An eHealth Business Model for Independent Living Systems

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Abstract: eHealth is one of the new mainly discussed topics. Many definitions have been given to capture this topic. We define eHealth as a consumer-centred model of health care where stakeholders collaborate, utilizing ICT, including Internet technologies to manage health, arrange, deliver and account for care, and manage the health care system. A new eHealth patient classification is proposed. Two potential generic business models are presented, indicating the value flows between the different actors. The model has been furthermore elaborated for the Flemish situation for people who require an independent living system. All cash flows between the actors are presented. Some conclusions will be drawn from the proposed models.

1. Introduction

The health sector is constantly in the picture as a result of the growing number of aging people and the increasing costs for the social security system. The introduction of eHealth services could be part of a solution to keep control of this situation. Many definitions have been given to capture this topic, ranging from simplification of processes offered within hospitals to health care services at distance. In the paper the following definition is used: “eHealth is a consumer-centred model of health care where stakeholders collaborate, utilizing ICT, including Internet technologies to manage health, arrange, deliver and account for care, and manage the health care system” [1]. The services are related to persons who are themselves on distance of the care provider. They are offered, making use of telecommunication, video and information technologies [2].

2. Objectives

The economic side of eHealth is of vital importance. Is there a market for implementing new technologies and services in the current health sector? What are the needs of the potential end users? Which actors will participate in the value chain? Can a profitable system be developed? A good analysis of the market, profiles of the potential users and costs/benefits for implementing an eHealth system are essential. At this moment eHealth business modelling is a hot topic but little has effectively been carried out and publicly made available. Business models help identifying, understanding the roles of and relationships between the relevant actors. The most important part of a business model is
the determination of the customer value offered by the service. A new service should outperform existing services and offer added value comparing the existing services [3].

The objective of this paper is to indicate the most important actors in the market, as well as the cash flows between them, for offering a complete eHealth service. In section 3 the methodology is described, related to the functionalities that could be implemented in an eHealth service system, the potential target groups and technology acceptance and support. In section 0 two generic business models are proposed, indicating the value flows between the different actors. A Flemish case is elaborated starting from the generic model, more specifically for offering an eHealth service for elderly people. Finally we will present the most important conclusions.

3. Methodology

The methodology part is divided in three sections. First the potential value added functionalities of the eHealth system are described. Next, we present our new categorization of potential target groups for specifically for eHealth services. The last part of this section deals with technology acceptance and support by the end users, more specifically the elderly patients.

3.1 Functionalities

The intention of offering eHealth services is to improve current processes within the traditional health care sector. Some functionality will need to be implemented to create additional value.

A crucial functionality is supporting organisational health care processes with ICT. The main focus is exchanging information between all end users. The combination of all current information systems, located at the different health care centres such as hospitals, health insurers, government building, etc. should improve and accelerate data retrieval, leading to more accurate diagnoses and solutions. All locally placed systems must be seamlessly connected to each other, same types of (meta)data must be used for sending and processing data and a full proof authentication system has to be set up. A personal network will be set up for each patient, connecting all required actors involved in the health care process of the patient. This network should be accessible anywhere, independently of its location. This last function supports mobility of the user e.g. at home, hospital, etc.

A second functionality is supporting community aspects. Due to limited mobility of the patient, social isolation could occur. An online community system with communication (audio/video conference tools) and entertainment facilities can be developed. This can support and ameliorate social activities, and stimulate contact with other people (doctors, carers, family, other patients, etc). Another service that could be coupled to an eHealth platform is the observation of the patient, through cameras and sensors. Family or other carers can check the safety and state of health of the patient. Hereby confidence and trust can be created for the family by constantly being acquainted with the current situation.

3.2 Potential Target Groups

The infirmity of the elderly can be measured by scales e.g. the KATZ-scale [4]. In Belgium the BEL FOTO-scale [5] has been developed specifically for home care, taking into account the physical needs (KATZ scale factors), but also psychological, social and domestic independence. Although this classification is well know and used, we have created our own classification in this paper more appropriate for offering eHealth services. This grouping is based on the form and degree of people’s disabilities:

1. People who are bedridden or patients with limited mobility

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2. People with physical shortcomings (e.g. chronic illnesses such as diabetes, heart ailment, etc) or with physical handicaps (e.g. people who are blind, deaf, etc)
3. People with mental handicaps or with a light form of dementia
4. People who are invalid for a long period or who need small help (e.g. cleaning wounds, help after surgery, etc.)

Each category will require specific functionalities, as specified in previous section. For the first category, community aspects will play an important role. The main reason is to reduce social isolation and ensure that those patients can still be in touch with other people. The second category consists of active, mobile and interactive persons, who need daily aid. The introduction of ICT applications could decrease the number of hospitalizations as a result of independent living systems at the premises of the patients, taking care of health data recording, patient observation, etc. The third group is a rather passive group where non-professional carers are playing an essential role in caretaking. An eHealth solution could help delaying the number of admissions in rest home. For the last group, eHealth services should be implemented at very short notice for a short periods e.g. after an accident or for longer periods for long rehabilitation.

3.3 Technology Acceptance and Support

Companies are willing to get a grip on the large potential market of elderly people. Therefore ICT can offer a lot in the field of health care. The experience shows that people accept easily a new technology when it improves their life quality considerably. They must be informed about the existence of the technology, their capabilities, the cost and user-friendliness. Seniors are open for the use of devices which increase their mobility and independence, but they must be adapted to their specific needs (e.g. large buttons, comfortable in use, large display, etc) [6].

The majority of the elderly had no experience with digital communication systems during their past professional life. In Table 1, the usage by aged people of current communication technologies is shown. When comparing to the average level, more recent technologies, such as mobile telephony and Internet, are less accepted than the older, more common technologies such as fixed phone. The Internet market for elderly people is now seen as a new opportunity for Internet Service Providers to furthermore extend their customer base (14% usage compared to the average of 61%). When television usage is considered, 98% of the aged households in Europe have at least one set at home [7]. Therefore the introduction of an eHealth service via this device could be an opportunity as a result of knowledge of instructions and user-friendly interface.

<table>
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<tr>
<th></th>
<th>Mobile phones</th>
<th>Fixed phone</th>
<th>Internet usage</th>
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<tbody>
<tr>
<td>Elderly People (65+)</td>
<td>51%</td>
<td>98%</td>
<td>14%</td>
</tr>
<tr>
<td>Average</td>
<td>78%</td>
<td>87%</td>
<td>61%</td>
</tr>
</tbody>
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ICT adoption by elderly can have positive and negative impacts. People might live a longer, healthier and more independent, taking part in social activities and keeping contact with other people such as family, friends, other patients, etc. This stimulates their mobility and social life which makes them less isolated. On the other hand, the introduction of ICT applications might even increase the gap between the information rich and information poor, between those with and without the need for evolving towards new technologies. This could increase the digital divide, between different generations but also within generations, such as the aged people.
4. Generic Business Models

4.1 Market Players

Within our model, all actors creating value in the offering of eHealth services are taken into account. Two major blocks are defined: financial and service provisioning actors. The first block indicates the players financing the system: the government and health insurers. The second block encloses all actors involved in offering the eHealth service to the user. In the next paragraphs, the different players will be furthermore elucidated.

The government will play a very important role in launching, supporting and distributing the eHealth service, whether is it at local, country or European level. Mainly this will involve taking care of new regulation and financial support. Health insurers, such as the National Health Service, offer financial support in case medical treatments, medication or other facilities or services, specifically for medical reasons, must be covered. Extra insurance can be concluded with private companies for specific risks or ailments. Health insurers are intervening in most health care payments. The introduction of eHealth can provide extra cost reductions due to the introduction of more cost efficient medical treatments or services.

The end-users of the system can be split in three categories: the patient, the non-professional carers and the professional medical practitioners. The patient can make use of the service at his or her residence. The non-professional carer, such as family or relief worker, visits the patient at regular moments in time. They can help the patient in taking tests and submitting telemetric data, setting up the communication link, controlling or retrieving information, etc. The professional medical practitioners will receive the data sent from the patient’s terminal and can analyse this at their practices. They will only intervene when medical parameters fluctuate outside determined margins. This way, less consultations will be required, even though the patient is closely monitored.

Equipment manufacturers will develop specific hardware compatible for offering the different functionalities, as mentioned in section 3.1. Wholesalers or retailers will distribute the hardware, eHealth service providers will take care of the software development required for offering the services. Several providers could specialise in niche markets such as telemonitoring, communication platform with information and entertainment options, security, etc. A network provider is required for transmitting information from the patient to the other users within the system, such as non-professional carers, medical practitioners, government, health insurers, etc. Depending on the system used and the amount of data that needs to be transmitted, different providers can be chosen ranging from mobile operators to broadband Internet Service Providers. Mediators, such as Social Service Departments, home care shops, local service centres and hospitals are market players in direct contact with the end user, to whom they offer the service. Most of these organisations are funded or subsidised by the government.

4.2 Generic Models

Two generic business models are presented in this section where value creating eHealth services are offered to end users, replacing current health processes. In the first model, the mediator delivers the whole service. The mediator delivers in the second model eHealth services, but the end user can choose its network operator independently. This last model introduces more flexibility and mobility for the user.

The first model is presented in Figure 1. As mentioned previously the local and/or national government will play an important role in offering the eHealth service as they have the capabilities and competences to create a market by adapting legislation, support the sector financially, etc. Value will be created during the whole process as costs for social
security can be optimized and kept under control. To eHealth service providers, value can be delivered by financially supporting them to implement a generic system for the complete health sector. Mediators can be financed to help promoting, distributing and selling the service to all possible end users. Finally users can also be supported by the government through several payback mechanisms. Health insurers can create value by stimulating patients to start making use of the eHealth service. Advantages for the insurer are for example reduction in reimbursements, gathering and exchanging information faster, less bureaucracy, etc. The mediator puts together a complete package to the end user. He buys rights of use for specific software components, purchases hardware equipment from wholesalers or retailers and negotiates a deal with one or more network operators.

![Diagram: Mediator Delivers Complete eHealth Service to the End User](image)

The model proposed in Figure 2 is relatively similar to the one proposed in Figure 1. The main difference is the role of the network operator. The mediator will still sell a complete package to the end user, but without connection. The user can make use of its current subscription with a network operator, or has to buy a new subscription. This model introduces more flexibility and mobility for the user. For example, the user can choose which platform he or she uses for sending data (mobile or fixed line, Internet, interactive TV platform, etc) depending on the chosen services (telemetric data transmission, video communication, entertainment, etc). This could enhance the adoption of the eHealth service system.

![Diagram: Network Operator Independent Model](image)

5. Case Study for Flanders

5.1 Current Work in Belgium

In Belgium the situation concerning the health sector is complicated. Belgium is a federal state, which means that as well the federal state as the different regions are both responsible for the health sector. This can lead to complicated situations due to overlaps of powers. The funding of the health sector, including home care, is a federal authority, but financial stimuli could also be arranged at Flemish level. Such an initiative is the ‘Vlaamse Zorgverzekering’, a Flemish insurance budget for non-medical care.
Several organizations are currently working on eHealth projects but public information concerning this work is difficult to find. Most companies are waiting for governmental initiatives to create a legal framework before spending too much effort in elaborating clear business propositions. In our neighbouring countries a similar situation can be observed: much reflecting and internal activities, but little relevant and useful public information.

Research programs are currently starting up in Flanders. IBBT (Interdisciplinary Institute for Broadband Technology), an institute that combines research groups from several universities in Flanders with leading companies in the sector, has several eHealth projects running at the moment e.g. Coplintho. Within this project ICT applications are developed for the support of the care process in the home environment (eHomeCare). The patient is placed in a central position in his home environment. This proposed network makes interaction possible with all actors involved in the care process of the patient [9].

5.2 Market Potential for Belgium and Flanders

The health sector is constantly in the picture as a result of the growing number of aging people. This has two consequences. For the social security system, costs are increasing massively due to more need for health care. On the other hand several companies are focussing on this enormous new market, which consists of aged people with money. The total expenses in the health care sector in Belgium (public and private) will rise to 12.5% of the GDP by 2030 (9.4% in 2004), which is comparable to the European average figure. The annual average increase of the expenses specifically related to the aging of the people is estimated at 0.7% of the GDP between 2009 and 2030 [10].

In Figure 3, the old-age-dependency ratio indicates the relationship between the total number of elderly persons when they are generally economically inactive (aged 65 and over) and the number of persons of working age (from 15 to 64). The major trend observed in this graph is the increase of elderly people versus the active population within the next 40 years (24.9% in 2005 to 52.8% in 2050). This last group is and will become more responsible for financing the social health care system.

In Belgium the elderly population (age 65 and over) has grown rapidly in the last century. By 2006, this group counted 1,809,017 people (17.2% of total population). This trend will continue, as this group is expected to reach 26.5% of total population by 2050 (2,899,324 people), of whom 17.2% in Flanders [11]. The highest growth rates will take place in the next 30 years, largely due to the aging of the Baby Boomers generation. The first wave will turn 60 by 2020. The population’s life expectancy also increases every year, the last 10 years with about 2 years, which is a burden to the social health care system. By 2050, 11.3% of the Flemish population will be older than 80 years old compared to 4.4% in 2005 [12].

![Figure 3: Old-Age-Dependency Ratio](image)

![Figure 4: Elderly People Living Alone](image)

The number of elderly people living alone (people older than 60) is increasing over the years. This can be seen in Figure 4. More than 636,000 elderly people are currently living on their own. Compared to the total amount of people living alone, in 2006 the elderly...
people living alone accounted for 25.6% and 57.7% respectively for males and females. The estimated number of people living in rest homes would increase between 2000 and 2010 with a factor 1.2, till 2020 with a factor 1.5 to 1.6 and till 2050 with a factor 2.5 to 3.1 [10] This indicates the need for independent living systems as more people will have to stay on their own due to a lack of beds in hospitals and rest homes.

5.3 Elaborated Business Model for Flanders

In paragraph 4.2 two generic business models were presented. As a case study, we have elaborated a more detailed model for offering independent living systems in Flanders (Figure 5). In this model, we have described all money flows between the different actors in the eHealth service model. We have further split up the end users into professionals (medical practitioners), non-professional carers and patients.

![Figure 5: Elaborated Business Model for Flanders](image)

As stated in the generic model, the government plays an important role in setting up an eHealth service, thus will finance or subsidize several actors through various channels. Mediators such as Social Service Departments are directly dependent of governmental funds (Federal level) (1). Specific budgets could be reserved for purchasing hardware equipment (11) and software or complete service package e.g. tele-assistance, storage, etc (12). Some cash flows will be going directly or indirectly from the government to the end users. Health insurers will pay back consultations as well as medication based on the health care nomenclature to the patient (3)(6). Professionals, joined with a health insurer, could be financed for a loss in consultations or for processing data gathered from the patient (5), next to specific services whereby professionals are contacted directly by the patient e.g. tele-consultation (7). (2) is financed by the ‘Vlaamse Zorgverzekering’, a Flemish insurance budget for non-medical care. This budget is partially funded by all working people in Flanders, whom must contribute €25 every year. This money will be used in 57.4% of the cases for financing the non-professional carers (€90 per month) e.g. family looking after their aged parents (8) [12]. The other 42.6% of the budget is for residential care (€125 per month). Patients will have to remunerate a monthly fee for the use of the eHealth service and hardware, offered by the mediator (9). A cash flow between patient and network operator could occur in case a specific network connection subscription needs to be concluded for the eHealth service (10). As stated in the generic business models, this could also occur through the mediator who could offer a complete package, including network connection. The government can also subsidize network operators for offering specific social deals to patients e.g. offering cheaper Internet connections to elderly people (4).

The model presented in the previous paragraph introduces many new money flows. The current health care system needs to be remodelled, which is a very difficult task. Some cash flows between actors, e.g. professional consultations, will diminish, which might cause
problems and discontent, which might jeopardize the whole system in case no financial solutions are proposed. Although the government will have to spend a lot of money for implementing such an eHealth system, costs could be recovered by savings in medical reimbursements and health insurance. Future work will include the elaboration of the presented business models, as well as a cost benefit analysis for implementing eHealth services for independent living systems.

6. Conclusions

Due to the growing number of aging people and increasing costs for the social security system, the current health sector will have to reorganize in the near future. The introduction of eHealth services could be a solution to keep control of the overall health care budget. We have presented two generic business models where several actors will play an important role in offering an eHealth service to the patient. Especially the government will have to take initiatives to create a market through legislative changes and financial contributions. Value will be created throughout the system and benefits will outrun the overall costs in the long term. When the generic model is further elaborated for the Flemish situation, several new cash flows are generated, which might complicate the whole case and could jeopardize a fast implementation of the system. But at the end, an eHealth system will be introduced, the only question is when.

Acknowledgement

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References
