



Utrecht University

How healthy are games for health?

“What are the hurdles and chances in the current value network for games for health in the Dutch healthcare system?”

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ABSTRACT

Major changes in the healthcare sector are coming within the following years. The healthcare sector faces challenges such as the aging of the population, more advanced therapies, the effect of changing consumption patterns on the health of people and the growing demands of the patient (Ministry of VWS, 2014; RANJ, 2015). This affects the accessibility, quality and affordability of care. If proceeded like this, care becomes unaffordable, a proposed solution is eHealth. eHealth is the application of ICT (Information and communications technology) in healthcare. For this research G4H (Games for health) is used as a case. G4H are games which besides being entertaining also serves a serious goal within a healthcare context. The implementation of eHealth is believed to cause a paradigm shift in the way the Dutch healthcare sector is organized. However, a new paradigm represents discontinuities in trajectories of progress which are defined within earlier paradigms (Christensen & Rosenbloom, 1995). The process of a paradigm shift brings disruption of the current paradigm. In order to analyze the context which is disrupted, the value network is used. The value network is the context through which a disruptive innovation acquires value. The actors within this system depict the value which an innovation can acquire. Furthermore, the implementation of G4H can be seen as the measure in which G4H fits to the value network or in which it is disrupted. This leads to the following research question: *“What are the hurdles and chances in the current value network for games for health in the Dutch healthcare system?”*. The answer is sought for in a qualitative explorative method, by interviewing seventeen respondents. The interviews and additional data are coded and analyzed to arrive at an answer on the research question. The implementation of G4H and eHealth causes a change in the position of some actors in the value network. The chances lie with the offer of a more efficient and effective manner of curing, caring and keeping healthy. The actors in the system acknowledge this and are willing to adopt the innovation. However, the manner in which the system is organized poses hurdles. This in the fact that the current value network is organized as a tight knit system which is reluctant to change. Furthermore, there are multiple actors who provide a deciding factor in implementation of G4H. Last, there is a need for validation of effectiveness and efficiency in order to acquire value. So G4H, as well as eHealth, has the choice to either adopt to the current value network or strive to change it and by doing so disrupt the Dutch healthcare sector.

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ABBREVIATIONS AND CONCEPTS

CF: Cystic Fibrosis, a common hereditary disease in which exocrine (secretory) glands produce abnormally thick mucus. This mucus can cause problems in digestion, breathing, and body cooling (Pubmed Health, 2016)

DBC: Diagnose treatment combination (Diagnose Behandel Combinatie)

eHealth : The use of information and communications technology (ICT) to improve and/or support healthcare (Nictiz & Nivel, 2015).

EMA: European Medicines Agency, responsible for the protection of public and animal health through the scientific evaluation and supervision of medicines (EMA, 2015)

EU: European Union

GGZ: Mental health care (Geestelijke Gezondheid Zorg)

G4H: Games for Health

ICT: Information and Communications Technology

Ministry of VWS: Ministry of public healthcare, welfare and sport (ministerie van Volksgezondheid, Welzijn en Sport)

NZa: Dutch healthcare authority (Nederlandse Zorg Autoriteit)

RCT: Randomized Clinical Trails

UMC: University Medical Centre

UU: University of Utrecht

Validation: Validation is the process of validating the effectiveness of certain claim a product or service makes. This can be done through different methods of which RCTs are just one.

Patient VS. Client: In this research care-users are discussed with which every Dutch citizen that has access to health care, are meant. Not every care-user is necessarily a patient. However, where the term patient is used, both the people currently in treatment as the people how are registered (clients) are meant.

Treatment: In this the term treatment is used for the actions a patient will undergo in order to improve his health. This term will also encompass the care a patient gets, as these are the actions performed to maintain the health of the patient

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1. INTRODUCTION

Major changes in the Dutch healthcare sector are coming within the following years. The Dutch healthcare sector will face challenges such as the aging of the population, more advanced therapies (therefore more expensive), the effect of changing consumption patterns on the health of people and the growing demands of the patient (Ministry of VWS, 2014; RANJ, 2015). This affects the accessibility, quality and affordability of care. For instance, the cost of long-term care is set to more than double over the coming decades (Schut, Sorbe, & Hoj, 2013). If proceeded like this, healthcare will be unaffordable. In order to solve the above discussed problems, the Netherlands focuses on the implementation of different technologies in their healthcare system. These technologies can take over certain tasks which are now performed by healthcare providers (Rijen, Lint, & Ottes, 2002). Technologies can monitor, react independently and work more precisely, by doing so allowing healthcare consumers and – providers with a more efficient way of providing and receiving care (Ministry of VWS, 2014).

One of the proposed technological solutions is the implementation of eHealth in the Dutch healthcare system (Ministry of VWS, 2014; Rijen et al., 2002; Schippers & Rijn, 2014). eHealth is defined as the use of information and communications technology (ICT) to improve and/or support healthcare (Nictiz & Nivel, 2015). For patients, it is made easier and more attractive to implement healthcare in their daily life and to control their own health. Furthermore, the implementation of eHealth enables healthcare providers to work more efficiently, by providing a product which can monitor and treat the patients which don't need direct attention (Ministry of VWS, 2014). Therefore, eHealth is used to meet the needs of consumers, patients, healthcare professionals, healthcare providers, and policy makers (Dumay, 2007; Nictiz & Nivel, 2015). These needs are met by providing a product or service which can take away those tasks, otherwise performed by healthcare provider, which can easily be done by patients themselves while being monitored by the applications. By doing so, the patient is enabled to take more control over his healthcare path as it provides him with the possibility to monitor his health from home on his own smart devices. Furthermore, healthcare providers are able to focus on those patients who need their attention while knowing the eHealth applications takes care of those patient who can do without the physical consults. By implementing eHealth, the relation between the healthcare provider and the patient is altered and the difference between care, cure and prevention will disappear as well as the difference in professional - , informal - and self care (Schippers & Rijn, 2014). Therefore, it is expected, if in the upcoming years, the societal and technological trends accelerate a paradigm shift will occur within the Dutch healthcare (Schippers & Rijn, 2014). However, despite the frontrunner status of the Netherlands in the European union (EU) with regard to eHealth, the implementation seems to stagger (Currie & Seddon, 2014; Nictiz & Nivel, 2015; Rijen et al., 2002; Schippers & Rijn, 2014). This is not uncommon, as such a shift is achieved through making changes in the manner in which Dutch healthcare is organized, this can originate in resistance of the actors invested in keeping the healthcare system as it is (Ministry of VWS, 2014). Such a phenomenon is described in the theoretical framework by Christensen (1997), which describes a situation in which incumbents within an industry overshoot the level of performance which the main-stream market can absorb. This triggers up starting companies to search for disruptive innovations. These disruptive innovations provide simpler, more convenient and less costly products or services (Christensen, 1997). However, when implementing a disruptive innovation, parties involved in the “old system” will be reluctant to the disruption of their system as they might not have a place in the new system.

Therefore, a new system has to arise in which the innovation can thrive. Within the theory of disruptive innovation, this system is defined as a value network. The value network being the context that defines and delimits what companies within them can and cannot do (Chesbrough & Rosenbloom, 2002; Christensen, 2006). This context being a tight knit network of producers and markets. A key determinant of the probability of commercial success of an innovative effort is the degree to which it addresses the well-understood needs of known actors, within the value network in which an organisation is positioned (Christensen & Rosenbloom, 1995). This encompasses the importance of knowing the actors, and their values, within the value network. Meaning by capturing the actors, and their needs, present in a value network can bring chances and hurdles for the implementation of the innovation to light. Therefore, within this paper the value network is analyzed by identifying value perception of the different actors in the healthcare system. By identifying the hurdles and chances in the value network of an eHealth innovation in the healthcare sector, causes for the problems in implementation of G4H can be identified. Furthermore, implications can be formed on the value network of an innovation within a healthcare setting.

As eHealth is a very broad concept, a case study is performed on games for health¹ (G4H). These are games which beside being entertaining also serve a more serious purpose (Baranowski et al., 2015; Kato, 2010). G4H are used as a case, as it is classified as an application of eHealth as it is an ICT in a healthcare setting (Growing games, 2015a; Nictiz & Nivel, 2015; RANJ, 2015). Furthermore, G4H provide an representative case as the goal of G4H are similar as the goals of eHealth, namely by its implementation making the healthcare system more efficient and effective (Neo observatory, 2015; Nictiz & Nivel, 2015). This leads to the following research question:

“What are the hurdles and chances in the current value network for games for health in the Dutch healthcare system?”

For this research, the scope used is the Netherlands, this due to the fact that the Dutch healthcare sector, and its laws, regulation and reimbursement system, is organized at a national level. Furthermore, an inductive qualitative research design is applied in order to arrive at an answer on the research question. Through interviews, with actors within the G4H sector, insight is gained in the workings of the value network in the healthcare sector.

By gaining insights in the value network of an innovation in the healthcare sector, this research contributes to the knowledge on innovation in healthcare. Furthermore, a contribution is made in the further understanding and use of the concept of the value network as proposed by Christensen (1995, 1997 & 2006). By doing so a theoretical relevance is provided. This is achieved through an explorative research design, resulting in implications on the use of the value network to analyze the process of an innovation in the healthcare sector. By doing so, more is learned on the process of innovation in the healthcare sector. Furthermore, a social relevance is provided in the sense that with the implementation of G4H, and eHealth, healthcare can be made more efficient and effective.

The remainder of the paper is build up as follows. First, a more extensive description of the case, G4H, is discussed. In the second part, the theory describes the disruptive innovation theory. Followed by the method, which describes the research strategy, and the method by which the data is collected and analysed.

¹ Further elaboration on the subject is presented in the following chapter.

For this research, a qualitative approach is used to obtain rich and detailed data through interviews with different players in the G4H industry. Fourth, the results section exhibits the data found through the interview. In the following chapter the data is analyzed and is linked back to the theory. In the conclusion section, an answer to the research question is given. In the last part, the limitations, theoretical and policy implications derived from the research are discussed.

2. GAMES FOR HEALTH

G4H are games developed to influence a person's health, the gradation in which this happens can vary per game (Baranowski et al., 2015). These games can be used as a tool to improve health behaviour such as healthy lifestyle habits, behaviour modification, self management of illness and chronic conditions and motivating and supporting physical activity (Ferguson, 2012). The attention for G4H is growing as more and more people acknowledge the ability of these games to increase knowledge, deliver persuasive messages, change behaviour, and influence health outcome (Baranowski et al., 2015; Kato, 2010, 2012; Susi, Johannesson, & Backlund, 2007). By doing so, G4H can provide a way for patients to engage in their own healthcare, by providing an easy and affordable alternative to current treatment methods. Furthermore, G4H offer the healthcare providers with a way to treat patient from a distance. This relates to the shift happening within healthcare discussed in the introduction section of this research.

There is a wide variety of applications for G4H, however for this paper the focus lies with the games, which make a serious claim of influencing an individual's health. An example of a G4H is "Moodbot". This game provides an online environment for patients who receive mental healthcare (IPPO, 2015a). It motivates patients to become more active, and gives caretakers a guiding role (IPPO, 2015b). It also offers a patient a playful environment to interact, socialize and share their feelings without the need to 'talk' about it (IPPO, 2015b). The care professional gets real-time, one-glance monitoring and an overview of the collected data (IPPO, 2015b). So through Moodbot physicians can monitor and treat patients from a distance. Another example is "Wind tales", a game developed for Cystic Fibrosis (CF) patients (Vici medical, 2015a). By blowing in a specially developed device a character is moved through a fantasy world (on for instance an iPad). The game enable the physician to observe the patient through a dashboard, which for instance monitors the lung function of the patient over a period of time (Vici medical, 2015b). The physician can alter the difficulty of the game to meet the demanded level of exercise of the patient (Vici medical, 2015a).

G4H are part of the wider concept serious games, which are games with a 'serious' purpose next to being entertaining (Ijsfontein, 2013; Susi et al., 2007; Wattanasoontorn, Boada, García, & Sbert, 2013). Serious games² make up for a significant aspect of the Dutch game industry, of all gaming firms 44% is involved in serious gaming³ of which 38% is dedicated to healthcare⁴. The Dutch game industry seems to be unique in its substantial focus on serious games (Neo observatory, 2015). However, this segment of the market faces challenges in becoming a sustainable economic sector (Neo observatory, 2015). These challenges are represented by the fact that for many potential clients for serious games, the games are an unknown territory (Neo observatory, 2015). As can be seen in the eHealth monitor, only 2% of the patients used a game to learn healthier behaviour or to learn to cope with their disease, 14% didn't but would be willing to use such a game⁵ (Nictiz & Nivel, 2015). Furthermore, the healthcare providers are conservative in accepting the G4H, as before they will consider using the games the proposed claims of effectiveness must be deemed trustworthy (Graafland et al., 2014).

² The games monitor 2015 uses the term applied games however for the clarity of the piece the equal term serious game is used.

³ See appendix 10.3.2.

⁴ See appendix 10.3.1.

⁵ See appendix 10.4.1.

G4H are a promising application of eHealth, and makes an interesting case to study. As G4H suffer from similar issues as clearly identifying clients wishes, difficulties with estimating a development time, and the fact that games are viewed as a luxury product in many sectors (Neo observatory, 2015). So as with eHealth, also the implementation of G4H is staggering (Baranowski et al., 2013; Gamekings, 2014; Kato, 2010, 2012). This stagnation is thought to be caused by the fact G4H have no place in the current value network of the Dutch healthcare system. This is reflected in the fact that the G4H are not adopted by healthcare consumers and – providers, as the G4H are not able to acquire value within this value network.

3. THEORY

This chapter formulates a theoretical background, describing disruptive innovation and value networks. This research builds on the notion of disruptive innovation by Christensen (1995 & 1997). This notion describes a situation in which incumbents within an industry overshoot the level of performance which the main-stream market can absorb. This triggers up starting companies to search for disruptive innovations. These disruptive innovations provide simpler, more convenient and less costly products or services (Christensen, Grossman, & Hwang, 2009; Christensen, 1997; Hwang & Christensen, 2008).

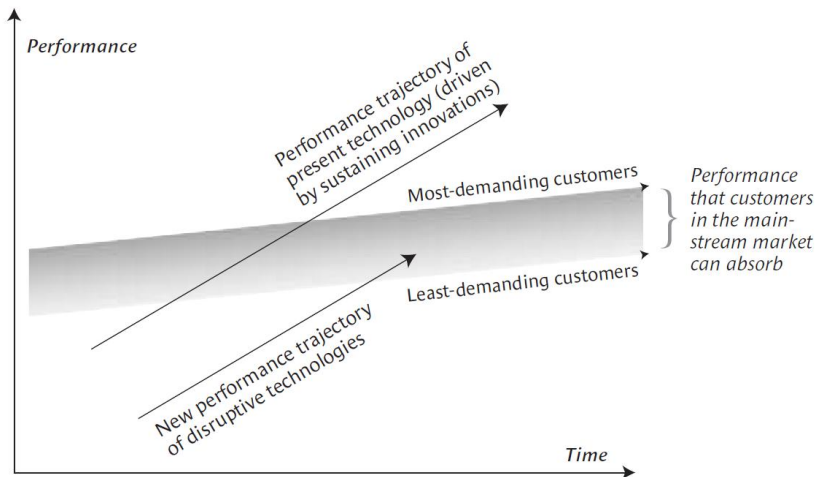


FIGURE 3.1 THE PROGRESS OF DISRUPTIVE INNOVATION (CHRISTENSEN ET AL., 2000)

As can be seen in figure 3.1., a disruptive innovation sneaks in from below. At first it provides a product or service with worse performance as the initial product/service (Christensen & Rosenbloom, 1995). However, the disruptive innovation possesses other features that a few fringe (and generally new) customers' value (Christensen, 1997). The incumbents keep improving their product or service and by doing so further overshooting the demands of their customers. The so-called adding of bells and whistles nobody wants to pay for. Meanwhile, the disruptor improves its product and by doing so appealing to more people. History has pointed out that often by the time the incumbents notice, the disrupter has already taken over the market (Harvard business review, 2013).

The process of disruption manifests within a market as following, the dominant players focus on sustaining their existing product or service through sustaining innovation. Sustaining innovations are innovations which improve the performance of established products, along the dimensions of performance that mainstream customers in major markets have historically valued (Christensen, 1997). With these sustaining innovations the big players upgrade existing products and services to attract higher paying customers (Harvard business review, 2013). By focussing on the high profit customers the regular customer is surpassed, as is illustrated by the upper arrow in figure 3.1.. The product or service provided by the big players exceeds the demands of the regular customer who will demand a simple low cost alternative. This is where an entrepreneurial company can jump in. By providing a simpler, more convenient and less costly products or services. Such an innovation is a disruptive innovation.

As can be seen in literature, the healthcare sector is ripe to be disrupted (Christensen, Bohmer, & Kenagy, 2000; Christensen et al., 2009; Zimlichman & Levin-Scherz, 2013). As the dominant players in the sector are focused on improving their product or services to the point where the average consumer doesn't even know what he is using (Christensen et al., 2000). The major health care institutions—medical schools, groups of specialist physicians, general hospitals, research organizations—have together overshot the level of care actually needed or used by the vast majority of patients (Christensen et al., 2000). Most players in today's health care system are in a lockstep march toward the most scientifically demanding challenges (Christensen et al., 2000). Therefore, the phenomenon of overshooting the needs of average customers and creating the potential for disruption, according to Christensen, quite accurately describes the healthcare sector. As many of the most powerful innovations that disrupted other industries did so by enabling a larger population of less-skilled people to do in a more convenient, less expensive setting things that historically could be performed only by expensive specialists in centralized, inconvenient locations (Christensen et al., 2000). In each of the cases described by Christensen et al (2000) , the disruption left consumers far better off than they had been.

The disruption in healthcare, discussed in literature, focuses mainly on disruptions in the delivery of care (Christensen et al., 2000; Hwang & Christensen, 2008; Zimlichman & Levin-Scherz, 2013). As Christensen and others argue many tasks now performed by specialist could easily be done by lower ranking, however more than capable, medical personnel (Christensen et al., 2000; Zimlichman & Levin-Scherz, 2013). However, G4H, as part of eHealth, provide a manner in which a simpler, more convenient and less costly product or service can be provided to the consumers of health. Furthermore, by implementing G4H, and eHealth, the move from tasks performed by specialist to tasks performed by lower ranking personnel is described. However, instead of the lower ranking personnel the technology will take over the task. Therefore, it is believed that G4H, as well as eHealth fit the definition of the disruptive innovation the healthcare sector needs. Which is an innovation which serves the lower demanding consumers and by doing so offering a cheaper, easier product and by doing so lowering the total health care costs (Christensen et al., 2000; Hwang & Christensen, 2008; Zimlichman & Levin-Scherz, 2013).

However, G4H, as well as eHealth, have not or might never disrupt the healthcare sector, as the fact remains that an innovation can be classified as disruptive only after the disruption has occurred. As Christensen (2006 pp.45) said: "*It is true that one cannot think a thought before it has been thought.*". However, all that must be asked of a theory is that it helps to evaluate a technology after it has been conceived or to evaluate a business venture after it has been proposed or launched. A theory must provide the ability to predict what will happen to the incumbents and entrants in the future if they take different actions relative to the innovation (Christensen, 2006). The earlier these predictions can be made after conception, of course, the better. Therefore, it is believed the disruptive innovation theory can be used for this research. As it has proven its worth in predicting the impact of the technologies in other cases (Christensen, 2006).

Moving on, a disruptive innovation leads a sector into an entirely new direction. The disruptive innovation pattern by which this is achieved has three elements namely (Christensen et al., 2009):

- Technology, the innovation, that simplifies, standardizes and structures solutions.
- Business models that deliver simple solutions affordably, accessibly and profitably, which provides the method of disruption.
- A value network of companies that reinforce each other and form the infrastructure which is disrupted.

All three elements are enablers of disruptive innovation (Christensen et al., 2009). The technology is the measure, the business model is the manner in which and the value network represents the context in which value is gathered.

When implementing a disruptive innovation successfully, the disruptive solutions need to be knit together in a new value network (Christensen et al., 2009). When this is accomplished, as with all disruptions, patients and providers will be drawn one by one from the old system into the new (Christensen et al., 2009). The value network being the context that defines and delimits what companies within them can and cannot do (Chesbrough & Rosenbloom, 2002; Christensen, 2006). Moreover, the context, being the value network, in which an eHealth application, in this case G4H, is embedded influences its ability to be successful. Furthermore, a key determinant of the probability of commercial success of an innovative effort is the degree to which it addresses the well-understood needs of known actors within the value network in which an organization is positioned (Christensen & Rosenbloom, 1995). Therefore, the emphasis for this paper lies with the value network. As the positive alignment with a value network can leverage the value of a technology. Failure to align with a value network can dissipate potential value (Chesbrough & Rosenbloom, 2002). In order to obtain value from its innovation a firm must position itself in a value network either by creating a new one or adapt the dominant one (Christensen et al., 2009; Christensen, 1997).

Moreover, the value network is defined as a nested commercial system (Christensen & Rosenbloom, 1995; Christensen, 1997). Within this system a nested network of producers and markets consists, through this network the trade able architected components at each level are made and sold to integrators at the next higher level in the system. Of which each component can be viewed as a system, comprising sub-components whose relationships to each other are also defined by a design architecture, this makes for a complex and inter related system (Christensen & Rosenbloom, 1995). A given system-of-use comprised a hierarchically nested set of constituent systems and components (Christensen & Rosenbloom, 1995). The scope and boundaries of a value network are defined by the dominant technological paradigm and the corresponding technological trajectory employed at the higher levels of the network (Christensen & Rosenbloom, 1995). A firm can create an appropriate business model however an appropriate value network is critical in making the business model successful (Christensen et al., 2009). Value is defined as a function of the dominant technological paradigm in the ultimate system of use in the value network. The metrics by which value is assed will therefore differ across networks. The attractiveness of a technological opportunity and the degree of difficulty a producer encounters in exploiting it, are determined, among other factors by the firm's position in the relevant value network. As firms gain experience within a given network, they are likely to develop their capabilities, structures and cultures to fit that position better by meeting that network's distinctive requirements (Christensen & Rosenbloom, 1995).

Within a value network the interdependence and mutual reinforcement bond among the actors in the existing value network, this makes opportunities outside the network less attractive for all of them (Christensen et al., 2009). This makes that the value network strongly defines and delimits what companies within them can and cannot do. As it is created around a given business shapes, the role that suppliers, customers and third parties play in influencing the value captured from commercialization of an innovation (Chesbrough & Rosenbloom, 2002; Christensen & Rosenbloom, 1995). This makes the value network an important factor affecting whether incumbent or entrant firms will most successfully innovate (Christensen & Rosenbloom, 1995; Christensen, 1997).

By mapping the current value network, the position and value perception of the actors present within the network, can be made apparent. By doing so, the chances and hurdles in that context are identified. Moreover, the value network is mapped by looking at the different actors within the G4H sector and what these actors value. By identifying the aspects valued by the different actors within the network, irregularities and misfits can be identified. As a value network strongly defines and delimits firms within them by mapping the network the factors which define and delimit G4H can be identified. Additionally, as discussed above, the alignment of a innovation with the value network is determining for the innovation in the acquiring of value. The process of fitting an innovation to a value network or creating a new value network, is the process of implementation. Therefore, the actors, and their value perception, within the value network, and the implementation of the G4H are analyzed in order to arrive at an answer to the research question.

4. METHOD

This chapter describes the manner in which the data is collected and analyzed. Furthermore, the reliability and validity is discussed.

4.1. RESEARCH DESIGN

As discussed in earlier chapters (1&3) by mapping the value network of G4H, the chances and hurdles for the G4H in the healthcare sector are identified. By arriving at these chances and hurdles, implications can be formed on the application of a value network approach to an innovation in the healthcare sector. In order to arrive at these implications an inductive qualitative research design is used. By using this design, implications are formed from general findings, which fits the goal of this research. Whereas with a deductive approach one would test the implications from theory on a large dataset (Bryman, 2008). Furthermore, the qualitative research design follows this research's demand for rich data and openness to the point of view of participants (Bryman, 2008). This demand stems from the fact that patterns found in the data are used to form implications. In order to arrive at these implications a grounded theory approach is used. Grounded theory is defined as theory that was derived from data, systematically gathered and analyzed through the research process (Bryman, 2008). By using this approach, implications are formed which are grounded in the data. The grounded theory approach demands for a continual interplay between data collection and – analysis. As a grounded theory is derived inductively through the systematic collection and analysis of data pertaining to a phenomenon (Bowen, 2006; Bryman, 2008).

For this research, a single case study approach is used, the G4H industry being the case. Through this design a detailed and intensive analysis is possible. More specifically, it's a representative or typical case/exemplifying case. The objective is to capture the circumstances and conditions of an everyday or commonplace situation (Yin, 2013). Thus, a case is chosen because it exemplifies a broader category of which it is a member. As discussed earlier, the case in this research is G4H⁶, G4H are part of eHealth, as it is an ICT application used in a healthcare setting. By analyzing G4H, the case, implications are made to fit eHealth innovations, the broader context.

4.2. DATA COLLECTION

The data is collected through semi-structured interviews. A semi-structure interview design consist of a line of topics that are treated, but allow interviewees to answer in their own terms (Bryman, 2008; Yin, 2013). This approach is chosen as the research' design demands for rich data and openness of the respondents as discussed above. By following a semi-structured interview design, the respondents are able to elaborate and answer freely on the questions while remaining within the boundaries of the research. Where as a structured interview design would limit the interviewee too much in his answers, and would leave no space for findings outside the framework. An open interview design would leave the interviewee with too much freedom and the chance exists that no relevant data can be collected. A semi-structured research design is pursuit as following. The questions are structured after two concepts as discussed in the theory, the actors, and their value perception, and the implementation of G4H in the Dutch healthcare sector. As the value network consists of the actors, how they relate to each other and what they value. Furthermore, as the value network describes the nested commercial system, the implementation of G4H in the Dutch healthcare sector is analyzed.

⁶ For further elaboration on the case see chapter 2

The implementation of an innovation describes the process of fitting an innovation to a value network or creating a new value network. As the attractiveness of a technological opportunity and the degree of difficulty a producer will encounter in exploiting it are determined by, among other factors, the firm's position in the relevant value network (Christensen, 1997). The actors, and their value perception, and the implementation of G4H in the Dutch healthcare sector are used as sensitizing concepts, giving the user a general sense of reference and guidance in approaching empirical instances. Whereas definitive concepts provide prescriptions of what to see, sensitizing concepts merely suggest directions along which to look (Bowen, 2006). They provide a general sense of reference and guidance in approaching empirical instances (Bryman, 2008). These concepts give a very general sense of what to look for and act as a means for uncovering the variety of forms that the phenomena to which they refer can assume (Bryman, 2008). And as sensitizing concepts provide starting points for building analysis to produce a grounded theory, the use of these concepts fits the goal of this research. As it fits the explorative nature of this research as it provides a direction without limiting the research.

Following, for each sensitizing concept a prompting question is formulated, this question gets the interviewee to think more about the subject and to provide the opportunity for a more detailed response (Bryman, 2008). The interview guide is found in appendix 10.1.. The interview guide is in Dutch, as the interviews are conducted in Dutch. The prompting questions ensure that interviewees give their opinion about each topic but, when needed, are also given the possibility to respond freely. If it is needed the respondents are asked additional questions to elaborate more on a specific matter. As a grounded theory approach is used, which demands for a constant interplay between data collection and analysis, the interview guide evolves through the process. All interviews are recorded. Following, the interviews are transcribed and coded right after being conducted. This contributes to the constant comparison, which is characteristic for grounded theory, by allowing to adopt the interview guide. After transcribing the interview, the transcripts are sent to the interviewee for verification of the transcript of the conversation. This is done to strengthen the validity, which is discussed later in this chapter. Furthermore, the transcripts are anonymized in order to respect the privacy of the interviewees and the firms they represent.

Last, the data is collected until theoretical saturation had occurred, meaning data is collected until no new or relevant data emerged regarding a category, the category is well developed (Bryman, 2008). Saturation seems to be reached after 12 interviews as no new findings occurred. Within the additional 5 interviews no new finding occurred. However, due to the small respondent sample, additional data is used. This additional data are white papers, scientific articles and websites, in some cases provided by the respondents.

4.2.1. SAMPLING

As a grounded theory approach is used, theoretical sampling is required (Bryman, 2008; Corbin & Strauss, 1990). "*Theoretical sampling is the process of data collection for generating theory whereby the analyst jointly collects, codes, and analyzes his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges*" (Bryman, 2008, p. 419). When a project begins, the researcher brings to it, some idea of the phenomenon he or she wants to study (Corbin & Strauss, 1990). Based on this knowledge, groups of individuals, an organization, or community representative of that phenomenon can be selected for study (Corbin & Strauss, 1990). For this research these groups of individuals, organizations and communities are the actors within the G4H sector. The initial respondents are found through the search for an internship and had agreed to be interviewed for this research.

Furthermore, examples of sources for respondents are the congress of Games for Health EU⁷, and Growing games⁸. These respondents are relevant for this research due to their position in the G4H sector and their knowledge on the workings within the sector. During the interviews, respondents provided contact information for new respondents, which were deemed interesting to interview for this research. The respondents are divided in groups, as is illustrated in table 4.1.. The respondent groups are not necessarily similar to the actors within the value network. However, the inclusion of three consultants and the three branch organisations⁹ is usefully due to the knowledge which these respondents have of G4H. These two groups are not part of the value network, however they are relevant as they have knowledge of the value network of G4H.

TABLE 4.1 DISTRIBUTION OF RESPONDENTS PER GROUP

Respondent group	Number
Game developer	6
Health insurance	1
Consultant	3
Researcher	3
Hospital	1
Branch organisation	3
Total	17

Together with the feedback of the respondents and the white paper, “*Innovatie routes in de zorg*”¹⁰, the relevant actors, and what they value, are identified. These being game developers, healthcare professionals, healthcare insurances, patients, healthcare institutions, researchers and the Dutch government.

As mentioned before due to the limited number of respondents, additional literature is used in the form of white papers, presentations and scientific articles. Despite the saturation which seems to occur, in the fact that no additional data was found. The use of the additional literature strengthens the research by providing additional data. During the interviews some respondents provided additional literature, this is included when proved relevant and an addition to the database. Examples of the literature used are, the previously mentioned, “*Innovatie routes in de zorg*”, Ehealth monitor 2015, Gamemonitor 2015 and “*Inzicht in e-health*” by van Rijen et al.(2002).

4.3. DATA ANALYSIS

For the analysis of data different rounds of coding were conducted. Coding is the process of reviewing transcripts and fitting labels (names) to component parts that seem to be of potential theoretical significance (Bryman, 2008). The coding rounds are described by Bryman and are portrayed in appendix 10.6. (Bryman, 2008, pp. 575–577). So as the first step, a research question is formulated, as presented in the introduction. After which data is theoretically sampled, as discussed in the above paragraph (4.2.). The sensitizing concepts are used as a starting point from which, in the first round, the interviews are coded. In the process of coding additional codes are made. An overview of the codes made can be found in appendix 10.5.

⁷ A congress on the 2nd and 3rd of November 2015 (Games for health, 2015)

⁸ A stimulation program for the Dutch applied games industry (Growing games, 2015b)

⁹ Branche organisations are organisations which seek to promote and enhance the G4H sector by combining the knowledge of different actors.

¹⁰ See appendix 10.7.

This process led to concepts, which are in a second round grouped into categories. These categories are value network, and implementation. These categories occurred through constant comparison during the different rounds and steps. These categories are saturated during the coding process, after which the relations between the categories are explored in order to arrive at hypothesis, or for this research implications. As the research searches for implications on the value network for innovation in the healthcare sector.

For the coding process NVivo is used. NVivo is a powerful tool for the collection of qualitative data (QSR, 2015). It enables managing the data and ideas, query data, visualization of data and allows to create reports from the data (Bazeley & Jackson, 2013; QSR, 2015). When all data is coded, the data is analyzed per code to see what the overall consensus is concerning that specific code. For example, within the code patient, all relevant fragments of the transcripts and additional literature are captured. First, the data per actor is analyzed by which an image per actor can be formed. Second, the relation of the actor being analyzed to the other actors. As the relation between the different actors are part of the value network. Both lead to a representation of the network of actors of G4H. This network represents the relations between the actors and the value creation through these actors. By further analyzing the codes, categories are formed these categories are used to form the implications. Following, these implications are used to formulate the barriers and chances for the implementation of G4H in the Dutch healthcare sector.

4.4. RESEARCH QUALITY

The quality of a research is measured through its validity and reliability (Bryman, 2008). The choice for a particular research design, in this case a qualitative design, can provide difficulties in ensuring validity and reliability. The measures taken to overcome these difficulties and how to ensure the quality research of this research are discussed below.

4.4.1. VALIDITY

A valid study is one that has properly collected and interpreted its data, so that the conclusions accurately reflect and represent the real world (or laboratory) that is studied (Bryman, 2008). In order to ensure validity two measures are applied. First the transcripts are sent to the interviewees or respondent validity in order to correct for misinterpretation (Yin, 2013). Furthermore, the principle of triangulation are uphold, meaning different reference points are used to calculate the precise location of an object (Yin, 2013). This is achieved through interviewing different groups of respondents with different views on G4H. Furthermore, additional to the interviews, literature in the form of white papers and articles provided by respondents is used.

4.4.2. RELIABILITY

Internal reliability refers to the agreement among the researchers within the project group (Bryman, 2012). Since only one researcher is involved internal reliability is guaranteed. External reliability relates to the repeatability of a study by someone else (Bryman, 2012). Due to the qualitative nature of the research external reliability can be problematic, since it is impossible to freeze a social setting and the circumstances of an initial study to make it replicable in the sense which the term is usually employed (Bryman, 2008). By striving for theoretical saturation, the accidental appearance of a result is limited. Also, by describing the methods in which the data is collected and analyzed the research is open for repetition.

5. RESULTS

In the following chapter, the results are discussed by section. These sections are represented by the categories, the value network, the implementation of G4H in the Dutch healthcare. Following, these two categories are combined to analyze the hurdles and chances for G4H in the Dutch healthcare sector. The first section, the value network, describes the actors which are present in the network and their perception and contribution to the value of G4H. This section is finished with a table summarizing the value streams through the different actors. Next, the second section describes the implementation of G4H in the Dutch healthcare sector.

5.1. VALUE NETWORK

A value network describes what actors within them value and how they can create and acquire value. Furthermore, a key determinant of the probability of commercial success of an innovative effort is the degree to which it addresses the well-understood needs of known actors within the value network in which an organization is positioned (Christensen & Rosenbloom, 1995). Therefore, an innovation has to be adopted to the existing value network or has to be placed in a newly derived value network. As was said in an interview: *“What makes it a difficult market is, normally you have a game and you produce it directly for the end user, the gamer who wants to play the game. A physician, a care institute and so on, they also have to adopt it.”* Therefore, in the next section, the different actors within the network are discussed. The actors present in the value network are identified by the respondents. This section closes with a table describing the values offered and received by each actor.

5.1.1. THE GAME DEVELOPERS

For the game developers, the same definition is used as the games monitor of 2015, all companies whose core activities include at least one of the following processes in the value chain: the development, production, publication, facilitation and/or electronic distribution of electronic games (Neo observatory, 2015). For this research, the game developers are the disrupting actor, as they provide the disruptive innovation, being G4H. However, as discussion exists on the role of the game developer, supplier of a service or as the producer, for this research the latter is assumed. This decision is made as multiple respondents and literature mentioned that game developers should pursuit this role. The role of a game developer is to develop the game and through game mechanics for instance making a boring exercise more appealing and by doing so heightening compliance and engagement. As respondent 15 said: *“We don’t claim healing, we claim more compliance”*. Also respondent 8: *“We use game elements to make it more fun and more interesting for people. So some things might not feel as a game but we use those elements to make a game attractive and by doing so making sure that the players stay engaged and play long enough to notice an improvement.”*

The game developers are an essential actor within the G4H value network in the sense that the development of a game is an expertise, as they know how to engage people into playing their game. And provide value by heightening the compliance and engagement of the patient to his treatment by the mechanisms captured in the G4H.

The game developers are often small firms with no to little experience with producing for a healthcare purpose. This results in the following: *“What we often see is that game developers focus too much on the disease and the solution and don’t look where the added value lies and who will pay for it. And how does the patient go through a care process and where does the profit lies, the value.”*

Therefore, a game developer can acquire value for his game by including the knowledge. This is done through including other actors in their process. By doing so, the game developer will know the value demanded by the different actors in the network and can anticipate on this. Respondent 7: *“They go out and talk to the target group, to patient, to the clients and to the paying party. That must be done early on, it’s not a technical trick, in the end it is about the user. If you do not do this, in the end you’ll have a product nobody wants, gets, uses or gets paid for.”* Furthermore, the motivation of the game developers can differ from other actors. Where other actors search for an effective way of treating patients, a game developer is motivated to make advanced and interesting games. This can provide a difference in a value provided and demanded. As respondent 12 said: *“For a game developer is it too simple, that doesn’t interest him [...] It has to be advanced however that is not what the target group demands.”* This is a result of a difference in value which a game developer and a target group, being the patient and/or the healthcare professional, depict to a G4H.

5.1.2. THE PATIENTS¹¹

The patients are the actor who has to be cured, cared for, treated and affected by the G4H. This makes the patients, in theory, the most important actor in the value network of G4H, as the patients are the users of the game. G4H can, for instance, offer the patients a more attractive and fun way of otherwise boring and tedious exercises, as can be seen in *Windtales* and *Revalidate*. Furthermore, G4H can educate patients about healthy behaviour and how to deal with their illness, as can be seen in the game *Remission*. Furthermore, G4H can be used as a monitoring tool, with which a healthcare professional can watch the process of a patient from a distance and the patient does not feel pressured, as can be seen in *Moodbot*. Additionally, the playing of a G4H is perceived to be less invasive as the patient needs less physical consults at his physician or in the hospital. These are all examples of the different value’s which G4H can bring to patients. However as the healthcare system is arranged in such an order that there are situations in which other actors are put between the patient and the game developer in terms of distribution. Therefore, meeting the value demanded by the patients is necessary but not always sufficient.

The interference of another actor, such as a healthcare professional, is necessary in some situation as the patient isn’t always able to make the decisions in what healthcare path he should follow. Within the healthcare sector, it is perceived that a patient has to be protected. Therefore, the choice of which product or service to use should be decided by another actor. Respondent 6: *“What makes the clinical environment different is that an external party has to vouch for the patient. The patient himself is not always able to judge if it works.[...] It’s hard that clinical validation is based on statistics, it isn’t always the best way. But you’re in an environment in which you have to protect the patient.”*

However, as shortly mentioned before, even if other actors determine which product or service a patient should use, if the patient chooses not to, the product or service will have no value. Respondent 12: *“I have some nice examples of clients saying I don’t want to, I will not do it. Then an innovation is doomed.”* This makes that the patient is a determining actor in the value network. If the patient chooses not to adopt the G4H, it has no value. Therefore, it is of great importance to make sure the opinion of patients is considered when pursuing a G4H. As can be seen in the eHealth monitor, only 2% of the patients used a game to learn healthier behaviour or to learn to cope with their disease, 14% didn’t but would be willing to use such a game¹² (Nictiz & Nivel, 2015).

¹¹ All games mentioned in this paragraph are described in Appendix 10.2.

¹² See appendix 10.4.1.

Respondent 11: *“If you look at the lower educated population there the need is really high however they are hard to convince and I think gaming and playful elements could help to reach that part of the population.”*. However, as many respondents said the use of smart devices is becoming more and more common. Therefore, almost everyone has access to a device with which the games can be played.

Therefore, the patients are a determining actor in the determination of the value of a G4H. For a patient the G4H can offer independence, knowledge, more compliance and most important a more entertaining way of dealing with his health and/or disease. Furthermore, as came apparent G4H, as an eHealth application, can empower patients and make them a director of their own health. However, many patients are not known with the use of G4H at the moment. And when this groups does not chooses to adopt the G4H it will fail.

5.1.3. THE HEALTHCARE PROFESSIONALS

This group is represented by, for instance the specialists, the physicians and the nurses. The healthcare professionals are in many cases the actor who prescribes the G4H to the patient. This makes the healthcare professionals an important actor in the creation of value for the G4H. As a healthcare professional chooses not to distribute the game, the G4H have to pursue alternative routes to get to the patient. Also in some cases the healthcare professionals are an user of the G4H as well as the game has a back end which he, for instance, can use to monitor the patients process. A G4H can provide the healthcare professionals with a more efficient and effective way to treat his patient. By adopting a G4H in the treatment of a patient the healthcare professionals can in potential monitor the patient through the results of the game and by doing so have a more detailed view in respect to for instance a consult once a month. This can lower the number of consults and can provide the healthcare professionals with more insight in the progress of the patient.

However, the use of G4H can pose some challenges for healthcare professionals. First, the adoption of G4H in potential leads to less consults, however this interferes with the reimbursement system. As healthcare professionals get reimbursed per consult, therefore by proscribing a G4H which in potential can lower the number of consults will mean less income for the healthcare professionals. Additionally, the healthcare professionals still have to dedicate time for the use of G4H. However because (most) games are not imbedded in a DBC¹³ the professionals are not paid to do so. Second, the healthcare professionals are known as a conservative actor towards eHealth innovation, such as G4H (Schippers & Rijn, 2014). The trust of this group in eHealth is often low. *“The culture of this actor is directed on taking over care and the idea that there always should be a healthcare professional physically present. [...] the use of technology is seen as a treat and not a chance in improving care.”* This makes that healthcare professionals see less too no value for G4H as it takes away from the physical consults which they value more. In order for healthcare professionals to value G4H, it should improve the treatment of a patient in an effective and efficient way. It is important that healthcare professionals get convinced of the value G4H offers as respondent 9 said: *“In the end the professionals will determine if it will become part of the DBC, so those are for me the most important players.”*

¹³ DBC: The DBC systematic is a system with which healthcare institution the provided care can register, so that they it can be declared with the healthcare insurance (NZa, 2016b).

As it is now the majority of the healthcare professionals do not see value in G4H, however there are ways in which this can be generated. As can be seen in the field, there are healthcare professionals who take a prominent role in promoting the use of eHealth and G4H, Lucien Engelen¹⁴ and Marlies Schijven¹⁵ for example. Furthermore, as education through serious gaming becomes more and more accepted in the healthcare education¹⁶, respondents utter that the value dedicated to G4H enhances as the future doctors have seen the effects of serious games.

5.1.4. THE HEALTHCARE INSTITUTIONS

The healthcare institutions represent for instance the GGZ's, hospitals and theme institutions like Aids Nederland or the kidney foundation. In many of the cases, the healthcare institutions are the ordering party, meaning often these institutions give an assignment to the game developers to develop a G4H to meet an unmet demand.

Respondent 8: *“There is less budget for contact hours with the healthcare professional and not healthcare insurance companies and – institutions are searching for ways how they can moderate this. Digital measures can be a solution and gaming is one of them.”*. G4H can provide institutions with a more efficient way of treating their patients, and through that be of value to the healthcare institutions. The institutions approach game developers to develop the games as the institutions have the goal to treat and cure patients. Respondent 6: *“It is my logic, a hospital or institution, why should those bring something to the market as it is their task to take care of patients and clients. Or to cure them but not to market it and through doing so making money.”*. The fact that institutions focus on curing and treating patients has the consequence that the institutions will not participate in the implementation of the G4H in the Dutch healthcare system, as this does not fit their goals. However, the manner in which it is arranged now, the institution is the owner of the developed G4H. This is one of the reasons the implementation of the G4H staggers. Furthermore, in the distribution of G4H across institutions some problems seem to occur as independent institutions do not see value in G4H developed for another institution. As respondent 7 said: *“That has the not-invented-here syndrome.[...] There is something that they rather develop it themselves than that they will adopt it from another.”*. As respondent 3 mentioned: *“With this it will stay with that individual healthcare institution that decides I'm going to do something with this (G4H) or not.”* Another hurdle in acquiring value for G4H by the healthcare institutions is the fact that by implementing G4H, they face problems with their own revenue model. As discussed earlier (paragraph 5.1.3.) within the Dutch healthcare system the institutions get paid per consults with a patient. Therefore, by adopting G4H, which in potential can lower the number of consults, the institutions get less reimbursement as G4H is not part of the DBC. Respondent 5: *“The hospital should say with the first consult, go play this game. The problem is hospitals are paid per patient and this game would mean less patients and thereby less income.”*. Lastly, as could be seen earlier also the healthcare institutions still need to be convinced of the added value by the G4H, this trust is not yet reached. In sum, the healthcare institutions do see some added value provided by G4H in the form a more effective and efficient way of treating patients. However validation of these effects are necessary to achieve the value desired by the institutions.

¹⁴ Lucien Engelen is the director and founder of the Radboud Reshape innovation centre and the academy. He experiments with the application of new technologies in healthcare (Radboud Reshape centre, 2016)

¹⁵ Marlies Schijven develops and performs research on valid applications of simulation, serious games and mobile application in healthcare and medical education (University of Amsterdam, 2015).

¹⁶ AbcdeSIM has recently become the first serious game in The Netherlands to be accredited with 5 hours of Continuing Medical Education (CME) credit by a number of medical specialist organizations (VirtualMedSchool, 2016)

5.1.5. THE HEALTHCARE INSURANCES

The healthcare insurance companies are the companies which execute the law made by the government (Windesheim, 2013). Therefore, in order for an innovation to obtain value, it has to fit in the rules and legislation which the health insurance has to follow.

These are the following: *“The G4H have to fit in the care process, it has to be a substitution of normal care. There are certain guidelines to determine the quality of care, is the price in agreement and is the accessibility in agreement. What is seen in games is that most of the times it is an add-on on the care process. [...] We ask ourselves if the game is implemented what of the traditional care can be supplemented and often that is hard [...] Where do the costs lie and how does it substitute the care process.”* Therefore, for a G4H to be of value for a healthcare insurance, it must be effective and efficient, meaning it must be a substitution rather than a add on. In potential, G4H can lower the costs per patient. However, in many cases G4H do not substitute a part of the traditional healthcare and only generates additional effort and costs. This relates to the difference in the value offered by the G4H and the value demanded by the health insurance. In that respect the health insurances can pose a barrier for the implementation of G4H. In order to be adopted by a healthcare insurance company a product or service must be a substitution of the current treatment and not add on to time spend and costs made.

Then respondents were asked for their opinion on the role of the healthcare insurances in the implementation of G4H in the Dutch healthcare many indicate that the healthcare insurances are a large and important player which have a lot of power. As respondent 10 said: *“A health insurance should do it however they are like a bank they do nothing.”*. Respondent 7: *“He (Healthcare insurance) expresses well being in money, because in the end that is what it is about. What it costs the health insurance to supply the care so you must really quantify what you can do with it (G4H).”*. However, despite the conservative stance of health insurances towards G4H, respondents do recognize the role of the insurances as important. When accepted by a health insurance, the G4H can be reimbursed and the insurances can put pressure on healthcare professionals and institutions to use the G4H.

5.1.6. THE RESEARCHERS

The researchers are represented by the universities and knowledge institutes like TNO¹⁷ and the Reshape centre¹⁸. The researchers in the G4H value network are a supplying actor, they provide the service of researching the effectiveness and efficiency of a G4H. As respondent 16 said: *“A researcher but also a knowledge institute is needed to monitor the process and to guard the quality of it.”*. Or respondent 6: *“The scientific corner, the people who in the end have to prove that it works. [...] But in the end you need people who collect evidence that the product works.”* And respondent 8: *“Subject matter experts, so people who really know a lot about a subject and you really need those to make sure that you have the right information to make a game.”*. Therefore, the G4H have no value for researchers per se, however by including researchers in the development and validation of the G4H can acquire value.

¹⁷ TNO connects people and knowledge to create innovations that enhance the competitive strength of firms and improve the well-being of the society (TNO, 2016).

¹⁸Technology is changing possibilities and lowering in costs of it faster than ever, sometimes even exponentially. To cope with these aspects, Radboud UMC launched a program called the REshape Innovation Center. We nurture the movement by setting up conferences to exchange thoughts, visions and listen to each other. But also by doing research on the different aspects of participatory healthcare which helps to move forward (REshape Center, 2016)

5.1.7. THE GOVERNMENT

The government dictates the laws and regulations all actors in the value network have to follow. This is done through the NZa¹⁹, which ensures affordable and quality healthcare for everyone (NZa, 2016a). Furthermore, the minister of VWS sees a lot of potential in the use of technologies, such as G4H, in healthcare. She wrote a letter to the House of Representatives describing potential gains which can be achieved by eHealth in the Dutch healthcare sector (Schippers & Rijn, 2014). As eHealth provides patients with a chance to integrate their healthcare path into their life instead of designing their life around their disease (Schippers & Rijn, 2014). Furthermore, gains can be made in reforming the healthcare system in order to make it more sustainable (Schippers & Rijn, 2014)

However, as the implementation staggers she dictates that steps must be taken in order to help the implementation. *“We put a mark on the horizon and make goals in order to realize this ambition.”*. Furthermore, she said: *“The use of eHealth is no goal on itself, but a measure for the movement toward the endorsement of more self-reliance, self care and self direction.”* Also, as the government is the actor which makes the laws and regulations minister Schippers utters: *“It is on the government to remove the hurdles in the law and regulation.”*. Therefore, the minister of VWS sees eHealth, of which G4H are a part, as an innovation in which one should invest. However, as respondent 14 said: *“The minister of VWS finds eHealth and things related really important however she does not want to invest a lot of money. She sais guys the field has to do it themselves.”* So the willingness is there and the government sees the value which eHealth, and thereby G4H, can provide. However, no real action is taken. A G4H provides value in the sense that it offers a cheaper and easier way of providing care and it fits the trajectory the government follows in reforming the healthcare system.

¹⁹ The Dutch healthcare authority ensure affordable and sufficient healthcare for everyone and dictated the laws and regulations needed. The NZa ensures that healthcare stays affordable, available and of good quality (NZa, 2016a).

5.1.8. VALUE PERCEPTION OF THE DIFFERENT ACTORS

In summary of the above discussed value perceptions of G4H by the different actors, table 5.1 is made. This table describes the different actors, their role in the network, the value they receive and offer. For the two last columns, value received and value offered, the different values can be granted a +, - or +/- in respect to a positive value, negative or both. A value is positive when it adds to the value of G4H, whereas a negative value takes away of the value of G4H. The neutral value means it can go either way. For example, the use of G4H can, in potential, cause a lowering in the number of consults for the healthcare professionals. This has both a negative as a positive effect on the value received by an healthcare professional. It can have a negative effect as less consults results in less income for the professionals as they are paid per consult. However, it can have a positive effect as it allows professionals to focus on those patients who need their attention the most, who cannot be helped by the use of a G4H but require the physical attention of a healthcare professional.

TABLE 5.1 VALUE STREAMS THROUGH THE DIFFERENT ACTORS

Actor	Role in the network	Value received	Value offered
Game developer	Produce the game	+ Knowledge of healthcare actors	+ More compliance and engagement in treatment
Patient	User	+ A more fun and engaging manner of following treatment/therapy + Less invasive because less consults + More insight in own health + Less consults	+ Inclusion of this actor in the development will generate value +/- If this actor decides not to adopt the G4H it is not going to happen
Healthcare professional	User Distributor	+ A more efficient way of providing care to patient + More data therefore more insight in progress of patient + More attention for patient who need it +/- less consults Interferes with income No trust - takes away from physical consults	+ Inclusion of this actor in the development will generate value + Can provide access to the using actors - When rejected by actor can cause problems in implementation
Healthcare institution	Ordering party Financier Distributor	+ A more efficient way of treating patients, less consults per patient + No trust +/- Usable with the already present ICT interferes with income - No value in G4H developed for another institution	+ Can provide access to the using actors
Healthcare insurance	Financier Distributor	+ potentially lowers the cost per patient Often only adds on to costs +/- reimbursement system	+ Can provide access to the using actors +/- High standards
Researcher	Check if effective and efficient	/	+ Inclusion of this actor in the development will generate value
Government	Provide legislation Financier	+ Move towards more self care + More efficient way of treatment	+ Willingness of ministry of VWS to implement eHealth +/- Laws and regulations

5.2. THE IMPLEMENTATION OF G4H IN THE DUTCH HEALTHCARE SECTOR

The implementation of an innovation describes the rate of commercial success of a innovation within the system in which it is embedded. As the attractiveness of a technological opportunity and the degree of difficulty a producer encounters in exploiting it are determined by, among other factors, the firm's position in the relevant value network (Christensen, 1997).

Through the earlier discussed actors, a G4H can acquire value and by having value being implemented in the Dutch healthcare sector. However, the value the G4H offer isn't always the value desired by some actors. This makes a misfit in what actors value and what value is proposed, which results in difficulties in the adoption and implementation of the G4H.

The G4H propose a fun and attractive manner for the patient to engage in his own health. The link between the value offered and the value demanded between the game developer and the patient seems to meet. As patients are used to the game mechanics provided from the entertainment games they already play. Furthermore, the G4H provide a nicer way of engaging in health. However, as discussed above the patient has to be protected and informed about which choices he has to make by the healthcare professionals, -institutions and - insurances. This makes that a G4H has to either adapt or create a value network fitting not only to the user, the patient, but also to the healthcare professionals, the healthcare insurance and the healthcare institutions. Within literature, different routes of implementation for a eHealth innovation are proposed, through the patient, the healthcare professional, the healthcare insurance and the government (Windesheim, 2013). All these routes demand for a different approach as the actors, and their demanded value, differ.

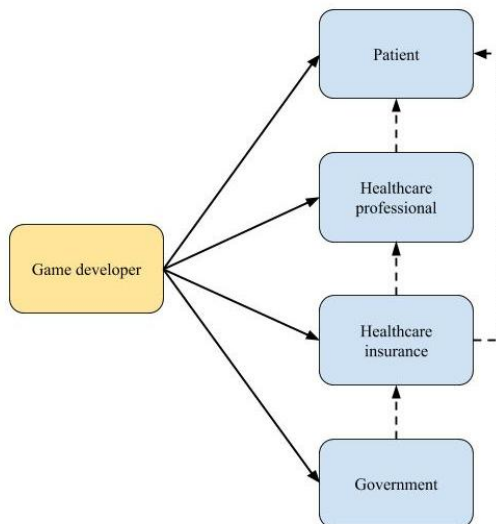


FIGURE 5.1 THE DIFFERENT DISTRIBUTION ROUTES(WINDESHEIM, 2013)

First, the patient route, when pursuing implementation through the patient one must emphasize on making the G4H affordable and it has to assess a recognizable problem for the patient or the caregiver. Therefore, the G4H have to provide a clear value proposition comprehensible for the patient. Second, the healthcare professional route, meaning the healthcare professional are the distributing party and prescribe the G4H to their patients.

As respondent 5 said: “A healthcare professional has to stand behind it on the moment he/she prescribes it to his patient.” In order for this route to be successful, the healthcare professional has to be enthusiastic about the application. Meaning the G4H has to prove its value in the treatment of the patient. This is done by offering a more efficient and effective manner of treating the patient. Third, the healthcare insurance, however to be considered for this route the G4H must have enough support of all actors involved. Furthermore, the G4H have to fulfil all criteria as proposed in the laws and regulations which the healthcare insurance has to follow. In order to apply for this route, a G4H must follow the laws and regulation and therefore be effective and efficient. The fourth and last route, is that through the government, this route applies for applications which offer new healthcare, which is not offered and reimbursed. For instance as it alters the nature or function of the care, or as it offers care which was previously not possible. This route involves the NZa as a new care performance has to be filled. The help of experts is necessary in order to arrive at a scientific correct evaluation of the application. Support of the healthcare professionals is crucial as they have to form a verdict on the safety of the new application (Windesheim, 2013).

These different routes originate from the fact that the different actors demand for different values of G4H. Whereas, the patients value the fun and engaging manner of following their treatment. This is not valued as such by the healthcare professionals. As they search for a more efficient and effective manner of treating their patients. And as the healthcare professionals are a crucial actor in the health care sector, to be implemented in the healthcare sector the G4H have to prove to be more efficient and effective as the current manner of treatment. Meaning, a product or service has to prove it works, being effective, that it does it in a cost effective way, being efficient. However, the demand for validation provides issues for G4H (Neo observatory, 2015). As respondent 7 said: “*Clinical validation is that the parties in the end, the medical parties are convinced that it works, that it is effective, that it is efficient and that it is expedient. [...] What you see is that there are really heavy norms for relatively light products.[...] I think there should be a way to look at what a product has to do and look at the risks and how do those relate.*”.

This originates in the fact, that the actors in the healthcare field are used to a more quantifiable value propositions, meaning the use of product X increases the rate of improvement by Y %. This does not fit the characteristics of G4H, as they provide a more qualitative proposition of value, by using this game the patient will be more inclined to follow the treatment and by doing so achieving better results. As respondent 2 said: “*For instance with Windtales, children get the same results as with other treatments however because they find it more fun they will practice more or endure it longer. That are important characteristics however these are not the outcome measures of a RCT. The finale grade is the lung capacity and with how much percent that is improved. The manner in which that is achieved is not important and especially for eHealth the attention for this should be included. But there has to be measures for that to make it quantifiable.*”.

This relates to the validation standard within the Dutch healthcare sector, being the RCT. This method of validating is costly and lengthy and does not fit the characteristics of G4H, meaning a G4H will be outdated or the developer runs out of funds before the RTC is finished. However, a shift is noticeable, as many respondents said the inclusion of the healthcare field, the healthcare professionals, the healthcare insurance and the – institutions, within the development process of the game will create value for the game. As the healthcare field than can see the mechanisms and level on which the G4H work and they are able to interact with the game.

However, despite the inclusion of these parties in the development the inclusion of a research actor is crucial in order to obtain value for a G4H in the Dutch healthcare system. As they contribute to the understanding of the workings of the game and therefore provide insights in the effectiveness and efficiency.

Next to validating the effectiveness of the G4H, the game has to prove it is efficient as well meaning the game must be cost effective. The Dutch reimbursement system demands that a new product or service has to fit the current healthcare path in such a way, that it does not add on to the cost already made. However, the costs made for the treatment of the patient potentially move from one healthcare actor to another, saving one actor money but in the process adding to the costs of another. As the implementation of a G4H can transform the care for a patient, from a specialist in a hospital to a family doctor. However, these are reimbursed from a different fund. Furthermore, as G4H do not fit in the current DBC as it is, the use of G4H is not reimbursable. Meaning, when using a G4H in potential the number of consults per patient decline, however the professionals and institutions are reimbursed for these physical consult. Furthermore, they have to monitor the progress of the patient in the game however the time spend doing so is not reimbursed. So as it is now, the implementation of G4H only adds on to the costs as they do not fit in the current reimbursement system. Therefore, they only add on to the cost already made and by doing so are not efficient.

Through a G4H, more data can be collected and at more moments in time, through this additional data a more extensive image of the patients' health can be made. By acquiring this data, the patient but also the healthcare field will have more insight in how a patient is doing. As the Dutch healthcare system is designed now, you, for instance, go to a cardiologist for your checkups as you suffer from arrhythmia²⁰. The cardiologist prescribes you a game which you can play, which provides exercises and monitors the heart while playing. The data derived from this game is monitored by the cardiologist. When the patient has good results regarding his arrhythmia, he does not have to go to the check up as the cardiologist already knows the patient is doing well. Additionally, when the arrhythmia of the patient seems to get worse the cardiologist can be able to spot this earlier and can then call in the patient for a check up. Therefore, a G4H provides an opportunity of closer monitoring and anticipating on a patients' progress. However, as mentioned by the respondents and the eHealth monitor the healthcare professionals value the physical consults with the patients, as this is their culture. The proposition of closer monitoring and consults when needed, and in most cases less consults, is valuable for the patient. As, by adopting the G4H, the patient is less confronted with his disease as the game provides a manner in which the patient only needs to go to his physician when needed while his progress is being monitored.

In sum, the G4H provide a value however due to the system which is currently in place the value provided cannot be recognized, as it provides a different kind of value. Respondent 17: *“The system as it is now is quite hard and the innovation is not so much in the technology but more in the system. As long as we keep saying that is just the system than nothing will change.”* As the value network is now, it seems a vicious circle in which the value proposed by de game developers in their G4H does not fit the value required by the healthcare field. However, the adoption of G4H, as a part of eHealth, has potential value for the Dutch healthcare sector.

²⁰ An arrhythmia is a problem with the rate or rhythm of your heartbeat. It means that your heart beats too quickly, too slowly, or with an irregular pattern (MedlinePlus, 2016).

Therefore, all actors in the value network together should try to find a consensus and break out of the vicious circle in which they operate now. As respondent 12 said: *“All stakeholders have infiltrating and contrasting interests. That is not linear and then you get to the ecosystem. If everyone in the ecosystem can move one position that might be enough but can they do that? Can they move and can they transform?”*

6. ANALYSIS

In this chapter, the results are linked to the theory in order to arrive at insights about the value network of an innovation, such a G4H, in the healthcare sector. Furthermore, the results are analyzed further in order to take steps towards an answer on the research question

By implementing G4H, and eHealth, the focus in the healthcare sector shifts from systems to patient. Meaning the patient will get a more prominent role in his own healthcare path. This is done through empowering the patient and making him take more control. However, this shift demands a change in the positions some actors have within the healthcare sector. The healthcare professional and the healthcare institutions positions change in the regard that they act from the background whereas now they are a prominent actor in the treatment of a patient. Furthermore, through the use of G4H, and eHealth, more data can be collected at more points in time which can lead to additional insights in the progress of a patient. By providing the healthcare sector with a way in which patients can be monitored from a distance, it can focus on the patients who do need physical consults. Therefore, it would mean a shift towards a more efficient system, in which the healthcare professionals and – institutions can focus on the most demanding patients. Furthermore, G4H offer more compliance which could heighten the effectiveness of the treatment of patient. By implementing G4H, and eHealth, the healthcare sector could potentially treat patients in a more efficient and effective manner. Therefore, G4H, and eHealth have a lot to offer, however this is not (yet) recognized in the healthcare sector as it is not yet implemented and being used.

The healthcare sector is a difficult sector for innovation, such as G4H, as there are many hurdles. These hurdles stem from the fact that the sector is a tightly knit system in which every component enhances the next. Resulting in the vicious circle in which the implementation of G4H is stuck at the moment. Next to these hurdles, there are also chances as G4H, as a disruptive innovation proposes a simpler, more convenient and less costly product. Following, in every case described by Christensen, the disruption left consumers far better off than they had been. This combined with the need for change in the healthcare sector provides a chance for G4H and eHealth applications.

The hurdles which are identified are the following. In order for G4H to be implemented a change in the roles and positions of the actors involved in the network is needed. And as the actors present in the network determine the value a G4H can acquire and through doing so, implementing G4H. It is important to acknowledge these actors, as the value network is a nested commercial system in which actors have fitted their capabilities, structures and cultures to fit the network's distinctive requirements. The incumbents in the system try to sustain the track their currently in. And therefore are reluctant to adopt the (disruptive) innovation as this changes their position in the value network. This is reflected in the data as following, the implementation of G4H changes the role of the patient by empowering the patient to control and direct his own healthcare path. Therefore, the role of the healthcare professionals and institutions changes. They fulfil a more monitoring role from the background. As can be seen now the professionals, - institutions and insurances, are reluctant to change and sticks to their way of doing thing. This group of actors act as sustaining actors in the sense that they persists in keeping the current network in which they operate in place.

However, despite the changing role of the healthcare professionals and – institutions, they remain important actors within the system. This due to the fact that the patient cannot decide entirely independently on his own healthcare path.

As he does not have sufficient knowledge in order to take such decisions unadvised. Therefore, the healthcare professional and - institutes therefore decide which treatment method is used. This method of distributing a product or service makes that the G4H have to meet both the value demanded by the patient, as well as the, for that game, relevant actors in the healthcare sector.

Next, validation is needed to win the trust of the healthcare professionals and – institutions. As they don't provide their patients with a product in which they don't believe to benefit their patient. And as both actors can push and stimulate the implementation, and acquiring of value by prescribing the game, it is important to gain their trust. The norm in validation is the RCT, however as can be seen in the interviews and literature this method of validation seems not to fit the characteristics of G4H. As a RCT measures the percentage in which the treatment improves the situation of the patient. However, G4H offer more compliance, this is not measured through a RCT. Also it is a lengthy and costly process which most game developers don't want to engage in. Therefore, the current validation norm measures a different value as proposed by the G4H. This originates from the fact that healthcare professionals search for a different value proposition as which is offered by the G4H. Therefore, the value G4H offer is not recognized within the current value network. This fits the disruptive innovation theory as a disruptive innovation offers a new customer value. However, validation is necessary and must be upheld in order to protect the patient for non-science. Therefore, alternative methods have to be used to validate the G4H. These alternative methods have to be designed to fit both the demands of the healthcare sector as well as the proposition of the G4H. Meaning the G4H have to be effective and efficient, however the manner in which this is tested has to fit the characteristics of G4H, and eHealth. Being the compliance they offer and the additional data that can be collected at more points in time, providing more insight in the process a patient makes. This relates to the difference in the proposed value, the new validation methods has to encompass and test this alternative proposed value.

Following, due to the problems encountered in the validation of the G4H, the healthcare sector does not acknowledge the potential value a G4H can offer. Therefore, it will not be implementable in the sector as validation is necessary in order to be accepted in the DBC and through that being reimbursed. When the G4H are not reimbursable, it only adds on to the costs and the time spend per patient²¹, meaning the G4H only add to the currently used treatment methods instead of replacing it. Therefore, when implementing an innovation, such as G4H, in the healthcare sector one must consider the need for validation. As this need is embedded within the value network and acts as a mechanism through which an product or service can acquire value. This is reflected in the fact that the demand for validation acts as a threshold for the innovation to be truly accepted and implemented within the sector. However, the manner in which validation is currently achieved, poses a hurdle in the sense that the value proposition made by G4H is not measured as such by the currently used methods. However the validation mechanism is necessary as it provides the needed proof of effectiveness and efficiency.

Important to note is, these hurdles are designed to protect the patient from getting worse by using a treatment. Moreover, the health of an individual is complex and a patient is not able to independently organize his own healthcare path. Therefore, it is important for game developers to realize they have to provide a game which offers the patient an effective treatment from which they get better and not worse. Furthermore, the involvement of healthcare professionals and –institutions is necessary to aid the patient in his healthcare path.

²¹ As the healthcare professional or – institution will not get paid as there is no consult however he will have to put in time to monitor the results gathered from the G4H.

In order to deliver the quality and effectiveness demanded the game developer has to consult actors from the healthcare field in order to provide a G4H which is implementable and can acquire value in the healthcare sector.

The chances in the value network of G4H are the following. First, the government sees a lot of value in the use of eHealth applications in order to reform the Dutch healthcare sector. As these applications provide a way to rearrange the healthcare system into a affordable and feasible system. Second, in potential, the application of G4H can provide additional data through which a much more detailed representation of the health of a patient can be obtained. Furthermore, the different actors within the value network are already familiar with gaming. As the use of games serious applications is growing, such as the education of healthcare professionals. Therefore, the healthcare professionals are becoming more used to the use of games and are familiar with what games can do. Also the patients are already familiar with playing games.

In sum, when analyzing the value network of an innovation such as G4H implemented in the healthcare sector one has to account for the following. The value network consists of multiple actors which need to be taking into account when considering the value proposition which the innovation will make. As these actors, the patients as well as the healthcare professionals and – institutions, pose a deciding factor in whether or not such an innovation becomes successful. Furthermore, within the Dutch healthcare sector for a product or service to be implemented, it has to validate its effectiveness and efficiency. The sector is arranged in such a manner that in order to acquire value the innovation must validate its effect. Next, as came apparent in literature and from the collected data, the healthcare sector fits the profile of a sector ready to be disrupted. As the sector keeps proceeding in a sustaining manner and by doing so becoming unaffordable and unfeasible manner. Furthermore, the sector is a tight knit system in which every component strengthens and links back to another component. By continuously following this road, the demands of the lower demanding patients are surpassed in such way that the current therapies are more complex and costly than needed. Meanwhile, the implementation of G4H, as part of eHealth, can easily provide value for these lower demanding patients. As G4H, and eHealth, provide applications which can be used to treat those patient which can easily be treated with the game instead of the regular treatment. The G4H, and other eHealth applications, offer the possibility for patients to engage in their own healthcare path and by doing so lowering the number of needed consults. Therefore, G4H, and other eHealth applications, supply an easier, cheaper, and more fitting manner to deal with that part of their treatment they can perform themselves with the help of the application.

As came apparent from this research, in order for G4H to acquire value in the Dutch healthcare sector, a disruption has to occur in the position of all the actors within the value network. First, the patient has to take more control in his own health, this demands a higher involvement. However, G4H anticipate on this by focusing on compliance. Second, the healthcare professionals have to adapt to the fact that their position is changing. They have to adopt a more monitoring role from the background. Second, the healthcare insurances have to embrace G4H as it saves costs. They could take a more prominent role in implementing and promoting the G4H, and eHealth, not necessarily as reimbursable care but since this actor has the power and ability to put pressure on the patients as well as the healthcare professionals to implement G4H. Third, the government, represented by the ministry of VWS, promotes eHealth however no real measures are taken. A more active approach would benefit the adoption of G4H as the government can provide pressure to other actors to adopt the G4H.

Next, the healthcare institutions have to be more open for more generic games, meaning the institutions have to move away from the thought that a game developed for another would not work for them. Last, validation methods have to be adapted to the invasiveness of the product or service, in order for this to work all actors must accept and adopt the new methods.

7. CONCLUSION

As the Dutch healthcare sector faces many challenges in the years to come, solutions have to be brought up in order to stay able to provide the Dutch population of healthcare. One of the possible solutions is eHealth, which is the use of modern information and communication technologies in order to meet the needs of consumers, patients, healthcare professionals, healthcare providers and policy makers (Dumay, 2007; Nictiz & Nivel, 2015). From different perspectives eHealth is seen to have the potential to be of great importance for the reformation of the Dutch healthcare sector (Nictiz & Nivel, 2015). For this research, a case is used being G4H, these games contribute to the health system by educating and informing the patient, triggering behavioural change, providing a new way of therapy and providing training and education for personnel (Ferguson, 2012; RANJ, 2015). However, to be implemented in the Dutch healthcare sector, the G4H have to be effective and this effectiveness has to be validated. Without being validated a G4H has no value and therefore is not adopted by the actors in the Dutch healthcare system. In order to analyze the G4H sector, the disruptive innovation theory by Christensen is used. A disruptive innovation is defined as a product or service which fits a new or emerging market segment that is not being served by existing incumbents in the industry (Christensen, 1997). G4H are a disruptive innovation in the sense that it provides a product or service which serves consumers/patients in a different manner as the current products or services do. The disruptive innovation theory describes 3 elements which affect the disruptiveness of the innovation, these are technology, business model and the value network. The emphasis lies with the value network. The value network being the context that defines and delimits what companies within them can and cannot do (Chesbrough & Rosenbloom, 2002; Christensen, 2006). This led to the following research question:

“What are the hurdles and chances in the current value network for games for health in the Dutch healthcare system?”

A qualitative research design is used to gather data in the form of interviews with different actors within the network surrounding a G4H. This led to the following insights which provide an answer to the research question.

The first and most prominent hurdle is the fact that G4H have trouble to acquire value through the current value network. This is represented in the fact that the implementation staggers. First, this is caused as G4H propose a value which differs from the value proposed by traditional therapies. Therefore, the value proposed by G4H is not recognized, this represents itself in the fact that healthcare actors are reluctant in adopting G4H as a treatment option for their patients. Furthermore, the mismatch in value proposition is reflected in the difficulties in the validation of G4H, as the norm being RCT, does not measure the level of value which G4H offer. Next, as G4H ‘value proposition is not recognized in the current value network, it is not included in the reimbursement system. Which makes that the adoption of G4H leads to a rise in costs made per patient. Another hurdles is the fact that the implementation of G4H alters the positions of many actors within the healthcare sector. As G4H allow patients to take a more prominent role in their own health and by doing so place the healthcare professionals more to the background. This would seem like a chance, would it not that the actors within the healthcare sector act conservative towards this shift in position and act reluctant towards this shift.

The chances for G4H are the following. First, G4H as a part of eHealth gets a lot of attention from the ministry of VWS as minister Schippers sees eHealth as an opportunity to rearrange the healthcare sector and by doing so putting the patient in the centre of his own care.

And by doing so generating more patient empowerment and a move to more self care. This provides a chance for G4H as these are dedicated to providing the patient/user with an ability to engage in their own health more. By allowing the patient to engage more in his own health the number of consults can potentially lowered. Which provides the healthcare professionals to dedicate their time to those patient who do need the physical consults. And by lowering the number of consults the patient is enabled to live his life instead of arranging his life around his disease. Furthermore, a chance lies with the fact that people become more and more familiar with gaming and smart devices. Last, the validation through a RCT of the plan-it commander game can be the push that the sector needs. As this game gets picked up by the healthcare sector and the patients, it can potentially generate the trust currently missing.

As it is presented, the stagnation of the implementation of G4H seems a vicious circle in which everyone points to each other to make the first move. This is portrait in the reimbursement system, the validation system and the lack of trust in G4H by the actors in the healthcare sector.

8. DISCUSSION

This chapter discusses the limitations of this research. Furthermore, the theoretical and policy implications are given.

First, the limitations of the research, these are measured through the validity and the reliability of the research. The valid study as explained earlier, is one that has properly collected and interpreted its data, so that the conclusions accurately reflect and represent the real world (or laboratory) that was studied (Bryman, 2008). Through the measures, triangulation and letting the respondents check the transcripts, taken the validity of the piece is upheld. Next, the reliability of the research is as it is a qualitative research debatable as it is impossible to freeze social settings however by reaching theoretical saturation the accidental appearance of the results is limited. Furthermore, it is impossible to look into the future, the disruptive innovation theory does fits the case of G4H, however whether or not it is disruptive can only be determined in hind sight. All respondents are asked whether they would classify G4H, as part of eHealth, as a disruptive innovation. Most agreed that this is the case. Therefore, it can be assumed the right choice is made in using the disruptive innovation theory by Christensen (1997). However, it would be interesting to perform a similar research in the future to see whether and in what way G4H, and eHealth disrupted the current value network. Furthermore, the game developer is portrayed as the distributing actor however this is not always the case and can therefore be debated. However, for this research the choice was made to only look at the value network, whereas the role which the game developer takes is more fitted in an analysis of the business model. Therefore, it was assumed that the game developer would act as the distributor of G4H. It would be interesting in the future to perform a complete analysis, including the value network, the business model and the state of the technology. As the inaudibility about the distributor of G4H poses its own problems for the implementation of G4H. Next, in future research it would be interesting to apply the findings of this research onto another application of eHealth. By doing so testing if the findings hold up in other cases and are not only to be found in G4H.

Second, as discussed in the introduction a theoretical relevance is served in contributing on the knowledge on innovation in the healthcare sector. Furthermore, a contribution is made in the further understanding and use of the concept of the value network. The following implication are made. First, when considering a value proposition one must consider the value demanded by patients, as well as the healthcare professionals and – institutions, as they all pose a deciding factor in whether or not such an innovation becomes successful. Second, the sector is arranged in such a manner that in order to acquire value the innovation must validate its effectiveness and efficiency. Next, the Dutch healthcare sector is ready to be disrupted as it presents a tight knit network of actors which enhance each other to pursue in a sustaining manner. By keeping on this track, the healthcare sector becomes unfeasible in the future and surpasses a majority of the patients in their demanded level of care. Therefore, the application of the disruptive innovation theory by Christensen (1997&2009) on innovation in healthcare is believed to provide useful insights. The last implication is related to the fact that the healthcare sector is pursuing in such a sustaining trajectory. Namely, the value which is proposed by eHealth application, such as G4H, is not recognized in the current value network in which they are positioned. Therefore, in order for eHealth application to be successful they should either adapt the current value network or disrupt into a new network. During this process considering the previously mentioned implications.

Last, the policy/ managerial implications, as already discussed in the results, all actors must adapt or change their ways in order to make the implementation of G4H, and eHealth possible. The patient has to take more control and take the lead in his own health. The healthcare professional should accept their changing role and should embrace the changes and add to the development in order to choose the best applications. Next, healthcare insurances should use their power and position to promote the G4H, and eHealth, applications. By adapting these applications the cost per patient can be lowered and therefore the total cost of healthcare can be brought down. Following, the government, as well as the healthcare insurances, should use their power in helping and promoting G4H, and eHealth, applications. As the implementation of G4H, and eHealth applications has the potential to cause a shift towards a more efficient and sustainable healthcare system. The healthcare institutions should be more open for generic G4H, and eHealth, applications as this will save the cost of reinventing the wheel every time an institution shows interest in a G4H, and eHealth application. By doing so costs can be saved.

Furthermore, by implementing and adopting G4H, and eHealth applications the institution can treat their patient more efficiently, by letting the patient who can manage them self do it themselves and by doing so the institution will have more time for the patients which require face-to-face care. Last, validation methods must be adapted to the invasiveness of the product or service, in order for this to work all actors must accept and adopt the new methods.

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10. APPENDIX

10.1. INTERVIEW GUIDE

- Begin met een korte introductie van het onderzoek:
- De inhoud van dit onderzoek wordt vertrouwelijk behandeld, de naam van de geïnterviewde en het bedrijf worden anoniem gemaakt.
- Duur: +/- 60 minuten
- Indien toegestaan wordt het interview opgenomen om later uitgeschreven te worden.
- Het interview behandelt drie hoofdthema's welke een hoofdvraag behandelen. Eventuele deelvragen kunnen behandeld worden om eventueel bij te sturen.

“What is the current value network for games for health and where do the chances and barriers lie for the implementation of G4H in the Dutch healthcare sector?”

Algemene vragen

Q1: Wat is uw positie in de G4H sector?

Q2: Wat is uw ervaring met/in de G4H sector?

Ecosysteem

Q: Kunt u uit wijden over het ecosysteem van G4H?

- Wat zijn de actoren en instituties die actief zijn binnen het ecosysteem en hoe verhouden zij zich aan elkaar?
- Wat zijn de barrières en kansen in dit systeem?
- In hoeverre verschilt dit ecosysteem met dat van medtech/farma ect.?

Validatie

Q: Hoe moet er, naar uw mening, omgegaan moeten worden met de vraag om validatie, dus het bewijzen van gemaakte claims?

- Zou validatie bereikt moeten worden door huidige methode, randomized trails, of zijn er andere mogelijkheden?
- Hoe zou de G4H sector, volgens u, moeten voldoen aan de vraag om validatie van de gemaakte claims?
- Zou het huidige systeem gevolgd moeten worden of zijn er ook andere manieren?

Implementatie

Q : Kunt u wat verder uitweiden over uw visie op de implementatie van G4H in de Nederlandse gezondheidszorg?

- Hoe zou dit zich vorm geven?
- Zijn er barrières die opgelost zouden moeten worden?
- Zijn er op dit moment omstandigheden die de implementatie juist zullen makkelijker maken?
- Welk segment van de gezondheidszorg zou de G4H sector zich op moeten richten?
- Welke acties zouden ondernomen kunnen worden?

Disruptieve innovatie

Q: Zou u G4H classificeren als een disruptieve innovatie, waarom wel/niet?

- Kunt u uitweiden over wat ze dan “disrupten”?
- Hoe vind deze disruptie plaats?

Q: Zijn er nog onderwerpen die niet behandeld zijn maar die naar uw mening wel van belang zijn voor G4H?

10.2. EXAMPLES OF GAMES AND PLATFORMS

10.2.1. WINDTALES

“Wind tales” is a game developed for CF patients (Vici medical, 2015a). By blowing in a specially developed device a character is moved through a fantasy world (on for instance an iPad). The game enable the physician to observe the patient through a dashboard, which for instance monitors the lung function of the patient over a period of time (Vici medical, 2015b). The physician can alter the difficulty of the game to meet the demanded level of exercise of the patient (Vici medical, 2015a)

10.2.2. LUCHTBRUG

This is a online asthma clinic, which consists of a general accessible information module where information can be found about asthma and the treatment. Furthermore, there is a shielded private module. Within this module the personal treatment plan of the child is visible and the possibility exists where the kid and parents can directly and through a secure connection can communicate with the treatment team (Slingeland ziekenhuis, 2015)

10.2.3. REMISSION

Re-Mission 2 games help kids and young adults with cancer take on the fight of their lives. Based on scientific research, the games provide cancer support by giving players a sense of power and control and encouraging treatment adherence. Each game puts players inside the human body to fight cancer with an arsenal of weapons and super-powers, like chemotherapy, antibiotics and the body’s natural defences. The game play parallels real-world strategies used to successfully destroy cancer and win (Remission, 2016)

10.2.4. MINDDISTRICT

Minddistrict consist of the largest and most extensive offering of qualitative high quality online treatment modules for all layers within the mental healthcare (Minddistrict, 2016)

10.2.5. QULI

With Quli clients can share and manage their care needs and healthcare providers can easily follow them and provide help. Patients and clients will become more independent, professionals will interact when needed and people who need extra attention get this. In this manner the costs are kept under control and by providing care in a smarter way the quality and effectively is bigger (Quli, 2016).

10.2.6. REVALIDATE

This is a CE-marked and clinical validates app which is linked to the electronically patient file. Patients can revalidate using the game. It makes it possible to design the validation track for a large group of patients on a fun, valide and effective manner (Medisch contact, 2014).

10.2.7. TOVERTAFEL

Active Cues, founded by researchers and applied studio Monobanda Digital, developed ‘ToverTafel’ (MagicTable), which helps Alzheimer’s patients. ToverTafel has been developed as new IP from the start and is being sold as a product. They are now broadening their market to include the mentally disabled and patients with autism.(Neo observatory, 2015)

10.2.8. MOODBOT

This game provides a online environment for patients who receive mental healthcare(IPPO, 2015a). It motivates patients to become more active, and gives caretakers a guiding role (IPPO, 2015b). It also offers a patient a playful environment to interact, socialize and share their feelings without the need to 'talk' about it (IPPO, 2015b). The care professional gets real-time, one-glance monitoring and an overview of the collected data(IPPO, 2015b).

10.3. FIGURES AND DIAGRAM'S FROM THE GAME MONITOR 2015

10.3.1. GOALS AND EXPECTED GROWTH OF APPLIED GAMES

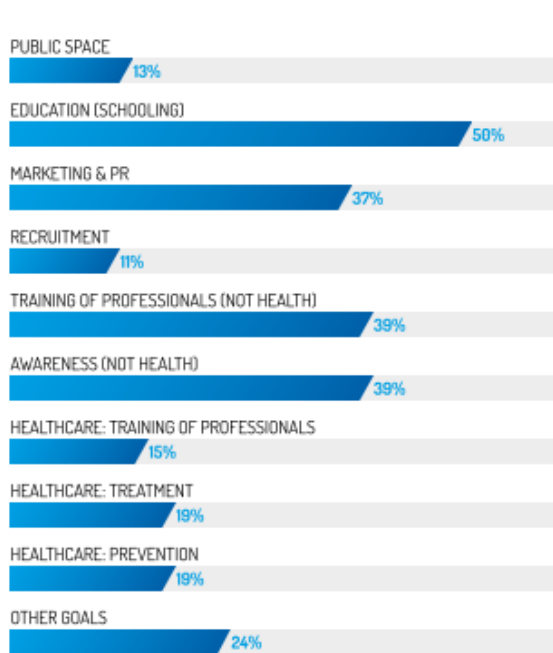


Figure 2.3: Goals of applied games

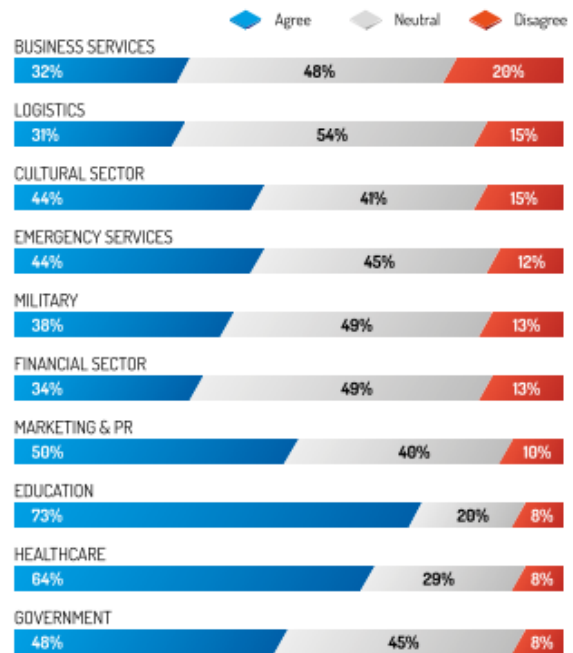
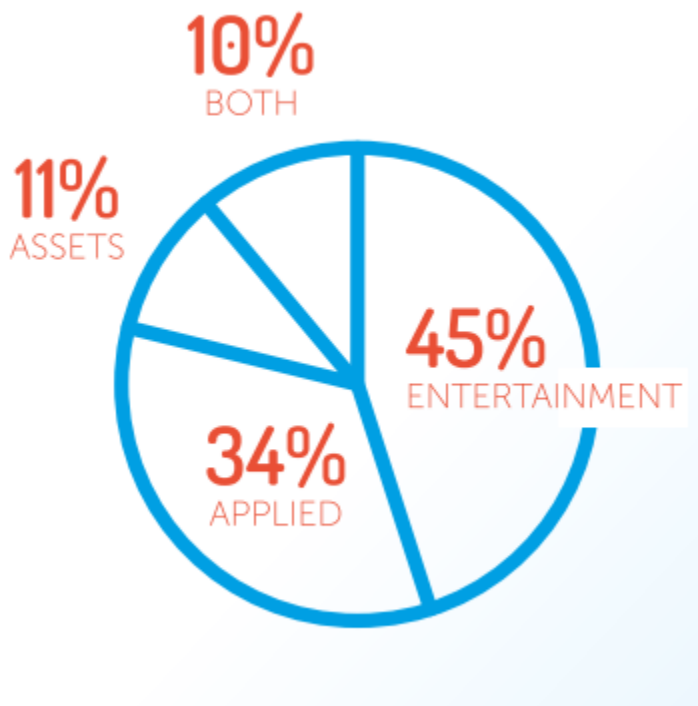


Figure 2.4: Expected growth in applied game markets

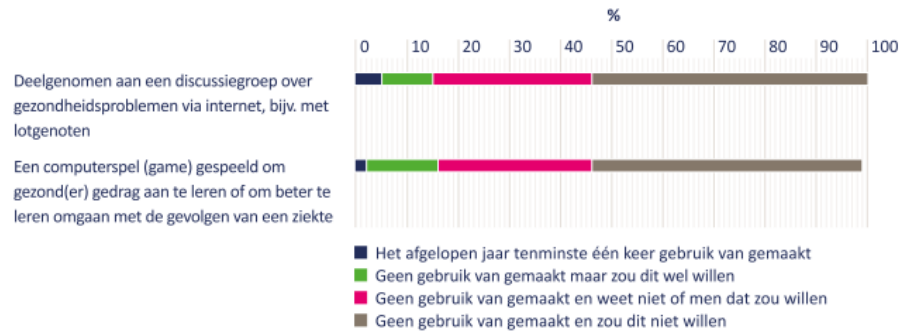
10.3.2. PIE DIAGRAM OF THE DUTCH GAME INDUSTRY



10.4. FIGURES AND DIAGRAM'S FROM THE EHEALTH MONITOR 2015

10.4.1. PERCENTAGE OF CARE USERS WHO HAVE PLAYED GAMES FOR THEIR HEALTH

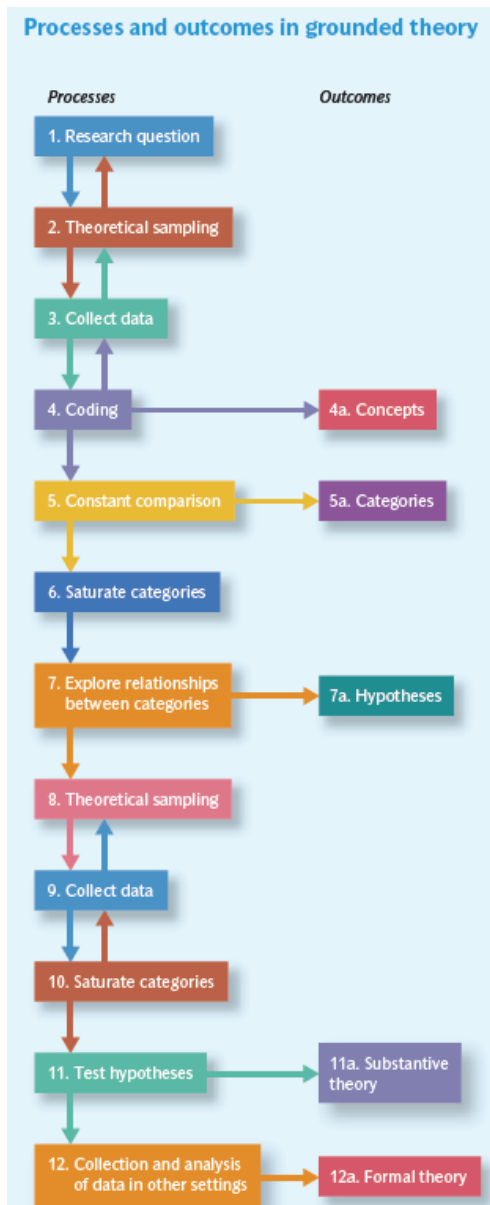
*Figuur 6-3
Percentage zorggebruikers dat in het afgelopen jaar via internet heeft deelgenomen aan een discussiegroep of een computerspel (game) gespeeld heeft voor de gezondheid (n=682-685).*



10.5. CODING SCHEME

- Disruptive innovation
- Value network
 - Actor or institution
 - Patient
 - Medical professional
 - Health insurance
 - Game developer
 - Researcher
 - Funding
 - Care facility
 - Government
 - Pharmaceuticals
 - Branch organisation
- Implementation
 - Reimbursement system
 - Barrier
 - Opportunity
 - Added value
 - Kind of care
 - Preventive
 - Cure & care
 - Intellectual property
 - Validation
 - Efficiency
 - Effectiveness
 - Problem
 - Solution
 - Methods

10.6. GROUNDED THEORY STEPS (BRYMAN, 2008, P. 571)



10.7. LANDSCAPE (Windesheim, 2013)

