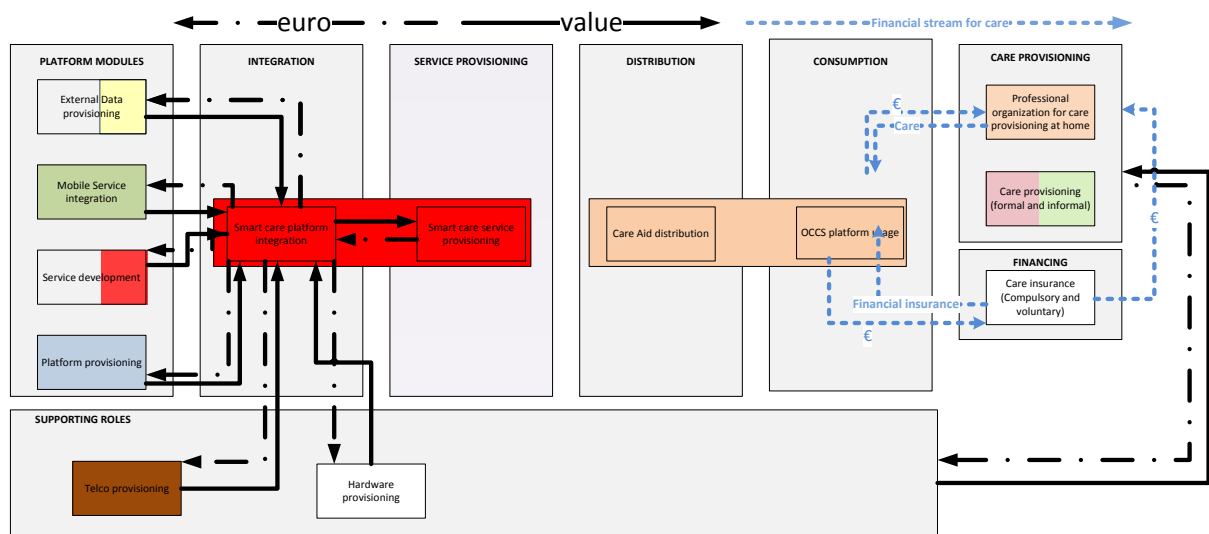


Figure 5: Value streams go to market strategy 3

The integrator will use its own resources but also use external expertise and resources to create the final billing & scheduling tool. Between its suppliers and the integrator, financial flows will be directed from the integrator towards the suppliers to compensate the value streams that flow from its suppliers to the integrator. On its cost to produce this tool, the integrator will add a profit margin that will form the selling price of this tool for its clients. In this case the care organizations.

The care organization(s) will pay the integrator for the tool and for its installation and integration into its back end system and other. The integrator could charge additional (monthly) fees for service support, maintenance, yearly education and other roles. As will be proven in the potential impact, the purchase of this tool will on the long run be cheaper, and thus more cost-efficient than the way the care organization manages these administration processes now.

Feedback from the care organization shows that opening billing & scheduling records for review could provide additional value for care receivers and (in)formal care givers. If the added value is of such a level that willingness to pay can be found, financial streams can flow from these actors to the care organization for the review of the care planning & billing. Further research could provide insights to the willingness to pay for these services.

b. Quantification of the potential impact

The care organizations themselves are convinced that a lot improvement is possible on the administration side of the billing and rescheduling processes.

In order to do detect which process steps would be impacted by smart care platforms, interviews with care organizations took place to collect the data to be able to quantify the current costs for billing and rescheduling processes. A calculation model is build that quantifies the different process steps in order to get a total overview of the current costs.

In a second step, the investments that would be needed to integrate smart care platforms in the current existing backend systems and the gains in efficiency that would result out of it are modelled.

All data was validated by the care organization, but because there remains uncertainty about many model parameters, a sensitivity analysis was performed as well. Also the scope of the model is limited to "Interregio 2 of Familiehulp", which has almost the same borders as the geographical borders of the province East-Flanders of Belgium and counts about 881 FTE home care givers which are member of the care organization Familiehulp [18]. All data and results are valid within this scope.

- **The process break down**

First a full decomposition of the current billing process is done. Also process that takes place when something has to change to the actual care schedule. For instance when a caregiver gets sick, all planned appointments need to be reallocated to other care givers. When a client went to the hospital all planned care visits should be replaced with others, otherwise the care givers would have no work, etc.

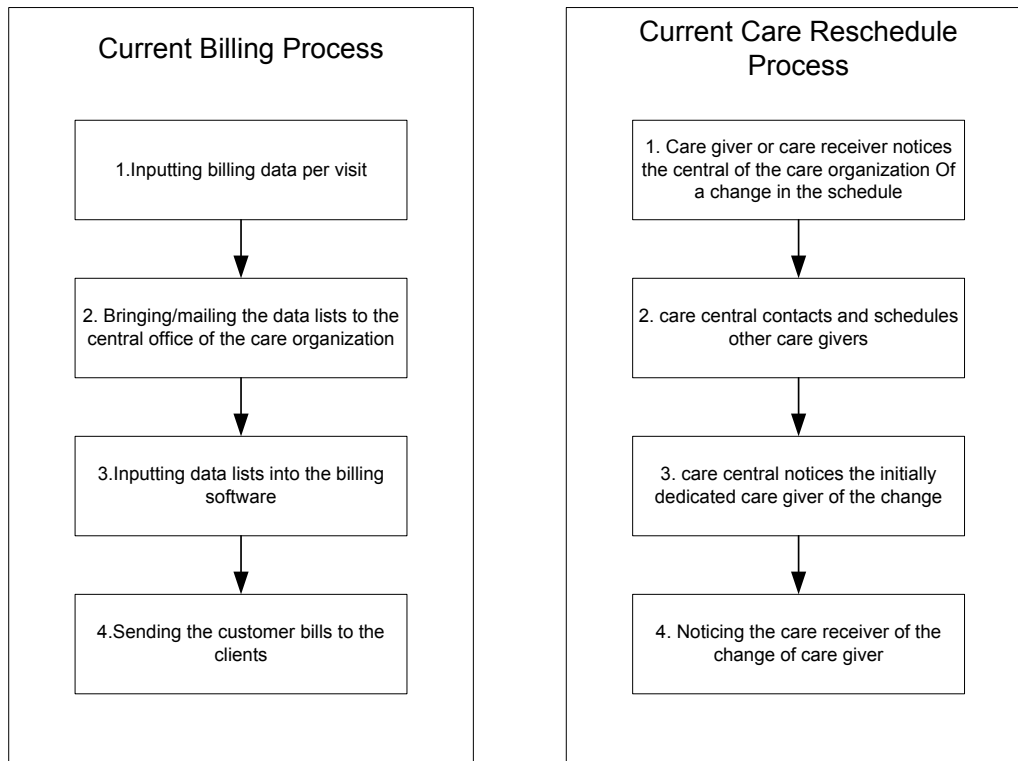


Figure 6: Process decomposition of current billing and care rescheduling processes

- **The process parameters and current resource usage**

In a next step each process block of the current billing process is quantified in terms of number of care visits per month, total amount of care givers, the full time equivalent, time needed to input the data into the back end system, cost for mailing the monthly visit records of the care giver to the care organization, time needed for inputting the data after each visit, average wages of the administration staff and the care providers, etc.

The same is done for the rescheduling process. Relevant data in that case is: frequency of care rescheduling in terms of percentage of the total amount of planned care visits, telecommunication cost if the care provider has to call the central administration office, average time needed to make the rescheduling exercise (not every care provider can be reallocated to a changed care visit due to professional or personal reasons (e.g. care provider must speak Dutch, cannot be pregnant because of the cat of the care receiver, etc.))

In following two tables a concise overview of the data is presented.

Table 7: Overview of the data for the current billing process

Input for the current Billing process		
<i>Description data parameter</i>	<i>Value</i>	<i>unit</i>
Time needed for inputting data per visit	2	min/visit
# visits per month per FTE	62	visits/month
Frequency of data list delivery by the care provider to the care organization administration	12	deliveries/year
Cost of envelopes to send the lists	12	euro/year
Time needed for inputting one line of the data list into the back end system	0.31	Min/data line
# care givers in 'Interregio Gent' (full time + part time)	1719	persons
Full Time equivalent of the total amount of care givers	881	FTEs
Total amount of data lines inputted in the backend system by the central administration (March 2014)	88000	data lines/month
% rework due to mistakes in inputting	4%	of # data

Table 8: Overview of the data for the current rescheduling process

Input for the current Rescheduling process		
<i>Description data parameter</i>	<i>Value</i>	<i>unit</i>
Time needed by the care receiver or care provider to inform the care central	1.5	min/call
Telco costs needed to inform the care central (in case the care provider calls with own mobile)	0.5	euro/call
chance that that a visit needs to be rescheduled	15%	Of planned monthly visits
# visits per month per FTE	62	visits/month
Chance that it the care receiver informs the care central him/herself	70%	
Time needed to inform other care provider	1	min/contacted care provider
Costs Telco for the care administration	0.01	euro/min
Average amount of care actors to contact (number of calls to make)	4	
time needed to make the new care schedule	4	min

Based on these inputs, the model provides following results on current resource usages:

Table 9: Resource usages for the current billing process

Resource usages for the current billing process:		
<i>Description data parameter</i>	<i>Value</i>	<i>unit</i>
Total time needed per FTE when inputting billing data when he is with the care receiver (time is paid by care receiver)	1488	min/year
Total time needed for the care administration to put in all the billing data of the care givers into the back end system	339120	min/year
Costs for the care administration to put in all the billing data of the care givers into the back end system	96084	euro/year
Costs to provide each care provider with 12 envelopes to send the data lists once a month	20628	euro/year
Total cost for the care organization caused by the current billing process	116712	euro/year

Table 10: Resource usages for the current care rescheduling process

Resource usages for the current rescheduling process:		
<i>Description data parameter</i>	<i>Value</i>	<i>unit</i>
Total time needed per care provider to contact and discuss the new care schedule with the permanency station (central office)	496	min/year
Total cost of wages for the care organization to pay for the time needed of each care provider to contact and discuss the new care schedule with the permanency station (central office)	119180	euro/year
Total costs for compensating the telecommunication cost of the care providers when they called with their own device to the care central	14748	euro/year
Total telecommunication costs for the permanency station due to calling to the care providers (central office)	6292	euro/year
Total cost for the wages of the people of the permanency station (central office)	264644	euro/year
Total cost for the care organization caused by the current care rescheduling process	397981	euro/year

Table 11: Total cost of current billing and care rescheduling processes

Total cost of the current billing and rescheduling processes:		
Total cost for the care organization caused by the current billing process	116712	euro/year
Total cost for the care organization caused by the current care rescheduling process	397981	euro/year
Total cost of the current billing and rescheduling processes	514693	euro/year

Next to high costs for the processes we notice from the table 9 that all the clients in total pay for 21849 hours (1488 min/year per FTE x 881 FTEs) per year for filling in the billing data.

- **The investment for integrating a smart care platform**

Integrating a smart care platform in the current billing and rescheduling processes will lead to some investments. These are modelled as followed:

Table 12: Needed investment to integrate OCCS

Description of investment	Initially	unit
Every care provider needs a (basic) smartphone, not only the people who work full time, but also the people who work part time. (The lifetime of these devices is currently set at 3 years. Then they need to be replaced)	80	euro/care provider
Every care provider needs a mobile telecommunication subscription. (there exist special group tariffs for care organization, that is way this yearly cost is initially modelled rather low [12])	40	euro/year per care provider
Each care provider needs to have access to OCCS. A yearly subscription cost is modelled per care provider.	20	euro/year per care provider
Each care provider needs to be educated once to understand the working of smart care platform functionality (2 hours of education)	31	euro/care provider
The smart care platform needs to be integrated once into the back end systems (1 FTE during 3 months)	14700	euro
A yearly operational cost which is modelled as a percentage of the integration cost is needed to keep the smart care platform up and running	5%	

Next to that economies of scale are expected for the smart care platform subscription cost per care provider. This is modelled as staircase function presented below.

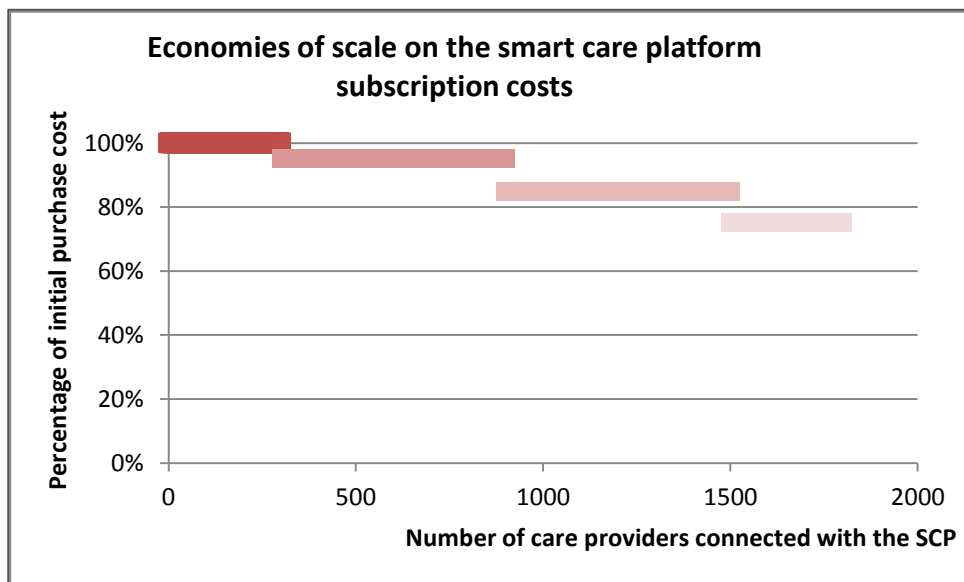


Figure 7: Modelled economies of scale effect for the smart care platform subscriptions

- **The resource usage with integration of a smart care platform**

Together with the care organization we modelled how a smart care platform would impact the current billing and rescheduling processes. Some process steps would remain unchanged; others would even disappear or would be impacted. The following figure shows what process steps would be impacted and how.

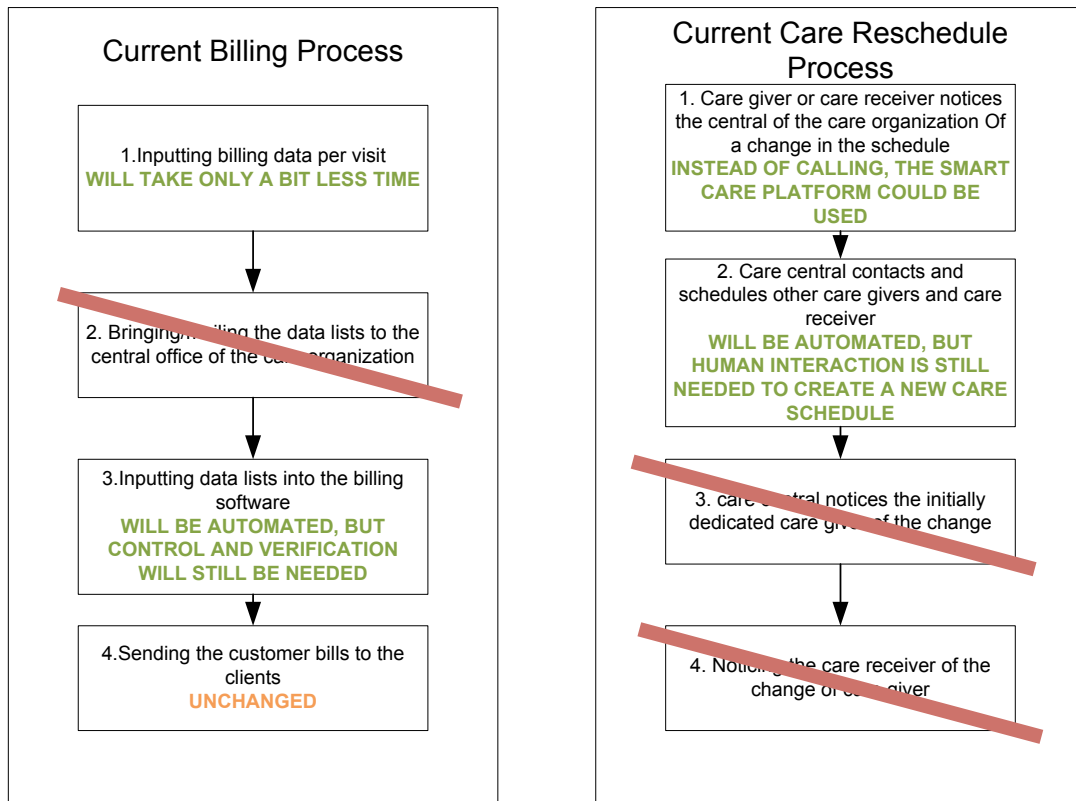


Figure 8: Process decomposition of new billing and care rescheduling processes

The new model parameters are given in following tables:

Table 13: Overview of the data for the new billing process

Input for the Billing process when a smart care platform is integrated		
<i>Description data parameter</i>	<i>Value</i>	<i>unit</i>
Time needed for inputting data per visit	1	min/visit
# visits per month per FTE	62	visits/month
Frequency of data list delivery by the care provider to the care organization administration	0	deliveries/year
Cost of envelopes to send the lists	0	euro/year
Time needed for inputting one line of the data list into the back end system	0.05	Min/data line
# care givers in 'Interregio Gent' (full time + part time)	1719	persons
Full Time equivalent of the total amount of care givers	881	FTEs
Total amount of data lines inputted in the backend system by the central administration (March 2014)	88000	data lines/month
% rework due to mistakes in inputting	4%	of # data lines/month

Table 14: Overview of the data for the new rescheduling process

Input for the Rescheduling process when a smart care platform is integrated		
<i>Description data parameter</i>	<i>Value</i>	<i>unit</i>
Time needed by the care receiver to inform the care central	1.5	min/call
Time needed by the care provider to inform the care central	0.33	min
Telco costs needed to inform the care central (in case the care provider calls with own mobile)	0	euro/call
chance that that a visit needs to be rescheduled	15%	Of planned monthly visits
# visits per month per FTE	62	visits/month
Chance that it the care receiver informs the care central him/herself	70%	
Time needed to inform other care provider	0	min/contacted care provider
Costs Telco for the care administration	0.01	euro/min
Average amount of care actors to contact (number of calls to make)	4	
time needed to make the new care schedule	4	min

The new process would lead to following resource usages exclusive the investment in a smart care platform!

Table 15: Resource usages for the new billing process

Resource usages for the billing process when a smart care platform is integrated:		
<i>Description data parameter</i>	<i>Value</i>	<i>unit</i>
Total time needed per FTE when inputting billing data when he is with the care receiver (time	744	min/year
Total time needed for the care administration to put in all the billing data of the care givers	51859	min/year
Costs for the care administration to put in all the billing data of the care givers into the back	14693	euro/year
Costs to provide each care provider with 12 envelopes to send the data lists once a month	0	euro/year
Total cost for the care organization caused by the current billing process	14693	euro/year

Table 16: Resource usages for the new care rescheduling process

Resource usages for the rescheduling process when a smart care platform is integrated:		
<i>Description data parameter</i>	<i>Value</i>	<i>unit</i>
Total time needed per care provider to contact and discuss the new care schedule with the	11	min/year
Total cost of wages for the care organization to pay for the time needed of each care provider to	2498	euro/year
Total costs for compensating the telecommunication cost of the care providers when they called with	0	euro/year
Total telecommunication costs for the permanency station due to calling to the care providers(central	0	euro/year
Total cost for the wages of the people of the permanency station (central office)	140679	euro/year
Total cost for the care organization caused by the current care rescheduling process	143177	euro/year

Table 17: Total cost of current billing and care rescheduling processes

Total cost of the current billing and rescheduling processes:		
Total cost for the care organization caused by the current billing process	14693	euro/year
Total cost for the care organization caused by the current care rescheduling process	143177	euro/year
Total cost of the current billing and rescheduling processes	157870	euro/year

A clear difference between the costs of the current and potential new billing and care rescheduling processes can be seen. But this latter requires a significant investment in order to reach the target cost. Next to that, it is expected that the data inputting process could be more time-efficient for the care provider by using of the OCCS app on the smartphone. This could free up nearly 11000 hours per year $((1488\text{min/year} - 744 \text{ min/year}) \times 881 \text{ FTEs})$ that could be spent longer with the care receiver. This could therefore impact the quality of care without affecting the cost of it.

But, as said above, these results can only be obtained if the care organization invests in a smart care platform system like OCCS. If they would do so, resulting from the initially inputted data, integrating a smart care platform would have a payback time which is less than one year.

The graph below shows the expected evolution of the undiscounted cash outflow in the situation a smart care system would be deployed in one year.

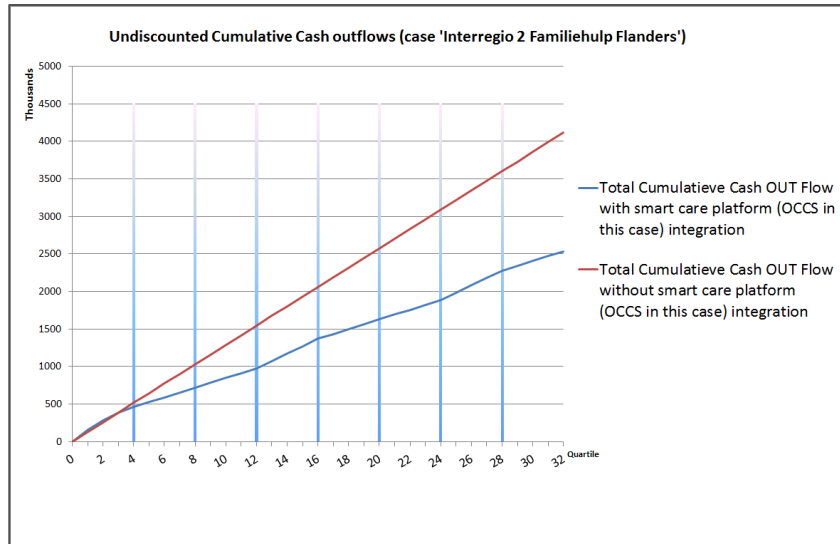


Figure 9: Expected undiscounted evolution of the cumulative cash out flow, deployment in one year

One can easily see the accumulation of the costs of the current processes, being 514693 euro per year. After eight years business as usual in undiscounted terms this would have cost 4117544 euro, which is indicated in the graph. The processes with smart care platform integration cost about 157870 euro and require a significant investment, evenly spread out over one year. After eight years of the smart care platform integration the total cost of the new processes and investment is expected to be 2536021 euro. This means that potential cost savings can lay around 1.5 million euro within eight years. Based on these findings the authors recommend a detailed study on this topic for the care organizations.

According to this model the subscription cost for a smart care platform may increase to about 150 euro per care provider (full + part time) in order to have not a more expensive process than today.

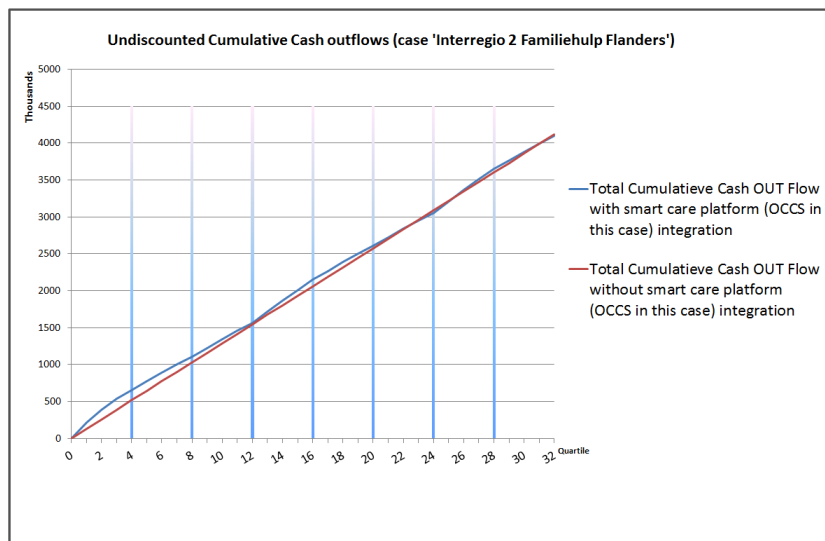


Figure 10: Expected evolution of the cumulative cash outflow in case the yearly smart care platform subscription cost per care provider would be 150 euro.

- **Dealing with uncertainty via sensitivity analysis**

It cannot be stressed enough that the expected evolution of the cash outflow is a result of a model that is subject to numerous uncertain factors. For instance all the data on the needed investment is uncertain, also the impact of a smart care platform on the current processes is uncertain.

To tackle these uncertainties somehow a sensitivity analysis is performed. Basically this means that all parameters we are uncertain of are modelled with an expected variance. Each time we run the model, all those parameters will have a different value, and will therefore lead to different results. If we now run the model

thousands of times, we can believe that many scenarios are covered. The result of a sensitivity analysis will allow us to say with certainty in which bounds the final result will lay.

Let us agree that we are certain on the current process parameters, but we are not sure of the impact and needed investment for a smart care platform. Therefore following variations on some input parameters are assumed, shown in the following table.

Table 18: modelled distributions for uncertain input parameters

Parameter	Modelled distribution	
Amount of hours needed for education [hours]	Normal distribution with parameters: Mean: 2.00 Std. Dev: 0.32	
Yearly smart care platform maintenance costs (% of integration cost)	Normal distribution with parameters: Mean: 0.05 Std. Dev: 0.01	
Smart care platform back-end integration cost [euro]	Lognormal distribution with parameters: Location: 104000 Mean: 14700 Std. Dev: 3498.6	
Cost for smartphone [euro]	Maximum Extreme distribution with parameters: Likeliest: 80 Scale 1.94	
Yearly Telco subscription for the care provider [euro/year]	Normal distribution with parameters: Mean: 40 Std. Dev: 11.76	
Yearly smart care platform subscription cost for the care providers [euro/year]	Beta distribution with parameters: Minimum: 15 Maximum: 100 Alpha: 1.2 Beta: 2.6	

After ten thousands runs of the model, we can say based on above uncertainties, that there is a 90% chance that the cumulative undiscounted cash out flow will lie between 2400000 and 3400000 euro (see figure below). This is in worst case still significantly lower than the current cost of the billing and rescheduling process.

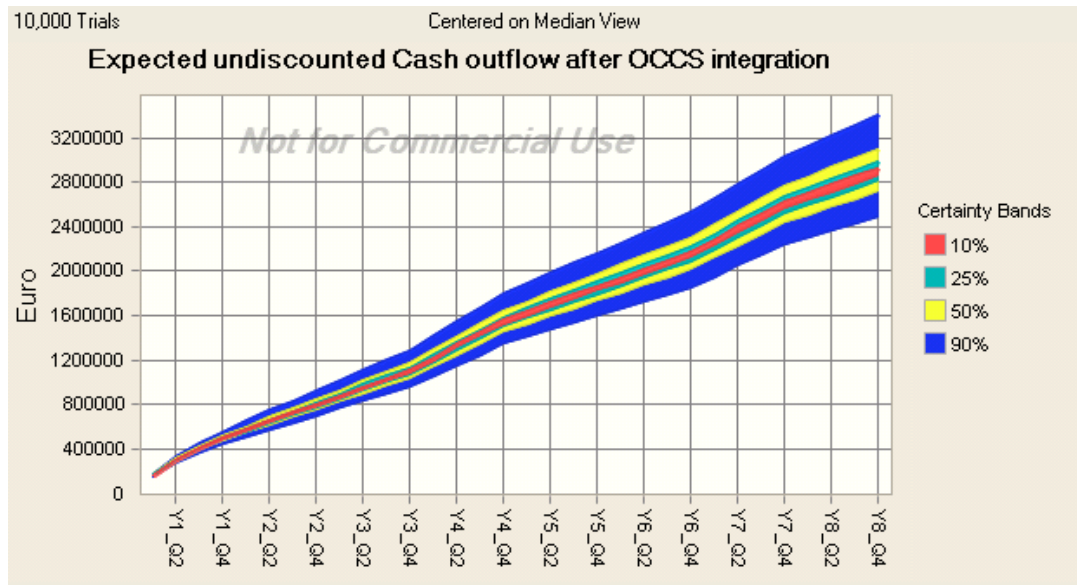


Figure 11: Expected undiscounted cumulative cash outflow with confidence intervals 90%, 50%, 25% and 10%

Another result from the sensitivity analysis is that we gain insights in which parameter contributes the most to the variance of the end result. This is valuable knowledge because it teaches us which parameters are most crucial and therefore need most attention when deploying/integrating a smart care platform.

In our model we see that the smart care platform subscription cost is the most important parameter (see figure below), which is not abnormal since the variance on this parameter is rather high and because of the annual effect of it.

Imagine that the yearly cost was 100 euro per care provider, this would mean that each year 171900 (1719 persons X 100 euro/person) has to be paid. Other costs like integration are marginal next to this number. The same is true for the Telco subscription cost. This means that it will be important to negotiate good subscription prices for both access to the smart care platform and for the telecommunication subscriptions.

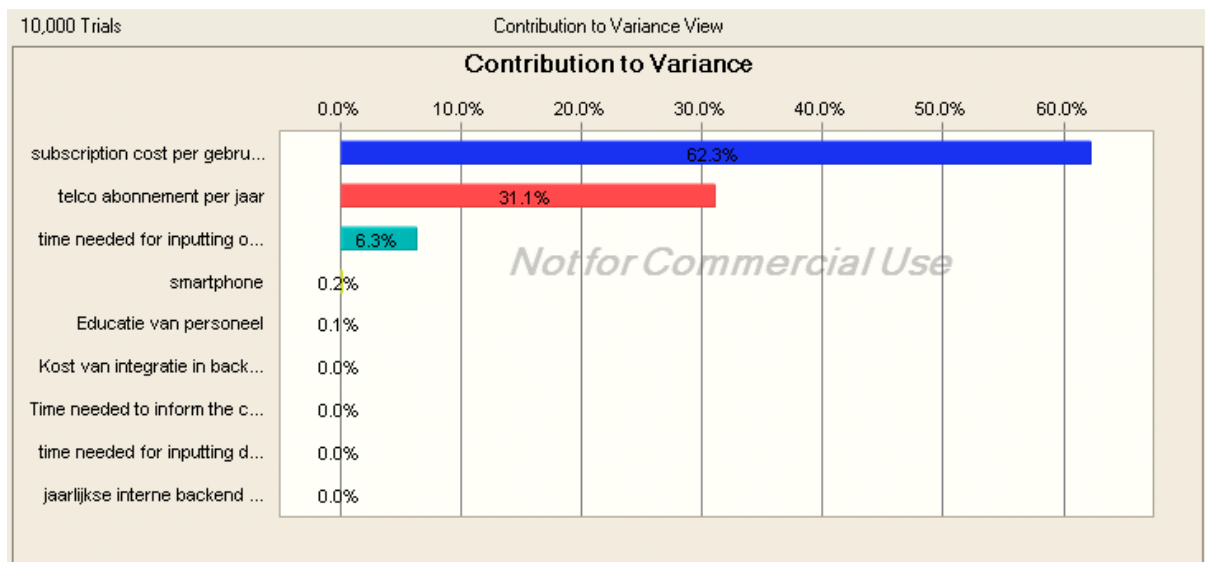


Figure 12: Contribution of the uncertain parameters to the variance of the result.

7) SWOT analysis for the go to market strategy 3: a smart care platform as billing and care rescheduling tool

<p>Strengths</p> <ul style="list-style-type: none"> - Creates added value for the care organization - Could be a first step to digital integration of more digital services (e.g. OCCS) - Gives the care receiver and informal giver an overview on their expenses and care agenda - Show already potential income flows for the care organization - Increases cost-efficiency on the long run 	<p>Weaknesses</p> <ul style="list-style-type: none"> - Stays care organization centred and does not move to a patient centred system, the initial upset - Needs a strong change management
<p>Opportunities</p> <ul style="list-style-type: none"> - Possibility to integrate this tool in a smart care platform 	<p>Threats</p> <ul style="list-style-type: none"> - Low willingness to adopt technology

VI. Migration path

The business modelling and user experience research showed that the market is not ready yet for installing complete integrated smart care platforms into their homes. For the care receiver, there are some technical barriers to get over and the added value of these technologies is still unclear. For the care organization, these technologies do not provide a unique selling position and does not show added value yet. More overly, there is no clarity on who will pay for this. To implement smart care platforms, between care organizations, there needs to be cross-organizational cooperation and change management. These organizations do not seem ready for this sudden change yet.

But all actors agree these technologies will be of value in the future and, as shown in the financial impact study above, will increase cost-efficiency.

Therefore a migration path was developed that, firstly, will fulfil into the care organizations' needs, and secondly, will provide a gradual process to adopt smart care platforms within the organization and across the sector.

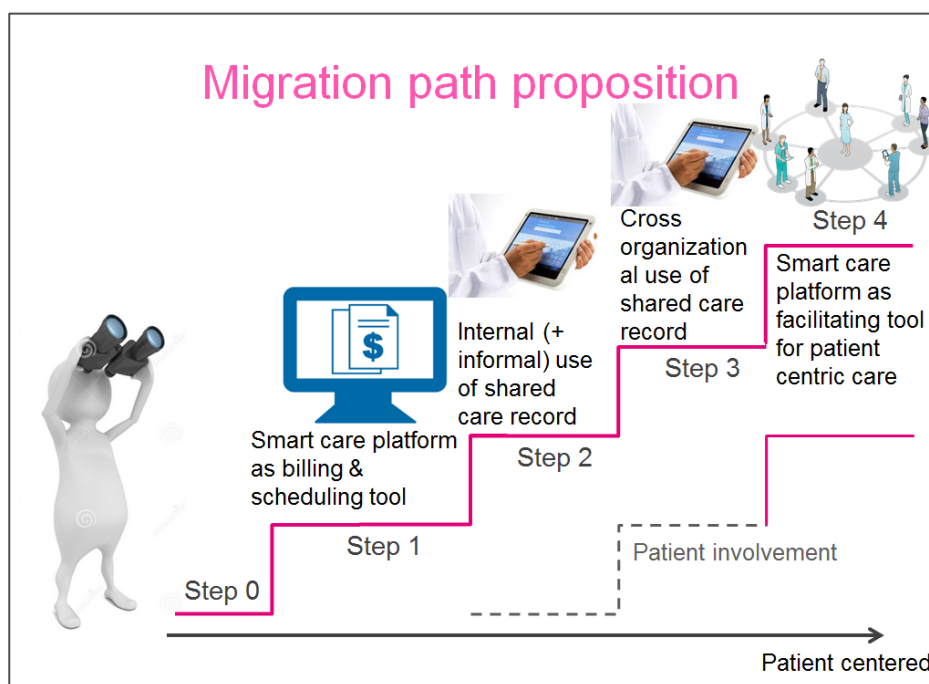


Figure 13: proposed migration path for the integration of smart care platforms

The above figure starts from the current care organization centred model (as care coordinator). An integrated smart care platform, which is at the end of the spectrum, fosters a patient centred system. To switch from the one to the other, the research indicates that in between, transitional steps are needed. Note that strategic partnerships already should be made in the beginning, to get smart care platforms integrated correctly.

- *Step 1: a smart care platform as billing & scheduling tool*

For the care organization to adopt a smart care platform, there needs to be proven additional value in it for them. Therefore SCPs should also be able to be used as a scheduling and billing tool. As calculations show, a billing & scheduling tool for care organizations can significantly lower their administrative costs. If integrated within a patient centred care system, it can deliver a competitive advantage towards the future.

A remark from a care organization was that the patient should already be able to see their planning and scheduling (without an active participation in it). This will already create value for the patient. The possibility to check on their care agenda could also provide a revenue stream for the care organization.

This step will probably pose the biggest hurdle for all actors: Infrastructure installation, the education and change management within care organizations, drawing the baselines for future partnerships etc.

- *Step 2: Internal use of the shared care record*

During this second step, care organizations are encouraged to start using the smart care platform functionalities within their organizations. Note that the patient still doesn't get empowered to participate in his or her own health record & organization. This second step merely serves as a change management step, where the care organizations and its staff get immersed in the new smart care platform technology, and are showed & convinced of its advantages and possibilities. Hereby, the smart care platform supplier/integrator of the system should educate all staff.

- *Step 3: Cross organizational use of shared care record*

In a third step, when all possible technical issues are cleared and change management convinced future users of smart care platforms (formal/informal care givers, staff members etc.), SCPs should become a tool for cross organizational use. If sales operations in step 1 & 2 were performed extensively and network effects occur [19], rollout to step 3 could go smoothly. Cross-organizational use of the shared care record could serve as a catalyst for sales opportunities when network effects occur.

- *Step 4: smart care platforms as facilitating tools for patient centered care*

Once previous steps are in place, care organizations and actors could start thinking about opening the systems to the care receiver. At this future time, care receivers will get more and more receptive towards (healthcare) technology innovations [20]. Care providers should foresee thorough education for care receivers to get accustomed to the health technology.

In this migration path, a first step may not include the majority of today's key partners, and will mostly focus on an application developer and/or consultancy firms to build a billing & software system within the existing smart care platform projects.

However, it will be important to develop key partnership. As the care industry knows big pressure on their budget, a partnership could be the solution to develop a long time business case to develop a market adoption plan and spread costs accordingly. All starting from the care organizations' (first) need: a billing & scheduling tool.

VII. Conclusion

The O'CareClouds-project envisioned to research and to develop a new "Cloud-like" smart care platform, offering trusted information and knowledge-based services related to the cross-border of different personal living hemispheres of the client/patient: the daily care related needs, the social needs and the daily life assistance. Smart care platforms as patient-centred care systems.

The value network analysis, together with the techno-economic modelling provided some valuable insights.

This work started by detecting barriers and challenges for creating and developing products and services in the eHealth landscape. Literature provided us with five blocks of challenges: a lack of financial support, the complexity of the eHealth value network, privacy concerns & legal issues, technical barriers and the issue that the added value of similar services still needs to be proven. During the project, others issues for creating and bringing the smart care platforms to market got encountered, like the slow adoption rate of technology in healthcare, low willingness to pay of patients for healthcare services and other.

To propose go to market strategies, this work started out by mapping the value network for creating and offering smart care services. The value network can be seen as a total image on all possible roles that need to be fulfilled to create the services and get it to market. Each role is assigned to a generic actor, which is validated by the members in our project consortium which are field experts. A key role within this story is the one of the integrator. The integrator is the actor responsible for turning smart care platforms into a tangible products and bringing it to the market. To create the final version of the product, the integrator will use its own expertise, but will also use input from external parties (for example: the integrator can buy the hardware from a supplier, will use the services from a software developer etc.).

After mapping out the value network, this work developed four go to market strategies to market smart care platforms and detected possible revenue streams of this service. In a first scenario, the smart care platform gets sold by the integrator to the care organization, which in its turn offers the service to the final client. Apart from having a competitive advantage over other care organizations, interviews showed there does not seem to be added value (yet) for the care organization. Willingness to pay from the customer's side seems to be the biggest hurdle to create a sustainable business model.

In a second scenario we explored the possibility of service flats offering the smart care platforms and include the fee for the use of it in the general service flat rent. It was noticed that there is still a technology adoption gap for elderly and, apart from having a competitive advantage over other service flats; there is little added value for the service flats to integrate the expensive technology.

In the third scenario this work tries to address the issue of a lack of added value for the care organizations. Taking into account the input from care organizations we developed a scenario where we stepped away from the key focus of smart care platforms, but used a billing & scheduling tool as starting point. A quantitative model showed the added value a similar system could have for the care organization. The migration path explained that adopting a billing & scheduling tool could bypass the problem of a lack of added value and technology adoption issues from the care receiver. If this tool is developed in such a way that it can be integrated into a smart care platform, this scenario would be most plausible at this moment in time.

The last scenario was developed to show how the business model would look like if smart care platforms are offered by the care organization but supported by government reimbursements. It is clear that this is not a desired scenario, as reimbursement strategies are under heavy financial pressure and is no guarantee for a long-term sustainable business model for smart care platforms.

As the project came to its end, we discovered that the challenges that were described at the beginning of this work did not cover the whole hurdle of creating a smart care platform innovation for the elderly. Today, smart care platforms seem too soon to integrate into current care offerings. This due to difficult technology adoption of the elderly, an unclear payment structure and little added value proven for care receivers and care givers. The migration path this work proposes tries to firstly focus on added value for the care organizations. A billing & scheduling tool has shown to increase cost-efficiency. This is believed to be a first step to digital integration of care organizations and a first step towards a patient centred care system.

VIII. Future work

In extension of this work, research to the potential value of smart care platforms for the society would be a great value. If a result out of that research would be that integrating a smart care platform in the homes of elderly is a cost-effective investment for the society, reimbursement structures could be pursued. Therefore a kind of health technology assessment study would be needed to determine the cost per QALY (quality adjusted life years) gained. The MAST-research framework [21] would be suitable for this kind of analysis.

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