The CareRabbit business model: Can innovation get any cuter?

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Management summary

IBM has developed the CareRabbit as a corporate social responsibility project and is now seeking to develop it further. The CareRabbit (ZorgKonijn) is an e-health device that can be used to play messages (e.g. text, MP3) sent through the Internet. It is a 23cm high white rabbit with rotating ears and lights in its belly. The device is used in children’s departments in hospitals. Its aim is to make children feel comfortable, and make their stay more pleasant, by keeping in touch with friends and family.

In healthcare several things are changing: amongst others the population is greying, there is a shift from cure to care, and the provision of remote care (like care at home) is increasing. ICT is often used as an enabler in this and therefore many e-health innovations are developed. In society, Internet is getting more important in everyday life: social media are common, there is a tendency towards sharing information in a non-invasive way, and social connectedness through ICT is developing. The CareRabbit is an e-health innovation that fits these trends.

The value the CareRabbit creates for hospitalized children is staying in touch with the outer world, getting more attention from relatives, providing distraction, and fun. For the hospital the values lie in the enthusiastic reactions from children and parents, children feeling more at ease, and the regional differentiation and marketing through the generated media attention.

The appearance and ambient technology of the CareRabbit are its strong points. The reliability of the technology is important to make it successful. Improvements can be made on the Text-to-Speech technology and the user-friendliness of the website. Thoughts should be given on a way to provide two-way communication and options to personalize the device.

The current organizational form works well: the childcare workers manage the process in the hospital, the IT department provides first support, and IBM is responsible for logistics, instructions, and technical support. The costs of the CareRabbit project depend on the chosen business model and the revenues are mainly indirect.

The goals of this research are to investigate the added value of the CareRabbit for children and other stakeholders (e.g. relatives of the child, the hospital, insurance companies) and to give advice on how to further develop and implement the CareRabbit (e.g. functionalities, support, organization and financing).

Therefore three scenarios for a viable business model in terms of STOF (Service, Technology, Organization, and Finance) are developed. Advice is given on the most viable business model to implement the CareRabbit in hospitals given the constraints from regulation, technology and market.

A pilot study is conducted in paediatric departments in two different hospitals. We administered the KIND-L questionnaire about quality of life to admitted children and their parents with a CareRabbit and a control group without a CareRabbit. Based on literature research, interviews with involved parties (e.g. experts, sponsors, science, and internal organization) and the STOF-model the business model is constructed.
The three viable business models that can be created are:

1. Break-even within IBM
2. Non-profit/CSR within IBM
3. Foundation outside of IBM

The second business model is preferred, since it generates the maximum indirect revenues: it is valuable for marketing, many (new) hospitals can be reached, goodwill is generated, and it is a contribution to CSR. Together this will lead to new business opportunities and (indirectly) more revenue.

The disadvantage of this model not being cost covering can be intercepted by offering the CareRabbit in combination with current services and products, and thus covering (part of) the costs.

The recommendations to implement this business model are the following:

- Investigate the possibility to offer the CareRabbit in package deals and the willingness of account managers to offer the CareRabbit project to customers and promote it at new customers
- Investigate the willingness of the board of directors of IBM to support the project and provide the initial resources needed
- Assure ownership within IBM and someone who is responsible for the operational part of distributing the CareRabbits to hospitals
- Investigate the opportunities for international cooperation with IBM in other countries
- Improve the technology: the TTS and the user-friendliness in terms of login functionality and extensive instructions for parents (e.g. instruction video, FAQ). Develop a test-environment for technical support if possible
- Investigate possible other applications of the CareRabbit (e.g. target groups like elderly or chronically ill, or applications like interactive games or supporting therapy adherence)

Confidentiality
Part of this thesis is confidential. The results, analysis and conclusions are therefore not open for public. Chapter 1 up to 4 are not confidential.

If you are interested in the CareRabbit project or (part of) the research, please contact me at S.R.Blom@gmail.com.
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Preface
The CareRabbit project was definitely a challenge. But it was the best one anyone can have for a graduation project and I am so proud of the results we have got!

“The most successful people are those who are good at Plan B.” – James Yorke

It could be so much fun to tell people that the subject of your graduation project is a CareRabbit and see the surprise on their faces. Once you explain the project, everyone had meaningful ideas and suggestions to improve the project. And they keep reminding me how special this project was. This made this project so inspiring!

It was quite the experience to work on such an innovative project, have an organising role, and be able to influence the direction of the project. It was dynamic and I learned a lot about myself and other people by getting this responsibility.

“The best way to make children good is to make them happy” – Oscar Wilde

And let’s not forget the children we did this project for. It was great to see and read their reactions, just as those from their parents and the other people in the hospital. That’s another reason that definitely made it worth all the effort. Some other special moments: make it to the front page of a national newspaper, presenting the CareRabbit on several (international) conferences, and working together with so many inspiring people.

I would like to thank all the people who participated in the research; who helped to conduct and design the project; who introduced me to new contacts; who provided me with ideas and suggestions; who provided moral support; who gave technical support; who made jokes; generated media attention, who pointed out news; who invested time, money and effort, who made it possible to do this research project, and everyone who was a “proefkonijn”: my gratitude it great.

I would like to thank IBM for all the possibilities and support they gave me to fully investigate all the aspects of the CareRabbit. Working at both IBM and Zenc, and getting the possibility to integrate their knowledge and skills for this project, was very special. Thank you both for this opportunity.

Especially I would like to thank Robert and Magda for guiding the process and keeping me on the right track. Jurien, thank you for the fun we had and all the support you gave. Bettine, I am grateful for all your advice, both on the project as on my personal choices. Arno, I really appreciate the valuable conversations we had at the right moments. Constantijn and Nina, thank you for reflecting with me on the project and for your advice.

Mom, dad and Remco (big brother) thank you for your support and all the caring. And finally, Axel: thank you for always being there, letting me tell my story, and all the solicited and unsolicited advice (I do listen).

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Thank you!

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1. Introduction
We can distinguish several developments in the Dutch healthcare system. To name just a few: the population ages, expenditures in healthcare are increasing, new technologies are developed, deadly diseases often become chronic conditions, relations between patients and healthcare professionals are shifting. Furthermore, distances between healthcare facilities, home, and family and friends are increasing, but the need to stay connected to relatives and friends remains essential. E-health and Information and Communication Technology (ICT) innovations in healthcare can play an important role providing a solution for the problems that follow from the developments mentioned.

The CareRabbit is an e-health innovation developed for hospitalized children. It can be used to play messages (e.g. text, music, audio books) sent trough the Internet by parents, family and friends. Its aim is to make children feel comfortable and make their often stressful and emotional stay in the hospital more pleasant.

The main purpose of the CareRabbit now is to provide support to children, be fun to “play” with and to give distraction. In the future the possibilities may lie in supporting adherence, monitoring health and lifestyle, prevention and possibly speeding up recovery, because people can feel more socially connected through the CareRabbit. If this device, or something similar, works, it helps reducing costs.

The idea behind the CareRabbit is that it will help the child to feel more at ease in the hospital, because it can stay in touch with all the people that are important to him or her. Furthermore, this connectedness might help the child feel better and perhaps even might help it cure, but this is never examined.

The CareRabbit idea is developed by IBM as an innovative application of ICT in healthcare as a corporate social responsibility (CSR) project. IBM is now seeking to develop the idea further and to make it more widely available to hospitals. The question we seek to answer is whether it should be developed further, and if so, what the best way would be to do so. This research project will answer more in depth questions like what is the added value for its users and how can it be implemented in hospitals?

Based on those answers viable scenarios will be developed for a business model (BM) for the CareRabbit. The advantages and disadvantages of each proposed BM will be discussed, so the choice for a specific BM can be made.

1.1 How to read this thesis
Chapter 1 gives an introduction to the research project and to current developments in healthcare. In Chapter 2 the problem statement is given. An overview of the research steps and methods used is given in Chapter 3. When you are interested in business models in general you can find information in Chapter 4.

Chapter 5 to 9 describe the four areas of the STOF model and the external factors. In each chapter a more comprehensive explanation is given of the methodology used for that research step.

In Chapter 10 the results from the different research steps are integrated to be able to create the three scenarios described in Chapter 11. This chapter furthermore
discusses the viable business model for each scenario. Finally, in Chapter 12 the methods, results and advice are discussed.

1.2 What does the CareRabbit do?
The subject of this research project, the CareRabbit, is an example of an e-health innovation. When the term CareRabbit is used in this thesis, the device, service and system that together make up the innovation are meant. If a specific distinction is needed, we will specifically refer to e.g. the CareRabbit device.

The CareRabbit actually has two main parts: the device itself in the shape of a rabbit and the underlying system, which consists of a website, portal and server. The device itself is an existing product called Nabaztag (Armenian for rabbit) and was developed by the French company Violet. It was designed as an open source platform for no particular target group: Violet wanted to discover what people would come up with themselves. At the beginning of 2011 a new rabbit like device will be launched: Karotz. This device will have more functions, like a battery, webcam and USB portals, which will provide other functionalities that could enhance the CareRabbit later.

The CareRabbit device is a 23 centimetre high, white, high-tech “Miffy” (Dutch: the rabbit Nijntje). The ears of the device can turn, it has lights in its belly, it has a microphone and speaker and an RFID reader in its nose. With a connection to the Internet, by means of WiFi, it is able to receive all kinds of messages and play them aloud. It accompanies this with matching lights and ear movements.

The idea behind the CareRabbit is to use his Nabaztag device in the paediatric departments of hospitals. By letting a young patient use the CareRabbit, it can receive messages from family and friends. To be able to do this, a website (www.zorgkonijn.nl) is developed from which parents, family and friends can send a messages to the child. Next to text messages, it is possible to send an MP3, for example the child’s favourite music or a story that is told by the child’s grandmother. IBM and Achmea chose children as their target group because not that many e-health innovations are made especially for children. Moreover, the kind of appearance and the type of services the CareRabbit offers, make it a logical target group to start with. Other target groups (like the elderly, children at home or babies) would be investigated in the future.

For the CareRabbit this means that it is important to clearly decide what the (initial) target group will be (who will be your first costumer) and what their needs are, because then a product or service with value for the user can be offered and an adjusted marketing strategy can be developed. After all, focus is important in new business development. Possible other applications and target groups can then be determined and developed later.
1.3 Developments in healthcare

1.3.1 The healthcare system is changing
As in most western countries, healthcare is rapidly changing in the Netherlands. The aging of the population causes the increase in demand for care and the personnel needed: people grow older and the proportion of elderly in the population structure increases; moreover, diseases that used to be lethal can now be treated and become chronic conditions (Westerhout, 2000). Furthermore the (technological) possibilities in healthcare are growing and more diseases are treatable. These developments cause an increase in the costs of healthcare.

Secondly, patients have more opportunities to inform themselves and in this way to be ‘empowered’, mainly through information provided on the Internet. This provides them with more opportunities for self-care and facilitates the shift from formal to informal care (from professionals to volunteers). However, not all patients will make use of these options. Not everyone has access to the Internet or knows how to use it, not all the information found is reliable and some people do not want to know about their conditions, since it might be confrontational (Vedder, 2003). Healthcare professionals differ in their opinion on this development: some appreciate the well-informed patient that wants to manage its own healthcare process, whereas others find the assertive patient difficult to work with.

The role of the government is important as well: it wants to stimulate the freedom of choice, and thus competition, in healthcare with the aim of increasing quality and decreasing costs. In the Netherlands the increasing encouragement of competition in healthcare is only sparsely successful; this is among others caused by lack of insight in offered quality and the importance of travel time for patients (Loogman and Velthuijsen, 2010). One task of the government and healthcare organisations is to keep healthcare affordable and accessible for everyone. Therefore priorities need to be set and smart ways of reallocating and concentrating recourses are needed (e.g. emergency rooms on one location in larger cities).

A third development is that medical specialisms (especially for rare or difficult to treat diseases) are concentrating on specific locations because of the technological possibilities, competition, access to information, and stimulation of the concentration of resources (Nieuwenhuijzen Kruseman, 2010). Examples are the specialised hospitals (for eye surgery, cancer treatment, treatment of burns, etc), specialised departments in hospitals (for transplantations, genetics), and furthermore the private clinics (for dermatology, radiology and cosmetic surgery) and the possibility to receive treatment abroad. Combined with individualism, globalisation, urbanisation, less informal care, this leads to greater (travel) distances from home to a care or cure institution for friends and family.

Finally, there is a shift from cure to care, more attention for wellbeing, prevention and mental-health and personalized healthcare. Hence, the importance of patients staying connected to friends and family, feeling emotional bonding with other people, and the influence of these factors on a person’s wellbeing gains more attention. This development is important throughout society and is discussed often in relation to having contact and maintaining relations through the Internet (Ijsselsteijn, Van Baren and Van Lanen, 2003).
The opinions on this subject are divided: some people consider the Internet an opportunity for more and easier contact. At least one advantage of this means of communication is that time and distance are less important. A device like the CareRabbit can be even used when the receiver is far away or not present at the time the message is sent. Others fear the impersonal and volatile character. Even the Dutch Queen, in her speech at Christmas last year, warned that virtual relationships through mobile phones and Internet might make people independent and aloof. But what is the influence of the means of communication on the actual message and how it is received and how can communication through Internet become more personal and affective?

ICT often acts as an enabler in these developments: it provides information and it facilitates certain services, like online therapies, e-consults and electronic health records. These services can for example make healthcare more efficient and help meet the increasing demand, ICT stimulates the “empowerment” of patients and has a facilitating role in the freedom of choice, and with ICT the physical distance between patient and care provider can be reduced (e-consult or video conferencing). Therefore, solutions for these developments are often sought in this area: the combination of ICT and healthcare is often referred to as e-health.

1.3.2 E-health and ICT innovations in healthcare

E-health is a relatively new concept that has become more popular in the past ten years. In this period it became an often-used expression, almost a buzzword, with different meanings. Therefore it is hard to find a scientific, generally accepted definition. In 2001 Gunther Eysenbach published an article on the definition of e-health. According to him e-health can be defined as (Eysenbach, 2001):

“an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve healthcare locally, regionally, and worldwide by using information and communication technology.”

This is the definition that will be used in this research project, because this definition considers e-health as not just a combination of technology and information in healthcare, but as a mindset as well. In addition, it focuses on other social factors that are needed to improve healthcare by using ICT. For a successful development and roll-out of the CareRabbit, not only the device and technology are important, but also social factors like acceptance by users and the hospital, embedding in the organisation, the integration in care processes, and the attitude of users towards the CareRabbit.

Eysenbach also states that a good e-health innovation should meet the “ten E’s” (Eysenbach, 2001), as shown in Figure 1. These can be seen as prerequisites for an e-health solution. Additionally he defined that three other E’s (easy-to-use, entertaining, and exciting) are important, just as the innovation, of course, should exist.
Eysenbach’s list makes it clear that there is a lot to take into account when creating a good e-health innovation: the innovation should fit into the organisation and meet the criteria of the organisation itself (e.g. safety, budget), reflect the wishes and needs of the user, deal with ethical dilemma’s (like having access to and securing of personal information, the distribution of responsibilities for the use of the innovation, and the aforementioned discussion on personal contact versus contact by Internet or phone).

An e-health innovation should make a substantial (positive) difference to the users, but should improve processes and a mindset as well. The e-health innovation therefore has not only a functional application, but should help improve the quality of life (by enhancing quality, enabling, educating) and wellbeing (stimulating excitement, empowerment, encouragement) as well.

For the CareRabbit Eysenbach’s E’s imply that (most of) the above-mentioned ten criteria should be met to make the product a success and that the three criteria in orange are hoped-for extras that can contribute to the acceptance of the device. The CareRabbit now has the function of playing all kinds of messages (like text, music, audio books) sent through the Internet and accompanying these with rotating ears and lights in its belly. To be efficient and to enhance the quality of existing products, it is important to define the precise function for the users: what needs are met when using the CareRabbit? Besides the function, the way of use is important as well: how can the CareRabbit be used for empowerment, encouragement and education purposes? Ethical dilemmas on the CareRabbit are not expected: the device is used to send messages that will not contain sensitive information (similar to a postcard or text message), there’s parental control on the division of the password and on the messages that are sent, and for now the main purpose is to be fun and supporting for the child. Some ethical dilemma’s that still might occur are how the security is organised and who has access to what information, hence, who is responsible for the CareRabbit?

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1 When the CareRabbit is used for telecare/homecare in the future, then other ethical
Equity means that the CareRabbit should be available and accessible for those who need it. For the CareRabbit it will probably not be difficult to meet the four extra criteria (easy to use, exiting, entertaining and existing).

1.4 The application of business models in healthcare

As discussed earlier, the framework of this research is the development of a business model. For many it is difficult to determine the precise difference between a Business Model and a Business Case (BC): in many articles about BMs and BCs the two get mixed up. In general, the difference is that a BM describes the how of an investment, the BC the why. The BM explains how the value is created for customers and how this leads to positive revenue streams, whereas the BC describes the expected quantitative and qualitative revenues, in order to make a (strategic) decision. In this research project several viable scenarios for a BM for the CareRabbit will be developed. Based on this, advice will be given to IBM on a BM for the most credible scenario. The corresponding BC cannot be developed yet, since the BM is not final then and open for adjustments. However, a start for a BC will be given.

When a new product is developed and implemented, many different factors have an influence on this process and they need to be defined. Examples of these factors include the technology of the product, the service it provides to customers and the network, regulation that may be of influence and opportunities for the product in the market. A BM helps map these domains and clarifies the relations between these factors. It is a way to keep an overview of all the different influences. By making a BM before a new project, the possibilities of the product or service can be estimated and, where needed, adjustments can be made during the process of developing the product and bringing it to the market. In this way one can respond to developments in for instance the market, technology or regulation, and make investments purposefully.

1.5 Motivation for this research project

1.5.1 Societal relevance
The CareRabbit project is developed at IBM as a corporate social responsibility (CSR) project in 2006. The goal of the project was to use ICT in such an innovative way that it has a positive influence on healthcare. Furthermore, the project should have a link with the current developments in healthcare. With the project, the developers wanted to show what ICT, IBM’s main business, can contribute to both health and wellbeing.

Following from the personal situations of the young professionals involved, children became the intended target group. These employees worked voluntarily and with a lot of enthusiasm on this project, in their own time. During a promotion at IBM the team collected money from IBM employees to buy one hundred devices.

The health insurer Achmea considered the CareRabbit an interesting project, because of the target group, Achmea’s experiences in healthcare, and the future possibilities of (a device like) the CareRabbit. Eventually a device like this CareRabbit might help reduce expenditures in healthcare based on the theory that emotional wellbeing shortens hospitalstays. Therefore Achmea is sponsoring the project financially and with promotions. Also the organizations OnDemand Rentals and PINS are supporting the CareRabbit with hardware and hosting.
The CareRabbit has the potential to make a positive contribution to the wellbeing of children that need to stay in hospital. In the first years of the project the idea met with great enthusiasm by hospitals, health insurers and several companies. At the same time there were some concerns: the technology was not without flaws and the precise added value for users and hospitals was not clear.

In this project we will find out to what degree the objectives of the CareRabbit project can be realised. What is the added value for the users and what facilities and organisational aspects are needed to optimize this value? If you want to use it in hospitals: what rules and regulations should you consider and how does it fit in the care processes? What is the best way of funding such a project? And if it turns out to be successful: how can the future of the CareRabbit be secured in an organisation? My societal goal in this project is to help a CSR project further and, by doing so, contribute to (the development of) healthcare and wellbeing.

1.5.2 Academic relevance
This research project combines and integrates several fields of study: technology and ICT, business studies, psychology and pedagogic studies, and health sciences. In this research project we combine the scientific theories from these areas with the scientific theories on business models (BM) and e-health innovations.

It is important to investigate certain aspects of the CareRabbit scientifically because this determines what the BM will look like: this is the evidence-based aspect of Eysenbachs ten E’s. If you know what the effect is of the CareRabbit on its users (for instance “just fun” or “positive influence on wellbeing”), this influences the involvement of other parties and thus the way the CareRabbit could be financed. In addition, when it is difficult to ascertain the precise effect, valuable information can be found by doing research on other aspects. Interviews with experts (from science, companies in healthcare and technology, foundations in healthcare, etc) provide insight in the probability of being successful in this market; interviews with healthcare professionals and childcare workers provide insight in how to use an ICT device in hospitals; interviews and questionnaires with users (children, parents) provide insight in usability, likability and new applications; interviews at IBM provide insight in if and how the CareRabbit could fit within this organization. Also, user statistics can tell us something about how many people have used it, how often, at what time and for what reason.

Constructing a BM can help with aligning the different domains and factors, so the factors that influence each other can be integrated, where possible. The various parts cannot be seen as isolated factors, but will always influence each other. For example, if the financing of the service changes (e.g. from sponsoring to commercial), it requires other things from the organization (like another network, involved parties or services).

Developing a BM can be done in different stages of the lifecycle of a product (Kijl et al, 2005):

- The design of the product
- Implementation and rollout
• Market phase

Each of these stages gives different insights in what would be the best business model (BM) for a product. Therefore the BM should be adjusted to these insights of each stage. In the past years IBM developed the first outline for a BM. In this research project we will investigate and execute the implementation phase in pilot studies in several paediatric departments in hospitals. During these pilot studies, the value in terms of wellbeing for children and parents and the value for and placement in the hospital will be investigated. Insights from this pilot stage combined with interviews with involved parties and the experiences with the CareRabbit in the first few years, are combined to develop scenarios for a BM for the third (market) phase. This BM will undoubtedly need some adjustments when actually executed, because of unpredictable insights found in that stage.

The use of BMs in healthcare is a recent development: compared to commercial businesses, there are not many BM’s and business cases (BC) developed for healthcare. This makes it interesting to see if the concept of an e-health BM works in healthcare.

1.5.3 Personal motivation

I have had some personal experience with healthcare in the Netherlands for I have Crohn’s disease (an inflammatory bowel disease) since 2000. Because of this, I spent a lot of time in hospitals and I personally expect that a device like the CareRabbit would have made my hospitalization more pleasant. It would have provided distraction and, even more important, a (non-disruptive) way of staying in touch with the people I care about. I want to find out if this other patients would benefit as well.

Even as a child, well before I got Crohn’s disease, I found the healthcare sector to be a special and fascinating world. I find the interaction between healthcare and businesses especially interesting and am fascinated by smart ways of improving healthcare. Furthermore, I would like to do a research project which combines different fields of knowledge, skills and disciplines and which integrates these. Collaboration of different organizations, like hospitals and businesses, makes it interesting for me as well. This research project on the CareRabbit combines all of this: it is an unique subject; combines knowledge of technology, IT, business processes, healthcare and even some psychology; it can affect people on different levels and might really make a contribution to their lives.

During this research I did an internship at Zenc Research & Consultancy as well. Zenc provided support in designing the research and writing this thesis.

2. Problem statement

The research project on the CareRabbit can be motivated from different perspectives. However, the practical urgency lies mainly with IBM, because they developed the idea and want to bring it to the next level. IBM wants to know whether
the CareRabbit can be used successfully in hospitals, what is needed to obtain this success and what the roles of IBM and other parties will be in this. This makes IBM the problem owner.

2.1 Research objective
This research project is directed at a complex, multi-disciplinary problem and has a practice-oriented design. The aim is to develop a business model (BM) for the CareRabbit in order to get insight in the relevant factors of influence and the implementation of an e-health innovation in healthcare.

In this research project the future of the CareRabbit cannot be predicted or determined, since several factors will still be uncertain or further research is needed. Moreover, the final outcome depends on the internal decision-making processes within IBM. Therefore, several scenarios for the future of the CareRabbit are developed based on the information gathered. For the most likely scenarios, viable business models are developed.

This leads to the following research objective:

“To develop scenarios for a viable business model for the CareRabbit, by analyzing the organizational layout, financial structure, technological opportunities, the value for customers and the network of the CareRabbit.”

With these additional aims:

- Make children feel more at home in hospitals and make the period of hospitalization more pleasant by letting them use the CareRabbit.²
- Gain insight in the factors that influence the development and implementation of this specific e-health innovation.
- Provide IBM with an advice on how to develop and implement the CareRabbit, so they can make a well-informed decision on whether to proceed with the CareRabbit and if so, in what ways.

2.2 Central research question
The BM that is used in the research project is the dynamic version of the STOF model. The domains of this model are Service, Technology, Organization, and Finance (hence STOF). Three other external factors (regulation, technological developments and market opportunities) are of influence as well. The choice for this business model is further explained in Chapter 4.

The central research question, following from the research objective, is how to use a BM to get insight in the development and implementation of the CareRabbit.

“What possible business models, in terms of STOF, can be applied to implement the CareRabbit in hospitals, for use by children and their parents, given the constraints from regulation, technology and market?”

² In a direct sense, this concerns only the children who participate in the pilot; in an indirect sense all the children in case this research contributes to a successful roll-out
2.3 Research questions
To obtain the research objective and to be able to find an answer to the central research question, five sub questions are formulated. The answers to each of these questions will make it possible to construct several scenarios for a BM for the CareRabbit and through the gained insights give advice on how to implement the CareRabbit in healthcare for children given this specific scenario.

The sub questions are classified according to the STOF model.

Technology
IBM has developed the CareRabbit concept to make it suitable for the hospital environment. This technology is considered a given in this research project. Therefore the technical specifications of the device, portal, and website, and their applications are described in Chapter 5. The pilots will give insight in whether the functioning of the technique is sufficient for the application in hospitals, and what adjustment, if any, are needed. This leads to the first question:

1. What are the technological characteristics of the CareRabbit that are essential to the services to be provided and the support to be organized?

External factors
The next step is to define the external conditions that influence the success of the CareRabbit. In this case we survey three areas: the developments and opportunities in the market, technological advancements in society, and the regulation applicable to the CareRabbit. Chapter 6 describes the areas that specifically concern the CareRabbit, because of their motivational or limiting character (e.g. stimulating subsidies, competition, trends in de market).

2. What is the influence of relevant market opportunities, technical advancements and regulatory concerns on the CareRabbit?

Service
The next research step is to examine the effect of the CareRabbit on its users and to explore how the relevant processes around it should be organised in the hospital to actually deliver its possible value. In this research project the CareRabbit will be tested in two hospitals: the Martini Hospital in Groningen and the MST in Enschede. Furthermore, we shall investigate how the CareRabbit can best be adapted to the existing (intra-organizational) processes in the hospitals.

In this case, the user is not just one group. Three types of users can be distinguished: the hospitalized children that receive the messages, their relatives sending messages, and the healthcare professionals and hospital staff that work with the CareRabbit. The value for the first two groups (children and relatives) is attended in Chapter 7:

3A. What is the value in terms of wellbeing and social connectedness of the CareRabbit for its users: both hospitalized children and their relatives?

Since it is aggravating for hospitalized children to bring them together to discuss the CareRabbit, we will do part of the research with a group of school children. With them we will investigate what they think of the functions, appearance, and user friendliness of the CareRabbit. This question will be addressed in Chapter 7 as well.
3B. *What is the value in terms of functions, appearance and user friendliness for children that are not hospitalized and what are their ideas on these topics for the CareRabbit?*

The hospital group consists of different subgroups: childcare workers\(^3\), nurses, paediatricians, the IT department and the management. The value for each group will differ, and within the groups the value per person may vary. This leads to the following question that is answered in Chapter 8:

3C. *What added value does the CareRabbit provide for the paediatric department of the hospitals and what processes need to be in place to deliver this value to its users?*

**Organisation and finances**

When the external constraints and the value for the user are clear, the next step is determining the (inter) organizational and financial network around the CareRabbit. The inter-organizational network is the network of the parties (like IBM, hospitals, health insurers, foundations, other companies: depending on the scenario) that work together to make, distribute and use the CareRabbit.

To determine this organizational and financial network, the costs and benefits are investigated and an analysis is made of the needs and wants of possible parties involved. This step provides information on how revenue and costs flows run.

4. *What do (inter) organizational and financial arrangements look like for the CareRabbit and how can they be placed in the business model?*

**Scenarios**

The final step is to bring all the information together and create the actual BM. It is most likely that this will lead to more than one possible scenario for the BM of the CareRabbit. For each scenario we will describe what is needed to make it successful. This leads to the final sub question:

5. *What are viable scenarios for the business model of the CareRabbit and what is needed, in terms of STOF, to make each of them successful?*

For each scenario will be explained what key success factors are needed to make this particular scenario successful and what the advantages and disadvantages are. However, the final decision is up to IBM. That decision will depend on what IBM wants to achieve with the CareRabbit and on the internal decision-making processes: who will responsible, what is his/her role in the organization, who will benefit from this idea, etc.? Further research on certain aspects may then be needed.

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\(^3\) In this thesis the childcare workers are the hospital staff taking care of the children. In Dutch: *pedagogisch medewerkers.*
3. Research approach
Now we know which questions need to be answered, we have to find out how we can find these answers. Therefore, we will describe the methodology for the research in this chapter: the steps, the input and output for each step and the methods that will be used.

3.1 Steps of the research project
The combination of the four domains and the three external factors, with the formulated research questions, leads to the sequence of steps as shown in Figure 2. These five steps match the five sub questions.

1. The first step is describing and analysing the Technology (T) of the CareRabbit.

2. The second step is defining the external factors that lead to the conditions: regulation on e-health, technological developments and market opportunities.

3. The third step is investigating the effect of the CareRabbit on children, relatives and healthcare professionals (S). This will be done in pilot studies and with help of literature research and structured interviews.

4. The fourth step is analyzing the organizations (O) that will play a role and defining the costs and benefits. This way the architecture for the organization and finances (F) can be made.

Based on these first four steps the scenarios for the business model (BM) can be constructed.

5. The final step is giving an advice to IBM on how to implement the CareRabbit if it is likely that the CareRabbit can become a success and how the product can be further developed in appearance, functionalities and target groups. Else, advice will be given on how such an innovation could become successful in healthcare.

Figure 2: The steps and sequence of the research
In Figure 3 a more detailed flowchart of the research steps and the in- and out put for each step is shown.

**Figure 3: Flowchart of the research steps**

### 3.2 Methods per phase

The research project on the CareRabbit is divided in four phases:

- The preparation and design of the research
- The pilot studies in the hospitals
- The interviews with experts and involved parties
- The construction of the scenarios for the BM and the advice to IBM

This paragraph briefly explains what research methods are used in each phase, which information is gathered, and what questions are answered with this information. In each corresponding chapter the methodology is described more extensively.
3.2.1 Preparation and research design

In the first phase desk research is used to design the research and describe the technology and external factors. Furthermore, information is gathered to describe the technology of the CareRabbit and to analyze the external factors (market, regulation and technology) and their influence. This way the first two sub questions (on technology and external factors) can be answered.

3.2.2 Pilot studies in hospitals

The second phase is designing and running the pilot studies with the CareRabbit in paediatric departments in two different hospitals. The hospitals that participated are the Martini Hospital in Groningen and the MST in Enschede. With the results from these pilots the third sub question can be answered.

To answer question 3A on the value for the children, the methods that are used are:

- Desk research
- Measurements with a validated questionnaire on both a control group of children and an intervention group
- Analysis of user statistics
- Logbook with observations in the hospitals
- Interviews with childcare workers.

For the research with children at a school, the methods used are:

- Face scale measurement before and after using the CareRabbit,
- Brainstorming and testing the CareRabbit
- Observations from the researcher

For 3B (value for the hospital) the following methods are used:

- Structured interviews with all involved parties at the hospital
- Information gathered during the workshops on the CareRabbit
- Logbook with observations

The output of this phase provides us with an answer to the question on whether the CareRabbit contributes to the wellbeing of the children and fits into the care processes. This last question is important for the future implementation and securing in the hospitals.

Depending on the value for its users, advice can be given on further development and implementation or on adjustments that should be made to meet the requirements.

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4 Initially the Flevo Hospital, Almere, participated as well, but due to problems with the Wi-Fi network, the CareRabbits could not be implemented. Furthermore, the Spaarne Hospital in Hoofddorp, tested the first version of the CareRabbits in 2008, but there are only a few results from this test, and given the developments in the meantime these results will not be used.
Another outcome might be that there is no added value and that it is better to stop the project.  

3.2.3 Interviews
Focussed semi-structured interviews are held with involved parties in the CareRabbit project. There are four categories of interviewees:

- Internal organization (IBM)
- Sponsors and partners (like Achmea)
- Experts (like foundations and trend watchers)
- Scientists

The output of this phase is information on their view on the CareRabbit. What do they think of the technology and application, the organization and financing of the CareRabbit? And especially: do they think it can be successful and which success factors do they define?

Based on this step advice is given on what the organizational structure of the CareRabbit should be and how the finances should be arranged for each scenario. This is the answer to the fifth sub question.

3.2.4 Final phase: business model and advice
One last step that parallels the last four steps is the advice on the further development of the CareRabbit as a device. During the research project we will possibly meet shortcomings of the device and service offerings and also ways to improve. No major adjustments will be made during the research process, but advice is given on how the appearance and applications can be improved. This advice will be given from a user perspective and is based on the pilot studies and interviews.

Finally, all the information will be integrated and several viable scenarios are developed for a BM for the CareRabbit. This BM will be based on the theories on business models. Advice is given on the preferred scenario and on key success factors needed to make it successful.

3.3 The role of the researcher in action research
In my role as researcher in the CareRabbit project I am both responsible for executing the larger part of the project as well as designing the research project, observing and analysing the results. This type of research is called action research (also known as practice (oriented) research): it is an interactive way of doing research that combines theory and practice (Avison et al, 1999).

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5 The value of the CareRabbit for its users is the input for determining the value streams of the BM, and should therefore be known before the other steps can be started. Unfortunately, the technical problems with the CareRabbit delayed the start and running of the pilots. Therefore, assumptions on the expected outcome were made based on literature research and interviews in the hospital. This will be the initial input for the questions on Organization and Finance. The final advice will, of course, be based on the actual results of the pilot studies.
There are several definitions of action research, but there are four recurring themes: empowerment of participants, collaboration through participation, acquisition of knowledge, and social change (Masters, 1995). Furthermore, the process of the researcher can be described as cycles of four phases: planning, acting, observing and reflecting.

Advantages of this method lie in the researcher being closely involved in the project, getting information from first-hand, and reflecting with the participants on the methods used and information gathered. Critics question whether the results from action research can be generalized and reproduced (Van der Zee, 2006).

The research strategy and methods are discussed with the involved parties (with professionals in hospitals, people from foundations, IBM and Achmea and other researchers). Also, more then one case study for the children, hospitals and interviews are used and the results from each research step are given back to the participants (Delphi Method (Hasson et al., 2000)).

This research project uses several case studies and validated methods (like the questionnaire) and these results will therefore be reproducible. For this research project it will not be a problem if some results (like the interviews or background of participants) are not generalizable, since the aim of the research is particularly about getting a fair indication of the value and opinions on the CareRabbit. Moreover, if the results are positive and the CareRabbit will be implemented, this will too be done by a person who is enthusiastic about it and in similar situations as the pilot studies were held now. Furthermore, Avison et al (1999) state: “to make academic research relevant, researchers should try out their theories with practitioners in real situations and in real organizations”.

The research objective shows that an important aspect of this project is investigating how the CareRabbit can be successful and how it can make the stay in the hospital more pleasant for children (rather then discussing if it can be successful). If the pilot studies show that no added value is expected for children, relatives and the hospital, advice will be given on what adjustments are needed to make it successful indeed.
4. Theoretical framework

One could say that there are as many different business models (BM)s as there are businesses and many different views and frameworks for BMs exist. Besides that, any model is always a simplification of the real situation and a BM is applied to a difficult-to-define and impossible-to-control environment: the real world.

In this chapter we will discuss BMs in general and several theories on BM frameworks. We describe four models more thoroughly and explain our choice for the STOF model, supplemented with aspects of the other models. Furthermore, the choice for the KIND-L questionnaire as research method is explained.

4.1 The definitions of BMs and BCs: what are the differences?

When a new business is developed, a BM is often used to describe the rationale of how the organization creates, delivers, and captures value (Osterwalder, 2009). The consistency between the separate parts of the organization, like the value proposition, production processes, core competencies and revenue streams is important.

There are many different definitions of a BM, which often have comparable elements, and still differ in the approach and the value ascribed to the BM. An often-used definition of a BM is the one given by Osterwalder and Pigneur (2002):

“A business model is nothing else than the value an organization offers to various customers and portrays the capabilities and partners required for creating, marketing, and delivering this value and relationship capital with the goal of generating profitable and sustainable revenue streams.”

Another definition is the one by Bouwman, De Vos and Haaker (2008):

“A business model is a blueprint for a service to be delivered, describing the service definition and the intended value for the target group, the sources of revenue, and providing an architecture for the service delivery, including a description of the resources required, and the organizational and financial arrangements between the involved business actors, including a description of their roles and the division of costs and revenues over the business actors”.

The main difference between these two definitions is the value ascribed: “a business model is nothing else than the value an organization offers” implies something else then “a blueprint”. The first implies a dynamic guideline or a framework to set up a BM; the second implies a static BM, which is not very open for change. In this research project the BM of the CareRabbit will be developed during the process of research project: pilot studies will be used to help develop the BM and make adjustments during this process. In these pilot studies the CareRabbit will be tested and implemented in two different hospitals and the value for users is investigated. The results from these pilot studies will be included in the BM and therefore, to leave room for those adjustments, the definition used in this paper is the one by Osterwalder and Pigneur.
As stated in the introduction (paragraph 1.3), the difference between a business model (BM) and business case (BC) can be difficult and often they get mixed up: the how of the BM versus the why of the BC. Remenyi stated in 1999 that a BC is:

“A justification for pursuing a course of action in an organizational context to meet stated organizational objectives or goals. A business case frequently involves assessing the value of an investment in terms of its potential benefits and the resources required to set it up and to sustain it.”

BMs are relatively young in ICT: most of them originated in the beginning of the 21st century. In the past ten years many different models arose and were further developed. Many models have their roots in the theory of the Balanced Score Card from Kaplan and Norton (1992). One of the models that integrated all the existing models is the one of Alexander Osterwalder (2004).

Since the CareRabbit is an IT innovation that will be applied in healthcare, the BM we will use must be adaptable to the healthcare sector. The STOF model is a BM that has strong resemblances to Osterwalders model, but is specifically designed for IT innovations. In 2009, Spil and Kijl developed a dynamic version of the STOF model and in a research paper they adapted the model to several healthcare innovations. This is therefore the model that is used in this research project.

4.2 The development of and the choice for the STOF model
The first ideas of BMs date from the 16th century: merchants and traders for example employed letter-writers in other cities. In the past two decennia the development and use of BMs accelerated and several different BM concepts are developed.

In 2004 Alexander Osterwalder developed an ontology to be able to describe the BM of a firm. To do so Osterwalder (2009) defined four main areas that frame the domains of the BM. These four areas are inspired by the balanced score card (BSC) of Kaplan and Norton (1992), which contains the following four areas: customer, internal business processes, innovation and learning, and financial. They state that “what you measure is what you get” and that financial measures alone cannot give an accurate representation. The balanced set of measurements is shown in Figure 4.

Furthermore, Osterwalder was inspired by Markides (1999) who stated that the three main questions can be brought back to: Who?, What? and How?.

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6 http://journalism.nyu.edu/pubzone/weblogs/pressthink/2008/04/22/business_model.html
7 According to Fensel (2001) “ontologies provide a shared and common understanding of a domain that can be communicated between people and across application systems” and they “provide support in integrating heterogeneous and distributed information sources”
The four areas of Osterwalders model are: product, customer interface, infrastructure management, and financial aspects. Next Osterwalder broke down these four areas in nine building blocks that can model a BM for a firm. The four areas, nine building blocks and their definitions are shown in Table 1.

<table>
<thead>
<tr>
<th>Area</th>
<th>Building Block</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product</strong></td>
<td>Value proposition</td>
<td>A Value Proposition is an overall view of a company's bundle of products and services that are of value to the customer.</td>
</tr>
<tr>
<td><strong>Customer Interface</strong></td>
<td>Target customer</td>
<td>The Target Customer is a segment of customers a company wants to offer value to.</td>
</tr>
<tr>
<td></td>
<td>Distribution channel</td>
<td>A Distribution Channel is a means of getting in touch with the customer.</td>
</tr>
<tr>
<td></td>
<td>Relationship</td>
<td>The Relationship describes the kind of link a company establishes between itself and the customer.</td>
</tr>
<tr>
<td><strong>Infrastructure Management</strong></td>
<td>Value Configuration</td>
<td>The Value Configuration describes the arrangement of activities and resources that are necessary to create value for the customer.</td>
</tr>
<tr>
<td></td>
<td>Capability</td>
<td>A capability is the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customer.</td>
</tr>
<tr>
<td></td>
<td>Partnership</td>
<td>A Partnership is a voluntarily initiated cooperative agreement between two or more companies in order to create value for the customer.</td>
</tr>
<tr>
<td><strong>Financial Aspects</strong></td>
<td>Cost structure</td>
<td>The Cost Structure is the representation in money of all the means employed in the BM.</td>
</tr>
<tr>
<td></td>
<td>Revenue model</td>
<td>The Revenue Model describes the way a company makes money through a variety of revenue flows.</td>
</tr>
</tbody>
</table>

Table 1: Four areas and nine building blocks of the BM (Osterwalder, 2004)
Figure 5 shows how these nine areas are connected.

Figure 5: The Business Model Canvas (Osterwalder, 2004)

In Table 2 is showed what the resemblance is between these three theories and the STOF model, and how the four main areas of each theory are basically the same.

<table>
<thead>
<tr>
<th>STOF</th>
<th>Business Model Ontology</th>
<th>Balanced Scorecard</th>
<th>Markides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
<td>Customer Interface</td>
<td>Customer Perspective</td>
<td>Who?</td>
</tr>
<tr>
<td>Technology</td>
<td>Product</td>
<td>Innovation and Learning</td>
<td>What?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perspective</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>Infrastructure Management</td>
<td>Internal Business</td>
<td>How?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perspective</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>Financial Aspects</td>
<td>Financial Perspective</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: The resemblance in the main areas of each theory

Osterwalders BM ontology formed the basis for many BMs developed after that. One of the models with great resemblance with Osterwalders model is the STOF model by Haaker et al. (2004).

The STOF model is developed by Haaker et al. (2004) as a tool to help develop BMs for complex cooperation that surpasses the boundaries of a single company, for the development and exploitation of innovative IT services (Haaker, 2004). In 2009 Spil and Kijl adapted this model to a dynamic situation and applied it to five e-health innovations. Figure 6 shows the STOF model.
Figure 6: STOF model (Frux Freeband, 2008)\(^8\)

The STOF model was chosen as the framework for this research project: it is a broad and generally applicable framework with the domains and factors almost being almost self-explanatory. Its four domains provide a clear classification for the research project and the base for the research questions. Furthermore, the dynamic aspect of the three phases of the BM make it suitable for the CareRabbit, because the first phase was already executed and the second phase just started when this research project began.

The external factors of influence are explicitly stated in the STOF model and these might be of great influence on the further development on the CareRabbit:

- The regulation in hospitals might cause restrictions, but other regulation might encourage e-health innovations;
- The technological advancements have an influence on the adoption of new technologies by people;
- The market dynamics learns us more about the competition of the CareRabbit.

The BM Ontology (Osterwalder, 2004) is worked out in great detail and is therefore a useful translation of the STOF model. The building blocks from this model will therefore be used indirectly in the chapters to structure them more.

\(^8\) https://doc.novay.nl/dsweb/GetDocument-93856/Ontwikkelen%20van%20levensvatbare%20business%20modellen%20voor%20mobiele%20diensten%20(Haaker%20Telematica%20Instituut%20Nov%202008).pdf
4.2.1 The dynamic STOF model makes it possible to adjust the BM to new insights
Kijl, Bouwman, Haaker and Faber (2005) stated a BM framework should be dynamic, so that the model can be adjusted to developments in a healthcare environment (Kijl et al, 2005). The development of a dynamic BM knows three stages: technology/R&D, implementation/roll-out and market. At each of these stages, each of the STOF factors should be considered and the three external factors can have a different influence at each stage.

In the first phase the technology and investments are the most influential, but moreover research should be done on market and regulation. In the second phase regulation is determinative; the other factors stay important. In the third phase the market is the factor with the greatest impact. Furthermore, the focus on the four STOF domains differs at each phase: the first focuses mainly on the technology, investments and the development of service concepts; the second phase focuses on testing, field experiments and small scale roll-out; in the third phase organization and finance are the most important (Spil & Kijl, 2009).

For the first phase, IBM developed an outline for the BM of the CareRabbit. In this research project we will mainly focus on the implementation phase and evaluate the first phase. We will anticipate on what is needed to make the third phase successful and develop the scenarios for this BM.

The framework for the dynamic STOF model then looks like displayed in Figure 7.

![Figure 7: Dynamic business model framework (Kijl, Bouwman, Haaker, Faber, 2005)]
**Service domain**
The value for the users, both children and their parents, and the hospital, is investigated. Moreover, the experiences with using the CareRabbit and the organizational aspects are analyzed.

**Technology domain**
The technology domain describes the functionalities and technical design of the CareRabbit and the experiences of testing it. We will also evaluate the Nabaztag device that is used. The current technology of the CareRabbit is considered a given, but an evaluation will be given on the adjustments made during the process and the improvements that still can be made.

**Organization domain**
The organization domain describes the structure of the possible network and the organizational aspects. What does the network of the organizations look like and what are the inter-organizational arrangements? For each scenario the organizations involved may differ: in one scenario the hospitals could be the clients (and are covered in the Service domain), in another scenario the hospitals could be part of the network around the CareRabbit and thus become a partner in the process.

**Financial domain**
Finally, the financial domain covers how costs, benefits, investments and risks are generated and divided between the stakeholders and how value is created. For each scenario the costs will be approximately the same and to make the project break even, the revenues have to be the similar too. What will differ for each scenario is the cost structure: where are the costs made and where do the benefits come from? This means that these cost structures depend on the outcomes and decisions in the other three domains.

**External factors**
- **Market dynamics**
The factor market dynamics describes trends in the market, changing customer demands and competition. In this part the potential target groups will be investigated and described. Moreover, the CareRabbit will be compared to other devices with a similar service.

- **Technological advancements**
In this part we will describe the advancements that there are with respect to the technology used in the CareRabbit. Examples are the use of Internet and wireless connections in hospitals and the use of IT in healthcare processes and treatments.

- **Changes in legislation**
Regulation can either inhibit or stimulate certain developments or it can provide certain restrictions to an innovation. Examples are legislation on safety and privacy. Furthermore, regulation can stimulate development by providing grants or media attention. For the BM on the CareRabbit we do not expect much restrictive legislation, but there are some trends in stimulating regulation.
4.3 Social connectedness through ICT and the influence on wellbeing

The CareRabbits aim is to make the stay in the hospital more pleasant for children. By using ICT to stay in touch with relatives the CareRabbit might influence the feeling of social connectedness or emotional bonding, which is important for wellbeing.

Many previous studies show that social connectedness is important for a person’s perceived wellbeing and health or disease. Sadlo (2005), in a research on connectedness, social wellbeing and communication mode, states: “the experience of social connectedness makes a more important contribution to an individual’s subjective wellbeing, than the mode of communication”. Especially family members and friends can give us a feeling of belonging, understanding and being cared for. Having a social network that supports an individual, can help buffer against stress, develop social skills (Cohen, Sherrod & Clark, 1986), and lead to higher levels of life satisfaction and self-esteem (Takahashi, Tamura & Tokoro, 1997). Even the frequency of the contact with family and friends has been positively related to wellbeing (Nezlek et al, 2002). Research showed that people use technology-based modes of communications as a supplement to their face-to-face communication, and not as a replacement (Sadlo, 2005). The CareRabbit will most likely be used to supplement hospital visits as well.

4.4 Choice for the KIND-L questionnaire

To investigate the value of the CareRabbit for the children in the hospital, we can simply ask them. However, it is difficult and time consuming to have well structured interviews with many children, and to process and classify all the given answers. Therefore a more reliable method is needed. We want to investigate if the CareRabbit affects the quality of life or wellbeing of the child while it is in the hospital. With a validated questionnaire specifically designed for children the health-related quality of life (HRQoL) can be measured (Verrips, 1998).

There is no norm for how to measure HRQoL with children. About twenty different questionnaires with this aim exist worldwide (Rajmil, 2004), examples are the PEDSQL, TACQOL and KIND-L. Only a few questionnaires are suitable when we consider the availability in Dutch. Some of these questionnaires are too long for use in the hectic environment of the hospital. Others are only suitable for children that are 8 years or older, while the CareRabbit can be used by younger children.

Taking this in consideration, the KIND-L is the best questionnaire to use for this research project. It mainly considers the actual situation of the child and the opinion of (one of) its parents is asked, which complements the answers of the child and provides more information.
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Frux Freeband (2008).


