Strategic Reorientation of Incumbents in the Healthcare Regime

Structural change towards use of eHealth in Dutch hospitals

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ABSTRACT

Major healthcare challenges, like a rise in prevalence of chronic diseases and growing healthcare costs, rapidly emerge and put pressure on the sustainability of the current Dutch healthcare regime. Radical eHealth innovations are believed to substantially contribute to healthcare reform addressing these challenges. These innovations can only lead to positive healthcare outcomes when they are actually being used after being implemented. Over the past years, however, the regime seemed locked-in since pilots have remained pilots and structural change within the Dutch healthcare regime towards using radical innovations like eHealth has been slow. Regime destabilisation is required for the introduction and use of radical innovations, like eHealth, in a socio-technical regime. Incumbents are considered to play a major role in (de)stabilisation of a regime, therefore this research specifically focused on incumbents inside the healthcare regime towards eHealth use. Incumbents need to strategically reorient – adapting the organisational strategic focus – in order to include usage of a new radical innovation in the organisation, which takes time. This makes strategic reorientation a relevant concept to consider with regard to regime destabilisation. Cognitive change and dynamic capabilities are believed to play an important role in strategic reorientation of incumbents. The aim of this research therefore was to study in what way cognitive change and dynamic capabilities influence strategic reorientation of incumbents towards use of eHealth in the Dutch healthcare regime. This is done through a multiple case study of nine hospitals, which represented the incumbents in the Dutch healthcare regime. The nine hospitals are divided over three stages, which indicates the degree of experience with eHealth use over time. This research focused on eHealth innovations that enable digital communication and exchange of medical data between patients and healthcare professionals used by Dutch hospitals in diagnosis, therapy, and care with regard to chronic respiratory diseases and/or chronic heart failure. In order to explore and to get in-depth insight in underlying processes of cognitive change, dynamic capabilities, and strategic reorientation of incumbents in the context of the socio-technical healthcare regime a qualitative research design is used. The research design is inspired by an inductive approach, due to the limited knowledge available on healthcare organisations' motivations to use eHealth. The results showed positive and negative influence of cognitive change and dynamic capabilities through strategic reorientation on eHealth use. In addition, the analyses revealed a positive and negative influence of cognitive change and dynamic capabilities directly on eHealth use in incumbents, without strategic reorientation coming into play. Furthermore, the findings suggest that the context of the socio-technical healthcare regime can positively and negatively influence incumbent's internal organisational processes for eHealth use. Main findings regarding the concepts and their relationships influencing eHealth use in incumbents has led to five societal implications, which advise how to stimulate eHealth use in the healthcare regime. (i) Focus should be on solving existing problems experienced by healthcare professionals, (ii) an innovative culture should be realised in the organisation, (iii) seeing eHealth being put in practice triggers to start to belief in this innovation, (iv) sharin is caring, and (v) resources should be reconfigured to create room for eHealth use in the organisation. Furthermore, extensions and refinements of existing literature are proposed, like adding business dynamics to the multi-level perspective and translating the socio-technical regime to the healthcare context.

LIST OF ABBREVIATIONS

CC	Cognitive change
CHM	Collaborative Health Management system (in Dutch: Keten Informatie Systeem)
COPD	Chronic obstructive pulmonary disease
CRDs	Chronic respiratory diseases
CTCEH	Collaborating Top Clinical Educational Hospital (in Dutch: Samenwerkende Topklinische opleidingsZiekenhuizen)
D2P	Doctor to patient communication
DCs	Dynamic capabilities
DHA	Dutch Hospital Association
DTC	Diagnosis-therapy-combination (in Dutch: diagnose behandel combinatie)
ECG	Electrocardiography
EHR	Electronic Health Record (in Dutch: Elektronisch Patiënten Dossier)
GP	General practitioner
HF	Chronic heart failure
HIS	Hospital Information System
ICD	Implantable cardioverter-defibrillator
ICT	Information and communication technology
MLP	multi-level perspective
P2D	Patient to doctor communication
PACD	Patient association for cardiovascular disease
SR	Strategic reorientation
UMC	University Medical Center
VWS	The Dutch Ministry of Health

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1 Introduction

According to the yearly Euro Health Consumer Index survey, the Dutch healthcare system has been offering the best healthcare in Europe since 2010 (Björnberg, 2015). However, major healthcare challenges rapidly emerge and put pressure on the sustainability of the current healthcare system. Demographic changes lead to an increasingly ageing population and rise in prevalence of chronic diseases. An increase of 17% in prevalence of chronic diseases was visible in the Netherlands in the past decade (RIVM, 2014). Approximately 33% (5,3 million) of the Dutch population has one or multiple chronic diseases (Gijsen et al., 2014). The increase of chronically ill patients is expected to result in higher healthcare costs, and rising indirect costs because of absenteeism and less labour productivity (Nauta et al., 2011; European Commission, 2012; Trappenburg and Schuurmans, 2013). These challenges simultaneously taking place, puts pressure on the sustainability of the Dutch healthcare system and underlines the need for more efficient ways to deliver healthcare with limited budgets. In addition, patients' attitudes have changed and empowerment of patients is rising. More and more patients prefer to have insight into health-related data and they want to be more involved in decision-making when it comes to their own health (Idenburg and Van Schaik, 2012; Hassink et al., 2013; May, 2013). Deeply rooted structural change in healthcare is required to cope with these challenges (European Commission, 2012), and new radical ideas that alter the way things are currently done may be necessary (Tidd and Bessant, 2009).

Radical innovations that are believed to substantially contribute to healthcare reform are eHealth innovations (Murray et al., 2011; Griebel et al., 2012; Krijgsman et al., 2014). These innovations are tools and services based on information and communication technologies (ICTs) to improve health and healthcare (Oh et al., 2005; Krijgsman et al., 2014; Voorham et al., 2015). eHealth is seen as a radical innovation because it enables to deliver healthcare to patients different from how healthcare is currently provided. eHealth is considered to be important for improving quality of healthcare (Murray et al., 2011; Griebel et al., 2012; Krijgsman et al., 2014) because it provides possibilities for better communication between patient and doctor (Shekelle et al., 2006). Through ICT, patients can directly interact with their doctors, which actively involves patients in the decision-making process on their own health (Wildevuur and Simonse, 2015). eHealth is also seen as something that improves efficiency and reduces costs in healthcare (Murray et al., 2011; Griebel et al., 2012; Lewis, 2015), like through less double investigations (Schelleke et al., 2006). Although eHealth is seen as a promising innovation, these ICT based tools and services can only lead to positive healthcare outcomes when they are actually being used after being implemented (Chiu and Eysenbach, 2010). Nevertheless, it seems that after pilots eHealth innovations are not always actually used by healthcare professionals in the Dutch healthcare system: often pilot have remained pilots (Krijgsman et al., 2014; Schippers and Van Rijn, 2014; Schrijvers, 2014; Andreassen et al., 2015).

Use of a radical innovation within an existing system is often difficult as established structures mainly fit the current way of how things are done (Tidd and Bessant, 2009). Structural change within the existing system is required in order for radical innovations, such as eHealth, to be used. The multi-level perspective (MLP) of Geels (2002, 2004) is one of the main approaches that helps to understand structural change in existing systems, also called transition (Smith et al., 2010; Fuenfschilling and Truffer, 2014). The MLP considers change in both the world of new emerging technologies and the social world of beliefs and (potential) users (Geels, 2002; Geels, 2004). It regards systems as so-called socio-technical regimes. According to the MLP, radical innovations are generated and developed in protected spaces at the technological niche level, like experiments or pilots with eHealth innovations (Geels, 2002; Voorham et al., 2015). The overarching landscape level includes technology-external factors, like demographic and

economic challenges in the case of healthcare, which can cause adaptations in the regime's selection environment (Geels, 2002). Through these adaptations core elements of the existing regime become weaker, which is called regime destabilisation (Turnheim and Geels, 2012). This enables uptake of radical innovations from the niche level by the socio-technical regime (Geels, 2002). Breakthroughs of innovations are thus context-dependent.

Instead of the outside-in pressure from the landscape level on the regime's selection environment, regime destabilisation can also result from pressure inside the socio-technical regime itself. The presence of intra-regime dynamics is argued to be essential for understanding regime (de)stabilisation, and thus should not be ignored (Markard and Truffer, 2008; Weber and Rohracher, 2012; Fuenfschilling and Truffer, 2014; Smink et al., 2015). Recently in the MLP literature, the regime level is argued to be of main interest, because this is where structural change must take place in order to enable use of new innovations in a system (Geels, 2011). Influential actors within the regime are incumbents: large (> 250 employees) established organisations with competencies that are compatible to the current technological regime (European Commission, 2015; Smink et al., 2015). Incumbents are powerful regime actors as they possess a considerable part of the system; they provide products or services to a large market share (Stenzel and Frenzel, 2008). Incumbents are likely to influence lock-in of the existing regime because transition can threaten their powerful position (Smink et al., 2015). Lock-in means that when time passes by rules that govern the existing regime become more dominant, and one therefore becomes more inflexible to shift to a completely different way of how to do things (Arthur, 1989). In addition, incumbents are likely to become locked-in themselves bound to routines in line with the existing regime over time (Unruh, 2000).

Although incumbents influence lock-in of the existing regime, they also can contribute to addressing challenges faced by the regime (Kern and Smith, 2008; Penna and Geels, 2012). Generally, incumbents possess a broad range of complementary assets (Teece, 1986) like financial resources, power, or knowledge that can accelerate large-scale implementation and use of innovations (Geels, 2010; Geels, 2011). Nevertheless, incumbents are not able to just undergo substantial change in order to use a radical innovation as several processes keeping them locked into the existing regime (Unruh, 2000). In order to substantially change, incumbents need to strategically reorient; they need to adapt their strategic focus to the new regime, which takes time (Turnheim and Geels, 2012). This makes strategic reorientation a relevant concept to consider with regard to regime destabilisation. Therefore, this research aims to unravel strategic reorientation of incumbents in the Dutch healthcare regime towards using radical innovations, like eHealth.

Elements important for reorientation of strategy over time are dynamic capabilities (DCs) (Teece et al., 1997) and cognitive change (CC) (Barr et al., 1992). DCs refer to "the firm's ability to integrate, build, and reconfigure internal and external competences [over time] to address rapidly changing environments" (Teece et al., 1997, p. 516). A dynamic incumbent is capable to reconfigure its competences and resources into a new, reoriented strategy, while a static incumbent remains stuck in its routines. Cognitive change (CC) is the process of noticing and constructing meaning of change in the external environment of the organisation, and developing new beliefs for solutions to address that change over time (Barr et al., 1992). When an incumbent is confronted with huge challenges, incremental solutions are not likely to be sufficient, because such challenges ask for an organisation's direction to be drastically changed. Then CC is required for being able to reorient strategy that focuses on radical ideas. It is thus interesting to explore DC and CC as underlying processes of strategic reorientation of incumbents in the Dutch healthcare regime, in order to use eHealth niche innovations that could address the rising healthcare challenges at the landscape level. Therefore, the following research

question is addressed: *In what way do cognitive change and dynamic capabilities influence strategic reorientation of incumbents towards use of eHealth in the Dutch healthcare regime?*

As indicated earlier, the best healthcare in Europe is offered in the Netherlands (Björnberg, 2015). However, because of major challenges, like the rising prevalence of chronic diseases, the current Dutch healthcare regime will not be sustainable in the long-term (Nauta et al., 2011; European Commission, 2012; Trappenburg and Schuurmans, 2013). eHealth is believed to substantially contribute to healthcare reform addressing these challenges (Murray et al., 2011; Griebel et al., 2012; Krijgsman et al., 2014). In addition, eHealth is considered suitable for use in chronic disease management (Krijgsman and Wolterink, 2012; Wildevuur and Simonse, 2015). Therefore, usage of this radical niche innovation in the healthcare regime is taken into account in this research. Various eHealth innovations are visible in the Netherlands. eHealth has a broad range of possible applications in numerous healthcare processes with various users (Krijgsman and Wolterink, 2012). It can be used for education and prevention in public health, as support for quality-control and administrative processes of healthcare providers (e.g. in hospitals or GP centers), or in the principal healthcare processes of diagnosis, therapy (i.e. cure), and care (Krijgsman and Wolterink, 2012). The various groups of possible users include patients, healthcare providers, and other actors in the healthcare system like insurers for benchmarking healthcare providers (Krijgsman and Wolterink, 2012). This research only focused on eHealth innovations that enable digital communication and exchange of medical data between patients and healthcare professionals – patient to doctor (P2D) or doctor to patient (D2P) – used by Dutch hospitals in diagnosis, therapy, and care. eHealth applied to the relationship between patients and healthcare professionals is chosen because chronic diseases are characterized by long duration and generally slow progression (WHO, 2016), which means that chronically ill patients often come into contact with healthcare professionals. The 'Research Methodology' further specifies the scope of this research with regard to which type of incumbents and which type of chronic disease is chosen.

A locked-in healthcare regime will probably cause problems for society as the current system will not be sustainable to meet the Dutch healthcare demand the long-term (Nauta et al., 2011; European Commission, 2012; Trappenburg and Schuurmans, 2013). It is thus a societal challenge to escape lock-in and promote structural healthcare reform in order to remain able to provide high quality healthcare. Unravelling the underlying processes of strategic reorientation of incumbents can contribute to how the Dutch healthcare regime can be unlocked and how radical innovations can be used.

This research contributes to the innovation and transition literature in multiple ways. Critiques have been raised indicating that regimes are treated as black boxes and often interpreted as one stable highly aggregated structure (Smith et al., 2005; Geels, 2011; Karltorp and Sandén, 2012). It is said that the MLP could benefit from further insights into the role of incumbent actors in intra-regime dynamics of destabilisation (Geels, 2010; Smink et al., 2015). Therefore, first of all, this research broadens understanding on intra-regime dynamics by exploring strategic reorientation of incumbents. Secondly, this research extends the MLP by incorporating strategic management literature regarding DCs and CC for exploring the underlying business dynamics of strategic reorientation inside the regime. Thirdly, this research contributes to knowledge in the innovation literature with regard to healthcare. According to Consoli and Mina (2009), the overarching systemic and dynamic aspects of innovation in healthcare are underinvested. It is therefore valuable to take an MLP approach which addresses both the dynamics of a holistic transition process like pressures on healthcare, and systemic change and dynamics at the regime level, like the role of incumbents. So far, most MLP research has focused on socio-technical transitions in transport- (e.g. Geels, 2012; Wells and Nieuwenhuis, 2012; Auvinen et al., 2015), energy- (e.g. Verbong and Geels, 2007; Essletzbichler, 2012), and agri-food systems (e.g. Elzen et al., 2011; Diaz et al., 2013;

Hassink et al., 2013). Only few attempts have been made to address socio-technical change in healthcare by using the MLP. However, these studies focus on the niche level of transitions in Finnish and Greek healthcare (Pekkarinen et al., 2011; Vassilakopoulou and Marmaras, 2013), while this research focused on the regime level in Dutch healthcare.

This research is organised in the following way. It first gives a brief overview of theoretical approaches and concepts regarding regime destabilisation. Secondly, the 'Research Methodology' clarifies how this research is conducted. It will then go on to the 'Empirical Findings', which describes the main findings on eHealth use in nine hospitals. Subsequently, the chapter 'Analyses & Results' explains the influence of the theoretical concepts reflected by nine cases. Finally, conclusions and points of discussion are stated.

2 Theoretical Framework

This chapter clarifies concepts that are regarded important for intra-regime dynamics and regime destabilisation by the innovation and transition literature. Firstly, the socio-technical regime is explained and refined to the healthcare context. Furthermore, strategic reorientation, dynamic capabilities, and cognitive change are explained with regard to regime destabilisation applied to eHealth use. Finally a conceptual model applied to eHealth use is presented, which is used to guide the data collection and analyses.

2.1 The socio-technical regime

In the past two decades, a number of researchers have sought to explain technological change from a socio-technical perspective, based on findings from evolutionary economics, science and technology studies, and sociology (Smith et al., 2010; Fuenfschilling and Truffer, 2014). Technological transformations that alter the way a regime provides an infrastructure that serves society (e.g. transportation, energy provision, or provision of health care), are called socio-technical transitions because the overall system-configurations need to be changed. This process is also referred to as regime destabilisation.

Regime destabilisation concerns both actors and dimensions (Geels, 2011, p. 24). Actors specific to the healthcare regime are for example healthcare consumers (including patients and potential patients), healthcare insurers, and healthcare professionals employed at cure and/or care organisations like university medical centers (UMCs), hospitals, GP's offices, or nursing-homes (Schrijvers, 2014). Also the dimensions of the socio-technical regime are specific with regard to the context of healthcare. According to Geels (2002) socio-technical regimes consist of seven dimensions. The first dimension, *culture*, involves the cultural and symbolic meaning addressed to a technology, product, or service central to the regime (Geels, 2002). In this case, the service medical care involving cure and care is provided by healthcare professionals in the healthcare regime. Cultural and symbolic meaning of a service is produced in the interaction between stakeholders in the regime (Geels, 2002). The cultural and symbolic meaning of medical care thus for instance emerged from the interaction between healthcare consumers and healthcare professionals, being D2P[1] or P2D[2]. Medical care is a commodity for which the product and the activity of production are the same, which is a typical characteristic of the healthcare regime (Arrow, 1963). This similarity in product and production means that the healthcare consumer cannot test the product before consuming it, which allows for a high amount of trust from the patient towards the healthcare professional characterizing the D2P and P2D interaction (Arrow, 1963). Also the market dimension, which involves user practices and application domains, plays a role in regime (de)stabilisation (Geels, 2002). The market consuming medical care consists of populations of patients and potential patients who might need to consume medical care in the future. These so-called healthcare consumers widely differ in their user practices and characteristics, like amount of medical care needed (being diagnosed with a chronic disease or not), specific disease areas, or age. It is plausible that these user practices and characteristics address variations in demand and willingness of patients to use medical care assisted or provided through innovations like eHealth. In addition, the nature of demand in the healthcare regime is not steady in its origin (Arrow, 1963). Since one cannot forecast when he, for instance, will be ill or have a certain disease or not, or when he will get involved in a traffic accident. The nature of demand in the healthcare regime is irregular and hard to predict. Moreover,

[1] Doctor to patient communication
[2] Patient to doctor communication

medical care only affords satisfaction in the event of illness (Arrow, 1963). In this thesis, the market dimension of the healthcare regime is referred to as *healthcare consumers user practices and characteristics*. The third dimension, *industry*, concerns elements like industrial networks and strategic games. Various industrial sectors are involved in the healthcare regime, for example the pharmaceutical sector or medical devices sector. With regard to eHealth, also organisations are involved which develop and supply ICT including apps, software, and hardware. Fourth, the *infrastructure* dimension is part of the socio-technical regime (Geels, 2002). Its sunk investments often influence a regime's stabilisation (Geels, 2011). In the healthcare regime, the infrastructure connects hospitals, GP's offices, and healthcare consumers for example by healthcare information systems including electronic health record (EHR), hospital information system (HIS), and Collaborative Health Management (CHM) which addresses both GPs and hospitals involved in a clinical pathway. Furthermore, the dimension *sectoral policy & government* influences the regime for example through political support and government funds (Geels, 2002; Geels, 2011). In addition, stakeholders in the healthcare regime are bound to numerous laws and regulations for quality and safety of healthcare. Also the available materials and technical elements contribute to the process of transition, which is called the *technology* dimension (Geels, 2002). In the healthcare regime multiple technologies, for instance ICT and imaging technologies, are being used. Furthermore, the healthcare regime consists of a broad range of *techno-scientific knowledge* related to different scientific disciplines (e.g. medical, biology, chemistry).

The multiple actors and dimensions included in the regime evolve interdependently and become more stable over time due to lock-in and complexity (Unruh, 2000). As stated in the 'Introduction', lock-in means that when time passes by rules that govern the existing regime become more dominant, and one therefore becomes more inflexible to shift to a completely different way of how to do things (Arthur, 1989). Complexity refers to a regime consisting of a lot of different interconnected actors and multiple interrelated dimensions (Unruh, 2000; Geels, 2002). Like explained previously, the socio-technical regime in the healthcare context covers various actors and dimensions.

Actors within a regime are bound to certain routines and beliefs which are based on their historical path encompassing an accumulation of prior experience and knowledge (Nelson and Winter, 1977; Arthur, 1989); also known as technological trajectories (Dosi, 1982). Actors also can be limited in their actions due to regulative and formal rules of dimensions, like legal contracts and technical standards, which stabilized along similar technological trajectories of the existing regime (Geels, 2004). Furthermore, embeddedness of actors within the regime causes stability. Interdependent connections between actors grow as the system matures, which leads to mutual dependencies and cognitive frameworks, making it more likely for actors to behave in line with the established system. A regime becomes also more stable over time since the accumulation of choices for the current technology and related investments made in the past, make it difficult to switch to another technology (David, 1985). Because of complexity and various sources of lock-in, change results in incremental innovation along prevailing technological trajectories within the existing regime, rather than substantial change towards a new regime which is central to a radical innovation (Unruh, 2000; Turnheim and Geels, 2012).

Lock-in and complexity thus hinder structural change and make regime destabilisation a process which slowly proceeds over time. Structural change towards use of a radical innovation within the healthcare regime can therefore be a long-term process. It is believed that the more radical innovations in the niche, the more difficult it is for the regime to select and incorporate them in the existing regime (Smith, 2007). It takes time for a regime to become able to function under the new innovation, and actors who are going to work with the innovation have to become familiar with it (Unruh, 2002). In addition, there is no prior experience on the exact outcome because of the degree of novelty of radical innovation, which

creates uncertainty and extends the duration of the change process (Tidd and Bessant, 2009). Especially in healthcare, where quality of a new device or clinical practice must be guaranteed as it directly affects people's health.

The socio-technical regime is only able to seize the opportunities from the niche level if structural change in the selection environment of the regime occurs (Smith et al., 2010). Structural change at the regime level happens when there are linkages between multi-dimensional developments on the three levels of the MLP (Smith et al., 2010). A considerable amount of articles has been published on how regime-exogenous factors influence transition, like strategic niche management (see e.g. Schot and Geels, 2008) or the role of institutions (see e.g. Unruh, 2002). Nowadays, however, a shift towards understanding intra-regime dynamics is visible. These dynamics inside the regime encompass the lock-in of actors and dimensions along the regime's prevailing technological trajectories, increasing stability. Besides, intra-regime dynamics refer also to how actors deviate from the technological trajectories (Garud and Karnøe, 2001) as the reproduction of core regime elements becomes weaker, resulting in destabilisation (Turnheim and Geels, 2012). Dynamics within a regime can for example be presented by differences in actors' behaviour or tensions between actors and dimensions of the established regime. The presence of intra-regime dynamics is argued to be essential for understanding regime (de)stabilisation, and thus should not be ignored (Markard and Truffer, 2008; Weber and Rohracher, 2012; Fuenfschilling and Truffer, 2014; Smink et al., 2015).

2.2 Strategic reorientation of incumbents

When zooming in on intra-regime dynamics, incumbent organisations seem powerful actors as they possess and influence a considerable part of the regime (Stenzel and Frenzel, 2008). Although incumbents influence lock-in of the existing regime through different sources, they also can contribute to addressing regime's challenges (Kern and Smith, 2008; Penna and Geels, 2012). Management literature enables to analyse these internal dynamics by taking an organisation-oriented approach (Turnheim and Geels, 2012). Contributing to structural change of the regime requires incumbents to strategically reorient (Turnheim and Geels, 2012). Destabilisation of the regime is then caused by an "endogenous and strategic response [of incumbents] to performance problems" (Turnheim and Geels, 2012, p. 37) of the incumbent itself or performance problems of the regime as a whole.

Strategy involves how to achieve something and concerns a plan of action designed by the organisation in order to reach an overall goal in the long-term. Reorientation towards something refers to changing the focus of something. Strategic reorientation is thus considered as changing the focus of the organisational strategy. In order to substantially change, incumbents need to strategically reorient; they need to adapt their strategic focus to the new regime, which takes time (Turnheim and Geels, 2012).

Organisational strategy on how to act, is among others determined by the organisation's shared beliefs (Fiol and Lyles, 1985). Shared beliefs of an organisation involve culture, patterns of behaviour, ideologies, norms, and values, which lie in the minds of the organisation's employees (Fiol and Lyles, 1985). Strategic decision making relies on managers, on people's minds, and therefore shared beliefs influence organisational action-taking (Fiol and Lyles, 1985). Furthermore, organisational strategy is determined by the organisation's resource base (Mahoney and Pandian, 1992). Resources include tangible assets and intangible competences (Mahoney and Pandian, 1992). A further distinction can be made based on the categorization of Hofer & Schendel (1978): financial resources, physical resources, human resources, organisational resources and technological capabilities. Resources are bound to path dependencies: resources currently possessed by the organisation are shaped by its historical path and

this constrains its path ahead of future available resources (Arthur, 1989). The organisation's strategy is thus determined by its available resources over time (Mahoney and Pandian, 1992).

Since organisational strategy is bound to shared beliefs and resource base present in the organisation, alteration of strategy is only possible if these beliefs and resources can be changed (Fiol and Lyles, 1985; Mahoney and Pandian, 1992). Shared beliefs are changed through a process called cognitive change (CC) (Barr et al., 1992). Dynamic capabilities (DCs) involve change in competences and assets (Teece et al., 1997). As explained in the following, CC and DCs are important elements for influencing the ability of incumbents to strategically reorient towards a regime central to use of a radical innovation.

2.3 Cognitive change (CC)

Restructuring of organisational shared beliefs takes place through a process of cognitive change (CC) (Barr et al., 1992). An organisation's ability to cognitively change relies on several processes in the organisation: *noticing external change*, *constructing meaning of external change*, and *developing new beliefs* for solutions to address that change over time (Barr et al., 1992). In short, CC concerns an organisation's willingness to structurally change over time. CC adjusts the organisation's "perceptions of the future viability of existing regimes and the chances of niche-innovations" (Geels, 2010, p. 505). As shared beliefs lie in people's minds, Barr et al. (1992) emphasize that adjustments in managers' minds precede organisational renewal. CC is thus a process that takes place in the minds of the organisation's employees, which are the people that have certain perceptions about the existing regime and give meaning to solutions presented in new radical ideas. Incumbents are often in favour of the current regime, which is reflected in their shared beliefs, and it is thus difficult for them to undergo CC (Lant and Mezias, 1992). However, structural change asks for organisational strategy and the underlying shared beliefs to be drastically changed. Then, CC is thus required for strategic reorientation.

CC is especially challenging in organisations providing public services, like healthcare, since these are characterised by locked-in shared beliefs (Pekkarinen et al., 2011). In addition, as organisations become larger and larger, they are characterized by command-and-control organisational structures (Faber and Scheper, 1992). An organisational structure represents the levels within an organisation (Shtub and Karni, 2010). Incumbents tend to have a bureaucratic structure (Weber, 2009) or a functional structure because these structures include clear defined roles and responsibilities for employees, which works more efficient for a large organisation (Faber and Scheper, 1992; Shtub and Karni, 2010). In a functional structure employees are grouped in structures according to the function they perform (Shtub and Karni, 2010), like in divisions of a hospital for specific disease areas. Although a functional structure results in high efficiency with specialists operating within their field of expertise, it also leads to rigid organisations with stuck belief systems since communication is standardized in formal ways and creativity can be discouraged (Faber and Scheper, 1992; Shtub and Karni, 2010). Nevertheless, shared beliefs including organisational culture and employees' beliefs are important aspects of healthcare reform (Scott et al., 2003). It is said that healthcare professionals are often attached to their routines and beliefs in favour of the existing regime (Schrijvers, 2014). This means that they not always see the potential benefits of a new technology, which creates resistance for cognitive change of the organisation they work for (Leung, 2012).

2.4 Dynamic capabilities (DCs)

Dynamic capabilities (DCs) are defined as "the firm's ability to *integrate*, *build*, and *reconfigure* internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516). DCs concern processes and mechanisms through which an organisation is capable to advance its capabilities and resources over time (Teece et al., 1997). In addition, DCs are distinctive organisational processes or

competences based on resources available in the organisation (Teece et al., 1997). Core competences are the distinctive activities that define an organisation's fundamental business (Teece et al., 1997). DCs thus allow an incumbent to adapt its (core) competences over time into a reoriented strategy in order to address the challenges in the regime. In short, DCs concern an organisation's ability to structurally change over time.

DCs is an increasingly relevant topic in public sectors, like healthcare, because it focuses on maximizing organisational performance based on strategically using available resources rather than competing for customers (Llewellyn and Tappin, 2003; Pablo et al., 2007). This is also the case for healthcare, where organisations aim to provide high quality healthcare to patients with the available resources, instead of fierce competition for attracting healthcare consumers. However, in a constantly changing healthcare environment due to the before mentioned landscape pressures like an enormous increase in prevalence of chronic diseases, incumbents in the current healthcare regime need DCs to reorient their strategy. DCs then enable incumbents to use new technologies effectively in order to remain able to maximise organisational performance for providing high quality healthcare (Leung, 2012).

2.5 Conceptual model

Figure 1 presents the conceptual model applied to eHealth use. The arrow from the socio-technical landscape to the socio-technical regime represents the demographic and economic challenges on the current healthcare regime. Included in the healthcare regime are several hospitals – the black rectangles of which one is referred to as 'incumbent X' – which contribute to (de)stabilisation of the socio-technical regime. This influences the creation of windows of opportunity for eHealth niche innovations. This research focused on underlying processes inside the regime with regard to strategic reorientation of incumbents in order to use eHealth innovations. An incumbents' strategy is based on shared beliefs in the organisation and the organisation's resources and capabilities, and change of these elements can both stir or hamper strategic reorientation (SR) towards use of a radical innovation. This is represented by the arrows from cognitive change (CC) to SR and from dynamic capabilities (DCs) to SR. The socio-technical healthcare regime exhibits the contextual background in which CC, DCs, and SR are influencing use of eHealth in incumbents. Regime destabilisation is plausibly influenced by incumbents able to strategically reorient, which can contribute to structural change of the regime (Turnheim and Geels, 2012). Incumbents able to strategically reorient are dynamic organisations which are open to cognitive change. This is in contrast to static incumbents which are stuck in their established shared beliefs and routines, and these organisations are probably not able to strategically reorient towards use of a radical innovation. In case of incumbents unable to strategically reorient, the regime is expected to remain stable (Turnheim and Geels, 2012). In addition, the incumbent's shared beliefs are critical for directing its strategy and resource accumulation, and thus for developing dynamic capabilities (Barr et al., 1992; Teece et al., 1997). The co-evolution of DCs and CC therefore is presented in the model as an arrow between the two variables.

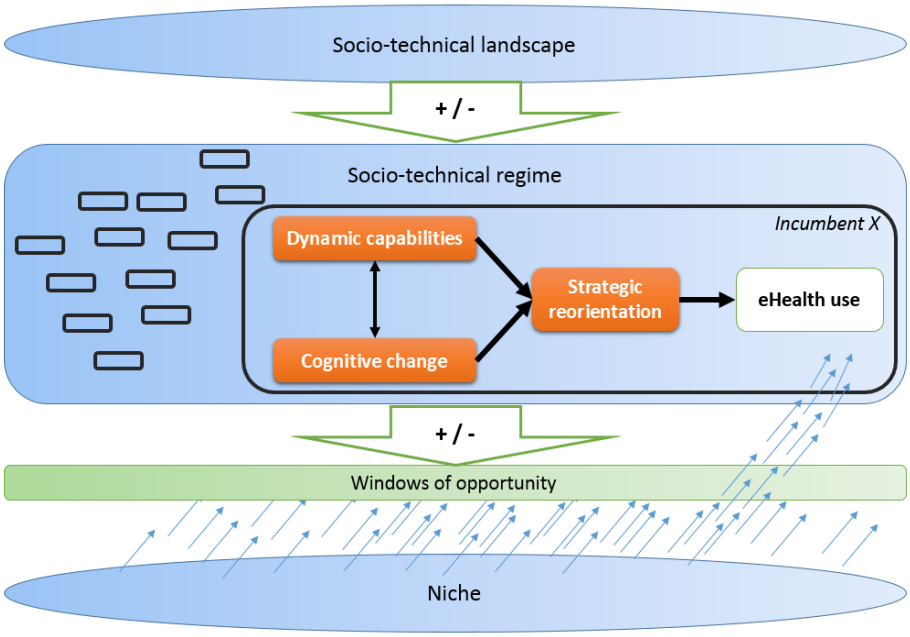

Figure 1: Conceptual model applied to eHealth use (adapted from Geels (2002, 2004), Teece et al. (1997), Barr et al. (1992).

The concepts of regime destabilisation, SR, CC, and DCs all reflect that structural change happens gradually over time. Structural change towards use of eHealth by incumbents in the healthcare regime is thus a process over time. According to Chiu and Eysenbach (2010), an internet-mediated intervention concerns different stages of use over time. Adapting these stages from Chiu and Eysenbach (2010), shows that incumbents (hospitals) can vary in their experience regarding use of eHealth in their organisation and that they can become more experienced over time (see figure 2). The *consideration stage* refers to orienting hospitals or non-users that evaluate if they would like to use eHealth in their hospital in the future. The *initiation stage* includes newcomers; hospitals that recently started to use eHealth. These hospitals intend to use eHealth and are typically in the first years of experimenting a few pilots. At the end of this stage, going from initiation to utilization, two paths of eHealth use are possible: intending and thinking about how to continue but no continuation in practice after first pilots yet, or discontinuation (attrition) with eHealth initiatives. The latter means that hospitals return to the consideration stage. Hospitals which continued with and extended previous pilots, and/or execute a broad range of pilots, are experienced in the use of eHealth and belong to the *utilization stage*.

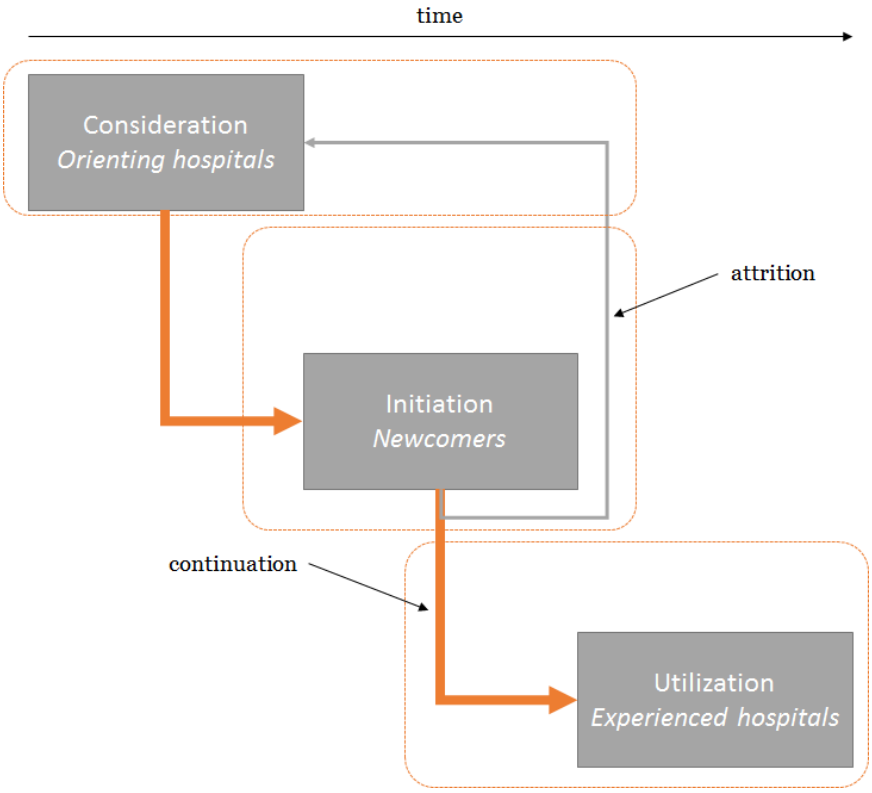

Figure 2: Stages of eHealth use in hospitals, adapted from Chiu and Eysenbach (2010)

3 Research Methodology

This section elaborates on research design, data collection, data analysis, and quality of the research.

3.1 Research design

This research aims to unravel the underlying processes of strategic reorientation (SR) of incumbents in the Dutch healthcare regime towards use of eHealth innovations. This section and the following sections attempt to make the research steps as transparent as possible, which contribute to an adequate replicability and therefore external reliability of this research (Bryman, 2008). In order to explore underlying processes of SR and to gain in-depth insights in organisational behaviour of incumbents regarding use of radical innovations a qualitative research design is used. The research design has been inspired by an inductive approach, due to the limited knowledge available on healthcare organisations' motivations to use eHealth and to gain more knowledge theoretically for extending and refining the MLP of Geels (2002, 2004). The MLP approach combined with business dynamics from Teece et al. (1997) and Barr et al. (1992) are used as sensitizing concepts guiding the research. The MLP includes both social and technological elements in technological change and acknowledges the external influences on actors at the regime level. In addition, business dynamics helped to understand transitions with regard to organisational behaviour of incumbents.

Chronic diseases are highly prevalent diseases in Western countries because this part of the world is characterised by an aging society (Wildevuur and Simonse, 2015). As indicated in the 'Introduction', also the prevalence of chronic diseases in the Netherlands is rising. eHealth is suitable for use in chronic disease management (Krijgsman and Wolterink, 2012; Wildevuur and Simonse, 2015). Since eHealth is considered to be important for addressing challenges regarding quality and costs of healthcare(Murray et al., 2011; Griebel et al., 2012; Krijgsman et al., 2014; Lewis, 2015), usage of this niche innovation in chronic diseases by incumbents is taken into account in this research. Incumbents are large (> 250 employees) established organisations with competencies that are compatible to the current technological regime (European Commission, 2015; Smink et al., 2015). Hospitals can be seen as incumbents of the healthcare regime because these large organisations provide health care regarding chronic diseases to a considerable part of the Dutch population.

The Dutch Ministry of Health's (VWS) goal is to realize use of eHealth among 40% of the chronically ill patients in 2019 (Schippers and Van Rijn, 2014). It is expected that the number of chronically ill people will rise to approximately 6,0 million in 2020 (Gijsen et al., 2013). This implies that VWS has reached its goal if 2,4 million chronically ill patients use eHealth in 2019. Even though VWS has set goals for broad range application of eHealth (Schippers and Van Rijn, 2014) and the use of eHealth in Dutch healthcare slightly increased in 2014 compared to 2013 (Krijgsman et al., 2014), large-scale application of eHealth has not happened thus far (Krijgsman et al., 2014; Voorham et al., 2015). Exploring the underlying processes of strategic reorientation of hospitals is thus a necessary contribution for sustainable healthcare reform in the Netherlands. As stated in the 'Introduction', this research only focused on eHealth innovations that enable digital communication and exchange of medical data between patients and healthcare professionals – patient to doctor (P2D) or doctor to patient (D2P) – used by Dutch hospitals in diagnosis, therapy, and care.

One of the big five chronic diseases is the group of chronic respiratory diseases (CRDs) which refers to "chronic diseases of the airways and other structures of the lung" (WHO, 2011; WHO, 2015). CRDs include for example asthma and chronic obstructive pulmonary disease (COPD) (WHO, 2015). CRDs encompass over one million lung patients in the Netherlands (WHO Europe, 2015), including 360.000

COPD patients (in 2011, see Boezen et al., 2013) and 444.200 asthma patients (in 2007, see Gommer and Poos, 2011). Moreover, COPD is expected to be the third cause of death in 2030 (WHO, 2008). Also chronic heart failure (HF) is highly prevalent in the Netherlands. The prevalence of HF has increased with 55% in the male population and 45% in the female population from 2001-2011 (Rutten et al., 2014). The prevalence of HF in the Netherlands is expected to increase even more, 84% in male and 50% in female from 2011-2030, due to national demographic changes as HF is often related to elderly (Rutten et al., 2014). Therefore, a multiple-case study is done on use of eHealth by hospitals in diagnosis, cure, and care of CRDs and HF in the Netherlands.

A multiple-case study design is chosen in order to gain in-depth, qualitative understanding of the phenomena of underlying processes of strategic reorientation of incumbents inside a regime (Yin, 2003). Moreover, as in line with Murray et al. (2011), a multiple-case study is adequate for studying complex systems which are forced to change (Yin, 1999). In addition, multiple cases provide multiple observations of the same phenomenon, which allows for critically assessing data through comparing it among several cases. A multiple-case study design is therefore considered to give a more valid answer to the research question (Yin 2003). Each case concerned one hospital. The next section explains why and how specific hospitals are selected.

3.2 Case selection

This research included hospitals in three different stages of experience with use of eHealth, which reflects the time aspect of structural change at the regime level as indicated in the previous chapter (see figure 2). Three hospitals are selected in each stage of experience regarding eHealth use, in order to guarantee internal validity of each stage. Internal validity refers to "establishing a causal relationship whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships" (Yin, 2003, p. 34). Because of its qualitative nature, this research needs to be controlled for variations in reality in order to strive for consistent evidence (Yin, 2003; Bryman, 2008). Therefore, analysing three cases in each stage is used for ensuring that possible outliers will be controlled for. Data is thus obtained from nine cases in total.

Nine cases are selected through purposive sampling. This sampling method is used, because it offers sufficient correspondence between the research question and cases to answer that question as only relevant cases are selected (Bryman, 2008). However, this non-probability sampling method limits the external validity. External validity involves to what extent found results are generalizable to a larger population (Bryman, 2008). The qualitative nature of the research means that cases "tend to be oriented to the contextual uniqueness and significance of the aspect of the social world being studied." (Bryman, 2008, p. 378). Results that are provided by the purposively selected cases must thus be interpreted and generalized with care. Due to the cases' contextual uniqueness, conclusions that will be drawn from this research may not hold directly for a larger population. However, insights that are provided by this research can be valuable for theoretical contributions, rather than to generalize to populations (Bryman, 2008), which is in line with the scientific relevance of this research.

In short, the following selection criteria are used in purposive sampling:

- Stage of eHealth use: consideration, initiation or utilization stage
- Disease area where eHealth is applied to: chronic respiratory diseases (CRDs) and/or heart failure (HF)

- Type of eHealth[3]: eHealth applications, platforms and devices that connect and enable communication between healthcare consumers and healthcare providers, patient to doctor (P2D) or doctor to patient (D2P), used by hospitals in diagnosis, therapy, or care (see the orange delineated part in figure 3).

Because of these selection criteria, findings of this research are only generalizable to a certain extent. Results on strategic reorientation of incumbents towards eHealth use in the Dutch healthcare regime, are thus only generalizable to the context of Dutch hospitals that are using or considering to use eHealth in diagnosis, therapy, or care regarding the chronic disease areas of CRDs and/or HF.

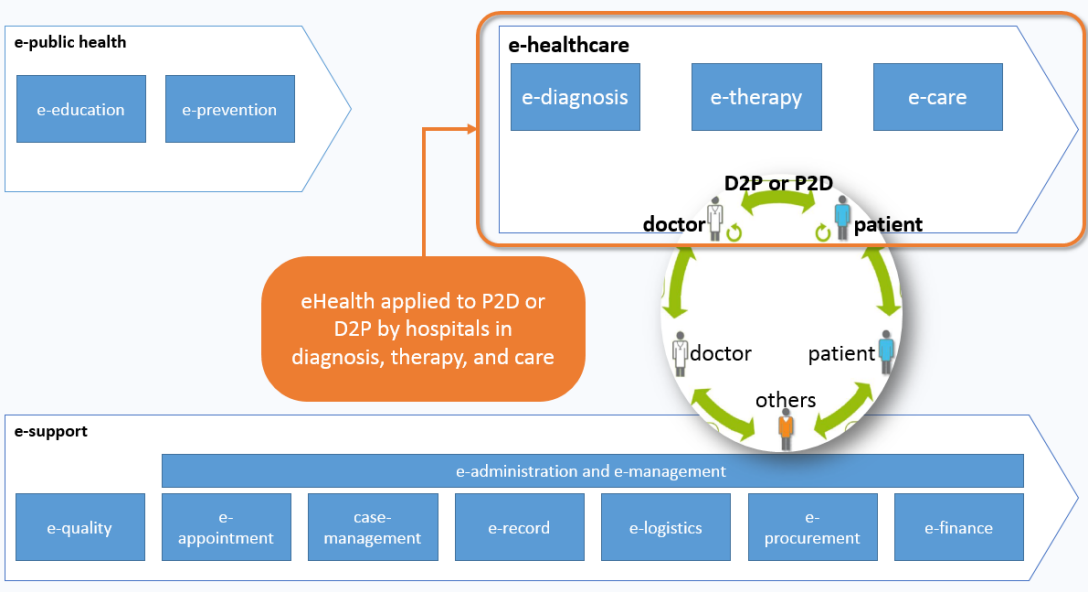

Figure 3: Types of eHealth, based on Krijgsman and Wolterink (2012)

The cases are shortly described below. All cases are anonymized for reasons of confidentiality, therefore none of the respondents' and organisation's names are given. Respondents are referred to as 'R#N' (see appendix I for respondents' affiliations).

3.2.1 Selected cases

Case 1: A UMC (referred to as H1) situated in the *utilization stage*. This hospital is involved in a broad range of new and follow-up eHealth projects with regard to both COPD and HF.

Case 2: A regional hospital (referred to as H2) situated in the *utilization stage*, which applies eHealth to a large group of HF patients.

Case 3: A UMC (referred to as H3) situated in the *utilization stage*. This hospital is involved in a broad range of new and follow-up eHealth projects, including healthcare regarding COPD.

[3] E-diagnosis involves eHealth supporting anamnesis, triage, or diagnostic medical research. eHealth that supports adjusting medication and administering medication is regarded as e-therapy. E-care examples consisted of telemonitoring and telecare (Krijgsman and Wolterink, 2012).

Case 4: A regional hospital (referred to as H4) situated in the *initiation stage*. This hospital uses eHealth among a few COPD and a few HF patients.

Case 5: A CTCEH (referred to as H5) situated in the *initiation stage* which experimented with eHealth for HF patients and is currently considering a follow-up pilot involving its HF population.

Case 6: A CTCEH (referred to as H6) situated in the *initiation stage*. This hospital experimented with eHealth for HF patients and is currently considering a follow-up pilot involving its HF population.

Case 7: A CTCEH (referred to as H7) situated in the *consideration stage* which experimented with eHealth for COPD patients. This hospital quit the COPD pilot some time ago. It is not planning on continuing the project. Therefore, H7 has returned to the *consideration stage*.

Case 8: A regional hospital (referred to as H8) situated in the *consideration stage*. This hospital has not performed any eHealth pilots yet, but is considering to start using eHealth in the near future.

Case 9: A regional hospital (referred to as H9) situated in the *consideration stage*. H9 has not performed any eHealth pilots yet, but is considering to start using eHealth in the near future.

3.3 Data collection

Multiple data sources are used for data collection. This allows to triangulate and check findings through different approaches, increasing the validity of the research (Bryman, 2008).

3.3.1 Primary data collection

In order to understand the underlying processes of strategic reorientation (SR) of incumbents, an in depth investigation of each selected case is required (Karltorp and Sandèn, 2012). Primary data enables to get a grasp on underlying motives of decision-making in SR. Since this research has an explorative aim the interview questions in general should allow for some form of openness, which enables the interviewees to share relevant details that would go unnoticed with standard questions. Therefore, semi-structured interviews are conducted following a topic list including possible questions, rather than a similar structured order of questions which is aked during all interviews (see appendix II). This allowed for deviation and follow-up questions when new topics arose (Bryman, 2008). Interview topics are derived from both the eHealth context and theory as sensitizing concepts. Theoretical concepts presented several organisational processes which are used as interview topics. Organisational processes for SR of incumbents towards using a radical innovation, related to CC and DC are for example: *noticing external change, constructing meaning of external change, developing new beliefs, building up resources, reconfiguring resources,* and *integrating resources*. Through asking in-depth questions specific activities related to these organisational processes are revealed (see appendix II). Besides, the MLP literature emphasizes that socio-technical transitions are context-dependent. Therefore, also the various dimensions of the healthcare regime need to be addressed as interview topics when exploring underlying processes of strategic reorientation of hospitals towards eHealth use. This helped to unravel in what way the regime context influences strategic reorientation of incumbents. Interview topics with regard to the healthcare regime are derived from the seven dimensions of the socio-technical regime of Geels (2002, 2004): *culture, healthcare consumers user practices and characteristics, industry, infrastructure, sectoral policy & government, technology,* and *techno-scientific knowledge*. Concepts and dimensions are used in a sensitizing way in order to leave room for interpretation of underlying processes and activities of organisational behaviour to emerge from the data. The presented list of interview topics is thus not limited.

Semi-structured interviews are held with employees of Dutch hospitals involved in eHealth and CRDs or HF. Preferably, these are employees who contribute to decision making on use of eHealth in the department of pulmonary diseases or the cardiology department because adjustments in managers' minds precede organisational renewal (Barr et al., 1992). To ensure the highest quality of information possible from the interviewees, the most well-informed persons are chosen to interview. Therefore, purposive sampling is also applied to sampling of the interviewees. The selected interviewees are employees with regard to ICT or innovation, employees of a hospital's support staff, or healthcare professionals including nurses or nurse practitioners and medical specialist (see Appendix I for the interviewees' affiliations).

Ideally three interviewees per hospital are selected, in order to guarantee internal validity of each case. It is thus desirable to conduct 27 semi-structured interviews in total. However, it has been challenging to include interviewees in the research since eHealth use is quite new in hospitals. In total 24 interviewees participated, spread over 21 semi-structured interviews (see Appendix I). Case 1 included four interviewees, case 2 comprised two interviewees, case 3 consisted of three interviewees, case 4 is covered by three interviewees, case 5 included three interviewees, case 6 comprised four interviewees, case 7 is covered by two interviewees, and case 8 and case 9 both included one interviewee. In addition, two experts are interviewed: one person affiliated to the Dutch centre of expertise for standardisation and eHealth, and the other person belongs to the Dutch Hospital Association (DHA). A note of caution on the internal validity of some individual cases is due here, mainly with regard to cases of the consideration stage (case 7, 8, and 9). A small number of semi-structured interviews is realized this stage because it was difficult to find employees who had insight in the organisation's considerations on future eHealth use. Especially healthcare professionals were not always willing to talk about the topic since the idea of using eHealth is quite new in their organisation. Results of the consideration stage therefore need to be interpreted with caution.

As eHealth is quite a new innovation among hospitals a schematic overview of types of eHealth, see figure 3, is brought to each interview in order to clarify the topic of this research to the interviewees. Moreover, the interviewees received a short intake survey in order to prepare them for a conversation on structural change of incumbents towards using a new technology (see appendix III). This is done because these topics are often not prominently included in the daily practice of for instance nurses and medical specialists. This intake survey enabled more in-depth conversations with interviewees about eHealth use in their hospital. Interviewees are encouraged to explain their answers given to the questions provided on beforehand and it was possible to ask follow-up questions regarding the survey during the interview. Openness to new instances that could emerge from the interviews is guarded by broadly starting the conversation with open questions, before deepening specific topics mentioned and diving into answers previously given in the survey. Furthermore, the intake survey assisted in conducting interviews more efficiently, which was useful since employees of hospitals are generally associated with limited time available due to high workload.

Furthermore, additional information is obtained from interviewees by emailing them, calling them, or sending them a short survey with follow-up questions. This helped to clarify unclear chunks of data directly by its source. Additional information is obtained by conducting two expert interviews with persons who have sound insights in the use of ICT and eHealth in the Dutch healthcare regime.

3.3.2 Secondary data collection

A desktop study is done to collect additional background information on use of eHealth in hospitals in the field of CRDs and HF. The collected secondary data includes scientific articles and book chapters, newspaper articles, annual reports of hospitals included in this research, general reports available on eHealth, and information at relevant websites like news items about ICT developments and eHealth use in hospitals. Scientific articles and books will be obtained through Google Scholar, Scopus, and PubMed. Search terms are related to both the eHealth context and derived from the theoretical concepts, using them as sensitizing concepts. Also field notes are made on the socio-technical regime of Dutch healthcare and other concepts included in this research, while attending healthcare related events like a meeting organised by the Dutch Hospital Association (DHA) with young professionals about healthcare in 2020, watching documentaries, and listening to podcasts.

3.4 Data analysis

Firstly, the semi-structured interviews are all transcribed. Thereafter, the transcripts are coded by using Nvivo which enables systematic analysis of the data. Secondary data is also analysed on their content by using Nvivo. An interpretivist approach is used in the process of coding the primary data in order to remain as close to the data as possible, to ensure in-depth understanding of underlying processes of strategic reorientation. The interpretivist epistemological approach views “the social world through an examination of the interpretation of that world by its participants” (Bryman, 2008, p.366)”, which helps “to grasp the subjective meaning of social action” (Bryman, 2008, pp. 694). Information-rich stories where issues around eHealth use were discussed in depth are searched for and coded across transcripts of multiple semi-structured interviews and secondary data. In addition, techniques of constant comparison to identify main themes related to eHealth use in hospitals. As this research is inspired by inductive research for exploring and extending theory, the process of coding is in line with Corbin and Strauss’ (1990) method of coding which is an iterative process aiming for theoretical saturation, starting open and gradually shifting towards more focused coding. The first phase of coding consisted of analytically breaking down data. The second phase focused on developing conceptual labels and initial categories and subcategories and comparing these with the theoretical concepts and their related organisational processes as elaborated on in the ‘Theoretical Framework’ chapter and the section of ‘Data collection’. This enabled to see what concepts and dimensions initially arose from the empirical data and which of them are related to the theoretically formulated concepts on beforehand. Next, axial coding provided a deeper understanding by defining and redefining categories and subcategories. Also relationships among categories were explored. Subsequently, data is selectively coded, which unifies all previously determined categories and reaching saturation on the content which is determined a specific category (Corbin and Strauss, 1990).

The output of the coding process with regard to eHealth use is presented in the next chapter, ‘Empirical Findings’. Subsequently, the ‘Analyses & Results’ chapter elaborates on the final step of the analyses and describes what results are obtained from comparing cases based on stage of eHealth use and comparing stages mutually.

4 Empirical Findings

This chapter describes the main empirical findings on eHealth use obtained from nine hospitals with regard to CRDs and HF. In-depth descriptions of eHealth use of each case individually are given in 'Appendix IV'. Semi-structured interviews are referred to as 'I#N'. Quotes and survey data of specific respondents are referred to as 'R#N' (see appendix I for respondents' affiliations). Cases or hospitals are referred to as 'case N' or 'HN'.

Each hospital is situated in a specific stage of eHealth use: consideration, initiation, or utilization stage. Data triangulation is applied, in order to come to a solid decision on assigning the involved hospitals to a certain stage of experience in eHealth use. The collected secondary data provided a first insight on which eHealth applications are available to patients in each hospital. Secondly, interviewees were asked to rank their hospital's current and desirable stage of eHealth use through an online survey. Interviewees had the possibility to further explain their answers given in the survey during the interview through follow-up questions that were asked. Thirdly, an independent expert, R#24, with sound knowledge on the field of ICT and eHealth in Dutch hospitals is asked to divide the interviewed hospitals among the three stages of eHealth use.

When screening the empirical field for selecting and designating cases to a specific stage of eHealth use, it seemed that a small part of the Dutch hospitals belonged to the utilization stage and that hospitals are mainly situated in the initiation and the consideration stage. Even some hospitals returned from initiation to consideration stage, for instance H7. This hospital quit an eHealth pilot with regard to COPD some time ago and it is currently not planning on continuing the project (I#7). Therefore, H7 has returned to the consideration stage. This hospital was actively involved in a pilot project regarding an e-care platform for monitoring and educating COPD patients by providing them several questionnaires. "The patients were quite satisfied with the platform … I liked to work with it myself as well because the platform enabled me to get more involved with the patient and I thus was able to provide better more patient-focused healthcare", stated R#22. Despite the positive thoughts on the COPD platform by H7's CRDs department, attrition of the pilot took place because there were other developments at stake. A new EHR was implemented instead (I#7). Besides, only a small part of the medical specialists in the Netherlands recommend their patients to use eHealth (Krijgsman et al., 2015)[4]. The empirical findings suggest that the healthcare regime is destabilising. The findings also put forward that the regime is not fully destabilised yet, because of the majority of hospitals is situated in the first two stages and a small number of medical specialists recommending eHealth use.

Examples of eHealth use obtained from the investigated cases regard digital exchange of medical data P2D or D2P through applications, devices, and platforms among e-diagnosis, e-therapy, and e-care (see figure 4). E-diagnosis involves eHealth supporting anamnesis, triage, or diagnostic medical research. H3 for instance uses an online clinical screening instrument for advanced diagnosis of COPD patients. Patients receive an email for filling out the online survey at the start of the clinical pathway and also after six months. The e-diagnosis tool extends the conventional diagnosis as it provides supplementary information on quality of life and wellbeing, in addition to medical data on the somatic domains (I#18; I#19).

[4] According to Krijgsman et al. (2015), 8% of the medical specialists regularly recommended eHealth use to patients, and 76% never recommended this (N=385).

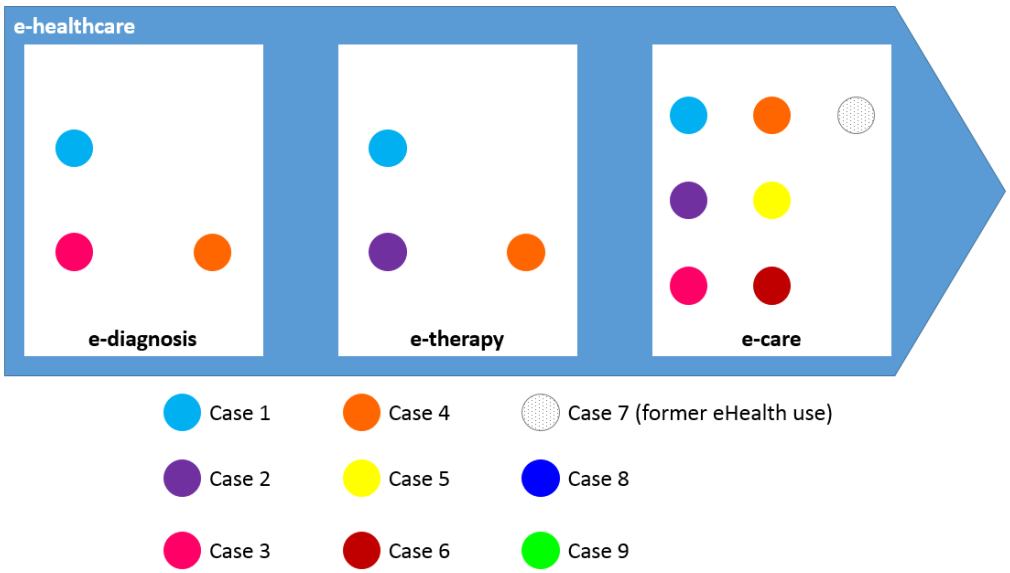

Figure 4: eHealth applied to P2D or D2P by case 1-9 in diagnosis, therapy, and care.

eHealth that supports adjusting medication and administering medication is regarded as e-therapy. H1 for instance recently finished a project on HF patients using iPads in the waiting-room. When waiting for their appointment, HF patients answer healthcare and disease related questions on the iPad (I#2). According to R#2, questions are for example "do you understand how to take your medication?" and "do you take your medicines correctly?". This type of e-therapy helps the healthcare provider to evaluate the effectiveness of information given during previous consults and therapy. "If patients do not understand why they must take their medicines and thus do not take their medicines, then you [as a medical specialist] have a problem because then your therapy is unsatisfactory", stated R#2.

The investigated cases mainly demonstrated examples of e-care. This type of eHealth concerns telemonitoring and telecare (Krijgsman and Wolterink, 2012). Telemonitoring is described as "monitoring a patient at distance, in which the patient measures his own health values at home … or fills out digital questionnaires. Based on the outcome of measurements and questionnaires, the healthcare professional can be warned when the health of the patient seems to deteriorate" (Krijgsman et al., 2015, p. 103). Telecare concerns care which for instance is provided through video consults (Krijgsman and Wolterink, 2012) or short clips showing disease related information to patients in order to better self-manage their disease. R#18 stated that e-care is considered safer to start with for including chronic patients in eHealth use compared to other types of eHealth involving diagnosis or therapy, because then all acute possibilities are already examined and excluded. This could explain why the majority of the cases is involved in e-care, rather than e-diagnosis or e-therapy. The yearly outlook on eHealth use in the Netherlands showed that 41 medical specialists are using telemonitoring of which 25% applies telemonitoring to HF patients, 17% to COPD patients, and 14% to asthma patients (Krijgsman et al., 2015). The e-care app with regard to H5's first pilot for instance is applied to HF patients (I#10; I#11; Annual Report H5, 2014). This e-care app features several functionalities. Firstly, patients are equipped with a wireless scale and blood pressure monitor device for daily self-measurement and e-monitoring of weight and blood pressure (I#10; I#11; Annual Report H5, 2014). As long as the patient remains within the boundaries with regard to weight and blood pressure, which have been determined by the GP or medical specialist, then nothing happens (I#10; I#11). "Then it is just self-management by the patient

and there won't be any medical specialist involved", underlined R#16. Secondly, a digital questionnaire is used for weekly e-monitoring (I#11). This questionnaire includes questions on the patient's habits "and it creates a record on developments in the patient's lifestyle", explained R#16. The e-care app also features a video consult tool which provides access to 24/7 contact with the care organisation (I#10; I#11). Furthermore, the e-care app contains an educational functionality for broadening the patient's knowledge on HF and improvements in lifestyle (I#11; Annual Report H5, 2014).

5 Analyses & Results

Analysing the nine cases on the influence of CC, DCs, and SR towards use of eHealth led to various results. Aspects stimulating eHealth use, called drivers, and elements inhibiting eHealth use, named barriers, are presented. The main findings are specified to the three stages of eHealth use[5]. Remarkable similarities and differences with regard to CC, DC, and SR between the various stages are exhibited. Each stage reflects findings of three analysed cases. Coded content of each case is compared with other cases situated in the same stage of eHealth use, and remarkable similarities and differences between cases with regard to the theoretical concepts are mentioned. Sub-nodes, including dimensions and indicators, that belong to specific concepts are only addressed when coded in all three cases of a similar stage, in order to keep the results as reliable as possible based on triangulated data. Only highly corresponding coded content is mentioned, unless the coded data presented a new avenue in enriching the body of empirically obtained data. Furthermore, the concept of the socio-technical regime applied to eHealth in the Netherlands is addressed.

Nodes are presented in italics. Semi-structured interviews are referred to as 'I#N'. Quotes and survey data of specific respondents are referred to as 'R#N' (see 'Appendices' for respondents' affiliations). Survey data is used when the obtained data from semi-structured interviews left room for additional clarification. Cases or hospitals are referred to as 'case N' or 'HN'

5.1 Utilization stage: experienced eHealth hospitals

The utilization stage includes three cases: H1, H2, and H3. H1 is a UMC[6] and wants to be first to market when it comes to data sharing between patients and healthcare providers (I#1). Moreover, H1's ambition is to be first to use a new eHealth tool (R#2; R#18; R#19). During three interviews (I#1, I#2, and I#3), questions are answered by two medical specialists (R#2 and R#18), one nurse practitioner (R#20), and one innovation researcher (R#19).

H2 is a regional hospital which is currently involved in a merger with other hospitals (I#16; Annual Report H2, 2014). This also means a merger of multiple HF clinics, various routines, and different e-monitoring systems (I#16). The merger will therefore determine H2's future use of its e-monitoring system. It is not clear yet how this situation will develop. This hospital is characterized by both a first to market ambition (R#15) and a fast follower ambition (R#9). H2 attempts to be first in implementing emerging eHealth initiatives and tries to be involved in further development of these initiatives, because "we believe in eHealth. eHealth is the near future!", according to R#15. The hospital also notices worldwide studies on eHealth. When the scientific results are promising, H2 wants to carry out tests itself (I#16). During two interviews (I#15 and I#16), questions are answered by two nurse practitioners (R#9 and R#15).

H3 is a UMC which wants to be first to market with new eHealth tools (R#4; R#14; Annual Report H3, 2014). This UMC wants to be known as innovative in order to attract the best medical staff and researchers (I#17). During three interviews (I#17, I#18, and I#19) questions are answered by one

[5]Three stages of eHealth use: (i) consideration stage refers to non-users that evaluate if they would like to use eHealth in their hospital or hospitals that returned to the consideration stage by complete attrition of eHealth initiatives, (ii) initiation stage includes newcomers; hospitals that recently implemented and started to use eHealth (no continuation in practice after first pilots yet is also possible in this stage), (iii) experienced hospitals in the utilizations stage continued with and improved previous pilots, and/or execute a broad range of pilots.

[6] University Medical Center

employee working at H3's innovation department (R#4), one medical specialist (R#8), and one employee of H3's support staff (R#14).

5.1.1 Cognitive change

The majority of respondents that belong to the group of experienced hospitals addressed in the survey that *noticing external change* is desired to be done in a strong and structural way as it is seen as a driver for eHealth use (R#2; R#18; R#15; R#9; R#4; R#14). Remarkably, data conducted by semi-structured interviews showed that noticing external change was mainly present in case 1 and 3 (see table 1), which involve both UMCs. External change noticed by experienced hospitals for instance involves shifts in healthcare consumers' demand and technological developments with regard to ICT and healthcare.

Getting insight in *healthcare consumers user practices and characteristics* could potentially drive hospitals willing to use eHealth. R#2 explained that H1 wants to improve its understanding of healthcare consumers' motives and what they want. "We aren't good enough at knowing what patients want. We should do it in a structured way", stated R#2. "Sometimes also patients notify me about new developments", mentioned R#8, a medical specialist at H3. Cases 1 and 3 showed that there is a broad range of technological possibilities to improve D2P or P2D contact, but it is not always noticed what patients want which slows down broad application of eHealth in the organisation. R#18 explained for example that "patients really want to make online appointments … or want to have access to X-rays taken from their broken leg, through a patient portal for example. This is not difficult technically, but the specific department probably hasn't noticed this wish so far".

Noticing external change also is considered supporting for *cognitive change* towards eHealth as a lot of *technological developments* take place outside the organisation (I#17; I#18; I#19). At H3, external change is noticed by looking at how eHealth is applied in other countries, like "the USA or Spain" mentioned R#4. Also developments in the national healthcare regime are noticed by H3's healthcare professionals and innovation department (I#17; I#18). "If healthcare professionals notice further developed projects in other hospitals, then they want to use it themselves as well", stated R#4. Healthcare professionals also notice external change through techno-scientific knowledge available in media and conferences (I#18). However, H3's healthcare professionals did not seem to have enough time available for structurally noticing external change (I#17; I#18). Therefore, "our innovation department tries to stay informed on all external developments", explained R#4. The department for example notices changes in sectoral policy and developments as the ministry of VWS is trying to guide change towards eHealth (I#17).

Table 1: Main findings about the influence of cognitive change in experienced eHealth hospitals with regard to noticing external change.

Main findings cognitive change	Case 1	Case 2	Case 3	Ratio of interviews topic is presented in
I: Noticing external change	X		X	**5/8**
Looking for new opportunities			X	2/8
Not noticing external change			X	1/8

The experienced hospitals showed that *constructing meaning of external change* led to positive *beliefs regarding eHealth*. eHealth is believed to be a possible solution for existing problems in healthcare (I#2: I#3; I#15; I#16; I#17; I#18). According to R#2 and R#18, constructing meaning of a new innovation like eHealth should be done among the workforce, rather than a top-down organisational policy. eHealth should solve a problem faced by employees themselves in the established way of working (I#1; Krijgsman et al., 2014). It should complement specific needs of healthcare professionals since they are the ones that need to use eHealth in practice eventually (I#2). In other words, it should be a problem-guided search, otherwise actual usage of an implemented eHealth tool is not likely to succeed (I#1; I#2). Therefore, H1 has started searching for existing problems in current routines by asking its workforce what problems they face and it tries to solve these problems by implementing new techniques like eHealth (I#1; I#2). "What is the problem at hand?" (R#2) or "what is interesting for you? And how can we assist in solving your problem?" (R#18). R#2 explained what problem was faced at the H1's HF clinic and how eHealth came into play: "our routine with regard to consults at the HF clinic is very old fashioned. It has been the same for 50 years: a ten minute conversation with your patient and most of the time the patient is just fine. Of course this is a waste of time for the patient and for me as well. Therefore the idea has arisen to do it differently, by using electronics". According to R#19, a digital desk for P2D contact solved the following problem: "when a patient calls us about deterioration of his disease, we often discuss this during the next consultation hour. However, this consultation hour is scheduled two months later and then the patient doesn't remember exactly what happened and why they called. Therefore, patients can contact us by email with their questions and we will reply through a digital consultation hour the same day or the next day. We hope this will help us to earlier recognize certain symptoms and prevent exacerbations". These two examples at H1's HF clinic thus show that eHealth helps to reduce redundant consults and to provide care through more effective digital P2D and D2P communication. Also at H2 it started with a problem faced by the HF clinic. "We couldn't handle the flow of HF patients anymore and there were lots of patients who were repeatedly hospitalised, so we figured that this had to change", mentioned R#15. H2's HF clinic has constructed meaning of available eHealth tools provided by external organisations. The department believed that eHealth could help them to deal with the large amount of patients repeatedly hospitalized. A solution is found in H2's e-care platform which enables HF patients to stay at home instead of hospitalisation, and thus reduced the flow of patients (I#15; I#16). Furthermore, an online questionnaire contributed to getting an improved insight in the overall health status of COPD patients of H3 (I#18). Case 1, 2, and 3 thus exhibited that constructing meaning of eHealth and how it can be part of the solution, drives hospitals willing to use eHealth. Also Krijgsman et al. (2015) explain that medical specialists belief that eHealth has added value because it can improve the accessibility of the clinic and reduces wasted time.

Constructing meaning of external change, of emerging eHealth tools, has also led to *resistance to change* (I#1; I#2; I#15; I#17; I#19). It is believed that initially the majority of an organisation is resistant to use eHealth (I#17; I#19). According to R#18: "if you ask doctors or nurses why they would use eHealth, then they often say: I won't use it because the current system functions well. It is just fine the way it is" or "we've been doing this for ten years. Why should we change it?". This is in line with R#14 who explained that "healthcare professionals are quite conservative and immensely trust in their own routines, therefore they find it pretty difficult to fully or partially relinquish some tasks and to trust on eHealth". Besides, an employee working at H3's innovation department stated that critical healthcare professionals are resistant to work with eHealth as long as it is not fully integrated, "afraid that they can't trust the new technologies" (R#4). Nurses and doctors can also be resistant to change because they are afraid that additional information provided by eHealth would result in patients panicking and asking a lot of questions (I#1; I#2). R#9 mentioned that, in contrast to the experienced eHealth hospitals, less experienced hospitals often do not see the additional value of eHealth when they incorrectly apply

eHealth; they do not fully reconfigure their resources and processes, which causes additional workload. The experienced hospitals showed that resistance to change was and still can be a barrier for eHealth use.

Table 2: Main findings about the influence of cognitive change in experienced eHealth hospitals with regard to constructing meaning of external change.

Main findings cognitive change	Case 1	Case 2	Case 3	Ratio of interviews topic is presented in
II: Constructing meaning of external change		X		1/8
Beliefs regarding current routines	X	X	X	3/8
Beliefs regarding eHealth	X	X	X	**6/8**
Resistance to change	X	X	X	**5/8**

New beliefs in order to cognitively change towards eHealth, breaking from the conventional way of providing healthcare, *are developed* in several ways. *Building coalitions* at departmental level preceded the use of eHealth in a broad range of applications in the experienced hospitals. In H3 healthcare professionals who are open to renewal or eHealth-minded are designated and involved in a project first (I#17; I#18; I#19). Subsequently, the eHealth-minded medical specialist for example should get his critical peers involved as well and should diffuse development of new positive beliefs among his colleagues (I#17). This example of building coalitions at H3 showed co-evolvement of CC and DC both positively influencing eHealth use in the organisation: building coalitions stimulates the hospital willing to use eHealth, and allocation of human resources enables healthcare professionals to have time to get involved in an eHealth project (see also the next section on dynamic capabilities). H3's approach also is considered effective by R#23, one of the interviewed experts. The workforce of H1's cardiology department showed to be highly involved in coming up with improvements challenging the conventional way of working, for instance by spontaneously discussing perceptions on new innovations and allowing employees to work on their new ideas (I#2; I#3). "This morning someone came up with an idea, and now already three other persons have commented on his idea by email", showed R#2. High involvement of employees is also the case when actively approaching and asking a department's employees what problems they face and how they believe eHealth could solve this. H1's medical innovation researchers and professionals have conversations with heads of departments and employees closest to the faced problem, and identify possible solutions together. "Having a dialogue as peers", said R#18. It is important to build coalitions at departmental level as "departments differ in characteristics like type of patients and type of doctors", explained R#18. The healthcare professionals of H2's HF clinic who faced the problem regarding high numbers of hospitalisation were also highly involved in thinking about solutions and the beliefs regarding eHealth have been discussed with the head of department as well (I#16). Although a coalition was built at departmental level, the rest of H2's organisation was not really involved. "This was neither hindering, nor facilitating", indicated R#9.

Furthermore, all experienced hospitals showed that *new beliefs are developed* by a *shared vision* in favour of eHealth. A shared vision supporting eHealth is described as "a prevailing mentality for radical change" (R#2), "willing to get things done" (R#2), "an enormous drive for innovation" (R#19), "openness" (R#19), and "a positive mind-set saying 'yes, if' instead of 'no'" (R#19). It is addressed that a

shared vision is essential for stimulating the willingness to delve into eHealth as it is radically different than the established way of working (I#15). In addition, a shared vision on existing problems stimulates people willing to solve them (I#1; I#2; I#3). Like building coalitions, also a shared vision at departmental level is required for eHealth use. It is also addressed that new beliefs are only developed, when there is a shared vision among the entire department (I#3; I#15; I#16; I#18). For example, in H1's cardiology department "our head of department is the key … and everyone is willing to change and to try new things", mentioned R#19. A shared vision involving a problem and possible solution is created and is put on paper first before taking action (I#1). Also at H3's pulmonology department a shared vision on how to improve healthcare allowed that new beliefs were developed by the department's nurses and mainly medical specialists (I#18). However, it is experienced that this specific department *lacks a shared vision* from which new beliefs logically emerge and therefore applying new things or routines, like using eHealth, is done quite ad hoc (I#18). Although a shared vision on eHealth was not the case for the entire organisation in H2, this did not hinder the HF clinic starting to use eHealth. "Especially when we started using the e-care platform there wasn't any organisational vision on eHealth", explained R#9, and R#15 added "our vision regarding the e-care platform hasn't been communicated to the higher level management, as far as we [from the HF clinic] know it". Later on, the entire hospital got involved in eHealth use with regard to HF patients. R#9 explained that "the e-care platform led to positive results, patients were enthusiastic about it, and there was positive attention by media, so the hospital had to back the platform by then". This case showed that cognitive change through developing new beliefs initially at departmental level, led to strategic reorientation in a plan of action at organisational level designed to achieve patient oriented healthcare in which the patient should be central in the healthcare regime (Annual Report H2, 2014; I#15; I#16). Also in the third case cognitive change through developing new beliefs, led to strategic reorientation. In H3 the shared vision at organisational level reflects the hospital's innovative ambition of being first to market, which led to the creation of a new department dedicated to innovation a few years ago (I#17). H3 has a certain idea and vision about eHealth as it stimulates the innovation department to work on several eHealth projects (I#17). A shared vision has thus led to strategic reorientation and strategically acting in favour of innovation, including eHealth use.

Table 3: Main findings about the influence of cognitive change in experienced eHealth hospitals with regard to developing new beliefs.

Main findings cognitive change	Case 1	Case 2	Case 3	Ratio of interviews topic is presented in
III: Developing new beliefs	X		X	4/8
Shared (project) vision	X	X	X	**7/8**
Lack of shared (project) vision			X	1/8
Building coalitions / high involvement of employees	X	X	X	**8/8**

Summarizing, the utilization stage showed a positive influence of *CC* on *SR*, and on eHealth use *without SR* coming into play as well. Willing to use eHealth seems to precede eHealth use in the organisation, since all cases addressed the importance of cognitive change, mainly at departmental level, required to start using eHealth in the organisation. Cases situated in the utilization stage demonstrated that *noticing external change* is a driver for willing to use eHealth, but could be improved. Even by experienced

hospitals. Getting insight in healthcare consumers user practices and characteristics and technological possibilities present outside the own hospital, could potentially stimulate hospitals willing to use eHealth. However, despite of *lacking* structurally *noticing external change* the three hospitals did succeed in becoming experienced with regard to using eHealth. The experienced hospitals also showed that *constructing meaning of external change*, specifically with regard to how eHealth is believed to be part of a solution, drives hospitals willing to use eHealth. *Positive beliefs regarding eHealth* are visible at departmental level, where eHealth contributed to more effective P2D and D2P communication (H1), reducing preventable flow of patients (H1, H2), and getting improved insight in patients (H1, H2, H3). Furthermore, *developing new beliefs* contributed to CC of hospitals situated in the utilization stage. The three cases showed that *building coalitions* at departmental level stimulated eHealth use. Also co-evolvement of *CC* and *DC* positively influencing eHealth use in the organisation is reflected by one case. Building coalitions stimulates the hospitals willing to use eHealth, and allocation of human resources enables healthcare professionals to have time to get involved in an eHealth project (see also the next section on dynamic capabilities). Like building coalitions, also a *shared vision* in favour of eHealth at departmental level is beneficial for eHealth use. This is visible at the cardiology departments of both H1 and H2.

In addition, two cases also showed an indirect positive influence of *CC* through *SR* on eHealth use. Case 2 showed that *developing new beliefs* initially at departmental level has led to *SR* in a plan of action at organisational level designed to achieve patient-oriented healthcare, which is partly done through eHealth at the HF clinic. Also in the third case *developing new beliefs* has led to strategic reorientation, as a shared vision on innovation at organisational management level resulted in a plan of action regarding innovation and the creation of a new department dedicated to innovation, including eHealth, a few years ago. These examples of CC positively influencing a hospital's strategy reflect that strategic reorientation happens over time. Nevertheless, a specific reoriented organisational strategy that structurally guides implementation and use of eHealth in the organisation is not present in any experienced hospital. Instead, adapted and renewed strategic plans most of the time addressed stimulating innovation or patient-oriented healthcare in general. Innovation and patient-oriented healthcare are seen as strategic goals and eHealth as a means to achieve those goals.

The experienced hospitals also revealed that resistance to change was and still can be a barrier for willing to use eHealth, which thus showed CC negatively influencing eHealth use in the organisation. The experienced hospitals have tried to overcome this resistance by stimulating constructing meaning of eHealth through promoting it as believed to be a possible solution for existing problems in healthcare. The experienced hospitals also focus on developing new beliefs in order to overcome resistance to change in the organisation: by building coalitions and through realising a shared vision on healthcare reform and innovation or eHealth specifically.

Furthermore, the three cases demonstrated that CC towards eHealth is department specific. Not all departments involved in chronic diseases of an experienced hospital are by definition cognitively changed towards eHealth yet. This can differ per medical department, as the pulmonology department of H3 for example showed that a lacking clear shared vision has not led to structurally and strategically acting regarding eHealth yet. Departments can vary in their constructed meaning and beliefs regarding eHealth, and prevailing shared vision on eHealth.

5.1.2 Dynamic capabilities

Many activities performed by the experienced hospitals make them capable of being dynamic. They are able to adapt to and use eHealth. Besides willing, in other words cognitive change, these hospitals are

capable of doing as well. R#18 mentioned for instance: “Our cardiology department really does something, instead of only talking about eHealth”.

Case 1, 2, and 3 presented *building up resources* as a major driver for eHealth use in the organisation. In all semi-structured interviews with employees of experienced hospitals *experimenting* with eHealth in a broad range of pilots is mentioned (see table 4). *Experimenting* seemed to have stimulated eHealth use in experienced hospitals since the amount of eHealth initiatives and the number of patients included have increased over time. The group of experienced hospitals has been involved in multiple eHealth pilots, varying in sample size included (see ‘Appendix IV’). eHealth tools are often first *tested* by healthcare professionals themselves, before starting a pilot and *taking out these products to healthcare consumers* (I#2; I#3). “We have tested the video consult and monitoring equipment ourselves first, and we wrote a manual for our patients”, stated R#19. The subsequent pilot aims to measure and test certain hypotheses regarding advantages for both patients and healthcare providers and the feasibility of using an eHealth tool (I#1; I#3; I#17), “like we are used to really want to getting to know how things work in the medical field”, explained R#18. R#4 indicated that “about three out of ten pilots are successful” at H3. A pilot that was not considered successful is for example the telemonitoring device used by COPD patients, which is evaluated for future improvements (I#19), like described in the appendix on ‘Empirical findings of case 3’. *Experimentation* with regard to eHealth often starts in small settings (I#1; I#2; I#3; I#17; I#19). Recent pilots discussed with interviewees of case 1 for instance included about twenty patients and about four healthcare providers (I#1; I#2; I#3), and a recent pilot with regard to an e-monitoring wearable at H3’s pulmonology department included ten COPD patients (I#18; I#19). Later on, eHealth becomes a more prominent part of providing healthcare. Case 2 for example showed that the e-care platform has become an integral part of care for HF patients over time. At H2 “all HF patients are included, unless they really don’t want it”, explained R#15. These findings suggest that, over time, experimenting with eHealth pilots has led to broader application of eHealth.

Building up resources, specifically knowledge, is also done by *learning from experience*. Taking out eHealth to patients helped *examining and reviewing* the innovation’s operational processes like communication and including patients (I#2; I#3). “Does the patient understand, despite our tests and manuals, how he must contact us or must download something?”, is one of the questions R#19 wants to evaluate throughout the pilot. In addition, the importance is addressed of constantly *examining and reviewing how the innovation is managed* until the pilot is finished. “We keep doing follow up questions on our projects in order to check if everything is ok”, explained R#2. Subsequently, recommendations for improvements are done based on *reflections on the innovation process* (I#2; I#19). eHealth tools are adapted in order to improve future use of the innovation. “The first version of the questionnaire lacked a few questions”, stated R#2, and therefore adjustments are made into a new version of the online questionnaire. Also H3’s pulmonology department gave recommendations for improvements to the developer of the e-monitoring tool about why it did not work well (I#19). Pilots are, in this way, thus used for building up knowledge in order to improve and continue eHealth use.

Another interesting finding was that, *building up resources* through *learning from others inside the organisation* contributes to *CC* towards eHealth in the organisation. Pilots carried out by healthcare professionals presented the effective possibilities of eHealth to other people in the organisation, stimulating the organisation’s employees in their beliefs regarding eHealth (I#1; I#3; I#17). “Seeing is believing”, stated R#4. Visibility and tangibility in the own organisation stimulate constructing meaning of eHealth in the short-term because “then everyone, also the critical healthcare providers, has to really think about it and explain why they like it or not”, explained R#4. However, not everyone is focused on showing their idea to others as healthcare professionals’ vision is often limited to their own specific

department or clinic (I#1; I#17; I#19). “There are very smart people in our organisation but they are isolated on their own island; their vision doesn’t include other departments”, stated R#18 which is one of H1’s medical specialists. This is in line with R#4, an employee working at H3’s innovation department, who explained that “healthcare professionals often think that innovation in a different disease area won’t work for their specific disease area, while basic concepts as lowering the amount of physical consults are often the same”. *Not learning from others inside the organisation* could become a barrier for extending eHealth use in the organisation. Therefore, the innovation departments of UMCs H1 and H3 have tried to connect employees and innovative ideas (I#1; I#17). The innovation departments have aimed to create a synergy of *learning from others inside the organisation* (I#1) and to facilitate *sharing of experiences* among employees in the organisation (I#17). R#2 underlined the value of *sharing of experiences*: “by talking with each other you often soon find out how to fix something”. H1’s innovation department recently started to present short stories about successful eHealth pilots, like one in the HF clinic, to employees of other departments (I#1). H3’s innovation department for example is currently connecting several medical departments to its eHealth platform (I#17; I#19). Other departments like ICT department or even other organisations get involved by H3’s innovation department when an eHealth initiative is further developed and needs to be implemented throughout the organisation (I#17).

The results also showed that *research and development* (R&D) is part of how experienced hospitals are *building up resources*. As UMCs, H1 and H3 are logically involved in *research* on a broad range of medical topics. H1 is involved in for example a scientific study on using an eHealth platform for providing information and education in order to improve COPD patients’ lifestyle, a study on improving care for HF patients by e-cardiology, and a publication on eHealth supporting asthma patients (#1; I#2; I#3). Also H2, which is a regional hospital, conducted *research* on eHealth. H2 has studied telemonitoring with regard to HF patients since 2008 and the hospital has got involved in a collaborative study on e-monitoring later on (I#15; I#16). These studies contributed to the healthcare regime’s available *techno-scientific knowledge* on use of eHealth (I#1; I#15; I#16). In addition, this resulted in other hospitals approaching H2 for sharing experiences on how to use eHealth (I#16). Besides *research extending knowledge on eHealth use* in healthcare, experienced hospitals also *developed human resources* to be able to use eHealth in the organisation. H2 specifically trained nurse practitioners to work with the e-care platform and visit the included HF patients at home (I#16). This is also done in H1 (I#1; I#2), where specifically trained nurses work with the HF e-care platform (I#2). Another example showed that nurses are trained and educated in order to work with the online questionnaire for COPD patients in H3 (I#18). Also internal *development* of other resources is underlined by some interviewees (I#1; I#2). H1’s cardiology department for example has developed its own EHR[7] since twenty years, which “has made the department’s workforce used to adapt functionalities and processes” explained R#2. The cardiology department tries to do most of the development inside their own department because only then they can control and guarantee quality (I#2). “If we would ask someone else for developing a crucial part, then I hope it will turn out good. Because if it doesn’t, then we can’t continue”, explained R#2. The examples presented by case 1, 2, and 3, show that *research extending knowledge on eHealth use* and *development of own resources* have driven eHealth use in experienced hospitals. It made them capable of being dynamic; to change and to work with eHealth.

[7] Electronic Health Record

Table 4: Main findings about the influence of dynamic capabilities in experienced eHealth hospitals with regard to building up resources

Main findings dynamic capabilities	Case 1	Case 2	Case 3	Ratio of interviews topic is presented in
I: Building up resources				0/8
Experimenting: testing and taking out products to healthcare consumers	X	X	X	**8/8**
Learning from experience: reflection on the innovation process, examining and reviewing how innovation is managed	X	X	X	4/8
Learning from others inside the organisation	X	X	X	**6/8**
Not learning from others inside the organisation	X		X	3/8
Research and development	X	X	X	**7/8**

It is interesting to note that all cases reflected activities related to another dynamic capability: *reconfiguring resources* (see table 5). This dynamic capability seemed important for eHealth use because existing resources, like human resources and financial resources, needed to be reconfigured in order to be capable of using eHealth as it radically differs from the current way of working. *Reconfiguring resources* is done in all three experienced hospitals through *combining new and existing resources* by adequately allocating resources (see table 5), in order to stimulate further development and usage of innovations like eHealth (I#1; I#2; I#3; I#15; I#16; I#17; I#18; I#19). R#14 mentioned that "it will be easier to incorporate new things in existing processes, when a clinical pathway is highly predictable". R#2 explained that "it is often soon clear what needs to be done to implement and use a new eHealth initiative, that there needs to be realised a new system, what should be included in the system, and who needs join into the initiative and thus must quit other tasks". The importance of *allocating* capable *human resources* to work with eHealth is reflected by all three experienced hospitals. Allocation of human resources to an eHealth initiative is considered essential in H1 (I#1; I#2), as "a plan needs a person to be responsible for succeeding it", stated R#2. This is in line with H3, where allocation *of* human resources is done by designating someone ownership and responsibility of an innovative project for three years (I#17; I#19). This designation is accompanied by providing this person time and space, which is necessary to cope with the high workload among healthcare professionals (I#17; I#18). As mentioned in the previous section, this also contributes to *cognitive change* towards eHealth as *coalitions are built*. In case of H2's e-care platform, adequate human resources are allocated to work with eHealth. H2's nurse practitioners are allowed to adjust medication when they monitor an exacerbation, which accelerates the process as the nurses do not have to ask the medical specialist's permission (I#15; I#16). Furthermore, *allocation of financial resources* is considered important in order to procure an eHealth tool, especially when the project takes off in order to accelerate development and scaling up the activities (I#1; I#2; I#17; I#18; I#19), like financial resources for development of the digital consultation hour system and its complementary video consult room (I#1; I#2). Besides, systems providing medical data about a patient are often isolated systems, "while it is necessary to know a

patient's complete medical background including medication, previous hospital visits, and e-monitoring data", stated R#2. H1's cardiology department therefore *combined existing resources* into one integrated application which easily provides the required insight in HF patients current health status and their context (I#2).

Reconfiguration of resources is also characterized by *repositioning of existing healthcare services*. "Combining multiple resources, like existing devices and wearables, leads to new processes", explained R#4. This is in line with R#23, an expert of the Dutch centre of expertise for standardisation and eHealth, who stated that using eHealth "is mainly a change that is not so much on ICT sphere, but which is a higher level change because at the process level". In H3 for example, existing surveys for screening are combined in such a way that healthcare for COPD patients is repositioned and a new clinical pathway with regard to COPD is created (I#18). H2 *repositioned* its healthcare with regard to HF patients by creating a new clinical pathway as well (I#15; I#16). As the e-care platform enabled providing 24/7 care instead of an HF clinic operating based on limited 'office hours', H2 repositioned healthcare service provided by its HF department (I#15; I#16). "Most HF clinics are not capable to provide 24/7 care as they are only opened three days a week", explained R#9, while "such an e-care platform requires continuity to make it work" stated R#15. However, not everyone agreed that eHealth by definition should fully substitute existing healthcare and clinical pathways. Some considered eHealth to be blended care; eHealth partly substituting or adding a new way of exchanging data P2D or D2P to the existing way of working (I#1).

Table 5: Main findings about the influence of dynamic capabilities in experienced eHealth hospitals with regard to reconfiguring resoruces.

Main findings dynamic capabilities	Case 1	Case 2	Case 3	Ratio of interviews topic is presented in
II: Reconfiguring resources				0/8
Combining new and existing resources: adequate allocation of resources	X	X	X	**8/8**
Repositioning of products / services	X	X	X	**5/8**

The influence of DC's *integrating resources* is mentioned during almost all semi-structured interviews of the three cases (see table 6). H2 and H3 integrated several eHealth tools by *acquiring external technological resources*, including software and hardware, through collaborating with industrial developers (I#15; I#16; I#17; I#18; I#19). H2 closely collaborates with an industrial partner in medical devices for acquiring external resources involving the technical aspects of the e-care platform (I#15; I#16). Together with its industrial partner H2 is evaluating the platform and considering improvements like video consult and a do it yourself ECG (I#16). Also collaboration with other healthcare organisations, like regional care organisations and GPs, for *acquisition of external services* is addressed important in case 2 (I#15; I#16). An external care organisation is situated between the HF patient and H2 for visiting and assisting patients in taking their medication for example. Also an external medical service centre is involved, with regard to controlling the alerts released by a patient's e-care platform and therefore reduces the amount of alerts actually sent to the hospital (I#15; I#16). *Integrating resources* through *acquisition of external resources* thus seemed to be a driver for being able to use eHealth since there are

various organisations available to collaborate with, that offer complementary eHealth tools and services.

In the utilization stage *integration of resources* - or more specifically: obtaining external knowledge - is also done by *learning from others outside the organisation* (see table 6). H3's innovation department organised sessions on specific innovation related topics where industry and healthcare providers meet for exchanging ideas (I#17). Learning from an industrial organisation is also done at the pulmonology department as it was taught on how to use the e-monitoring device and how to analyse monitored data (I#18). Moreover, involving stakeholders like GPs in order to mutually improve new clinical pathways involving eHealth is considered important as multiple healthcare organisations are often involved in providing healthcare to chronically ill patients (I#16). However, it is also said that learning from others outside the organisation should be improved in general as organisations in the healthcare regime tend to be isolated inventing everything on their own (I#19). It thus can be stated that DC can positively or negatively influence the ability to use eHealth in the organisation through (not) learning from others outside the organisation. Especially, learning from other healthcare organisations is a potential driver as it is not done in a structured way yet.

Table 6: Main findings about the influence of dynamic capabilities in experienced eHealth hospitals with regard to integrating resources.

Main findings dynamic capabilities	Case 1	Case 2	Case 3	Ratio of interviews topic is presented in
III: Integrating resources			X	1/8
Acquisition of external resources	X	X	X	**7/8**
Learning from others outside the organisation	X	X	X	**7/8**

5.1.3 Strategy & Strategic reorientation

The survey results showed that the strategy of the experienced hospitals pays attention to eHealth (R#2; R#18; R#15; R#8; R#4; R#14). However, as figure 5 shows, only a few respondents considered that their hospital's strategy prominently pays attention to eHealth (R#2; R#18; R#14). The first case exhibited a range of eHealth examples and there are more ideas to come. This logically follows from H1's strategy which actively guides innovation activities and facilitates with necessary resources (R#2; R#18; R#19). According to R#4, strategy is about "what do we have to do in order to achieve that, [our vision], and how can our innovative developments contribute right here, right now". H3's strategy does consider eHealth, although it is not seen as top priority (R#4; R#8; R#14). "Innovation can be a lot of things, and does not necessarily mean that we want everything to be eHealth", explained R#4.

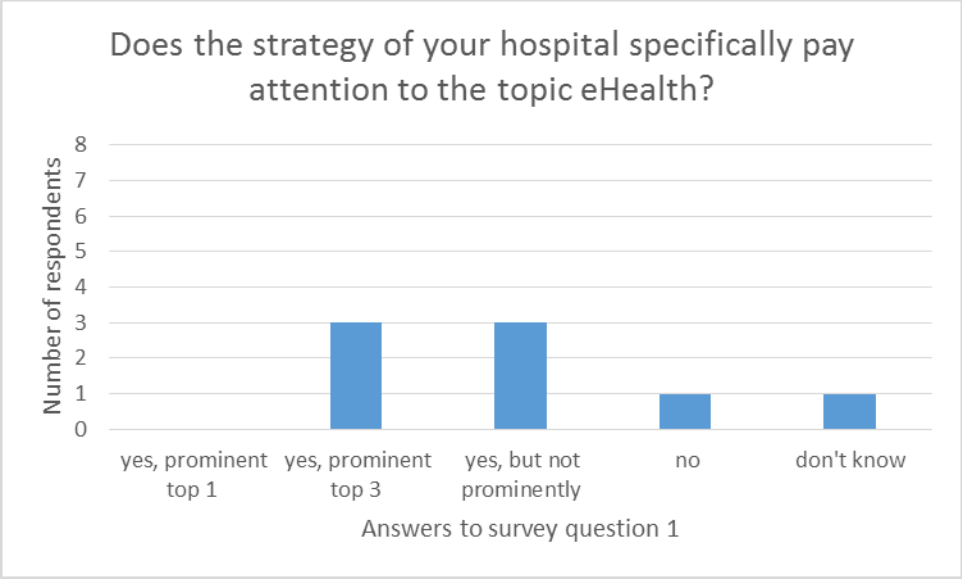

Figure 5: The strategy of experienced hospitals on eHealth.

It is impossible to explore, implement and further develop all innovations available, so choices are made on what projects will and will not be carried out (I#1; I#17; I#18). *Making choices and strategic selection* for use and further development of an eHealth project are determined by factors like efficacy and efficiency of eHealth (I#1), and if there are technical problems (I#3). Also patients' experience is an important factor for *decision-making* as H1's strategy seemed *patient-focused* (R#2; R#18; R#19). These factors are the outcome of DC's *building up resources* through *learning from experience* and *experimenting*, which makes DC influential for strategic reorientation's (SR) decision-making on using eHealth. *Decision-making, making choices and strategic selection* of eHealth tools to be used is also based on *shared vision* over time (I#15; I#16; I#17; I#18), *available resources* like human resources, time and financial resources (I#17; I#18), and *strategic focus* (I#17; I#19). This reflects the influence of *cognitive change, dynamic capabilities*, and existing strategy on strategic reorientation towards eHealth use. As mentioned before, case 2 touched upon a limited influence of CC on SR initially, as eHealth use emerged from a department's *shared vision* with regard to providing healthcare to HF patients. *Making choices and strategic selection* of innovative initiatives is done by the innovation department in the third case (I#17). Also the board of directors is involved in *decision-making* in this case, especially when it regards changes in financial resources (I#17; I#18).

5.2 Initiation stage: newcomers

The initiation stage consists of three cases: H4, H5, and H6. H4 is a regional hospital and is rather reactive when it comes to eHealth (R#5, R#6, R#7). It solely uses eHealth tools that have proven their value in other hospitals (R#5, R#6, R#7). During three interviews (I#12, I#13, and I#14) questions are answered by one employee of H4's support staff (R#5), one nurse (R#7), and one employee of H4's ICT staff (R#6).

H5 is a CTCEH[8] and serves the region as well (I#11; Annual Report H5, 2014). H5's ambition is rather reactive when it comes to eHealth (R#11, R#12, R#16). It solely uses eHealth tools that have proven their

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value in other hospitals (R#11, R#12, R#16). Both e-care platforms H5 uses, have already been used by other Dutch hospitals (I#10; I#11). During two interviews (I#10 and I#11) questions are answered by one employee regarding innovation and ICT (R#11) and two employees of H5's support staff (R#12 and R#16).

H6 is a CTCEH[9] and is rather a fast follower (R#10) or even reactive (R#13) when it comes to eHealth. "We didn't take the first step with eHealth. Other hospitals need to take the first step. They can show novelties to us and then we might want to join as well", mentioned R#10. According to R#13, H6 solely uses eHealth tools that have proven their value in other hospitals "because they first want to know what results are provided by previous studies". During two interviews (I#4 and I#5) questions are answered by one medical specialist (R#10), two nurses (R#13 and R#20), and one employee of H6' support staff (R#21).

5.2.1 Cognitive change

Respondents of the initiation stage considered *noticing external change* less important, than respondents of the utilization stage (see figure 6). Especially H5 addressed the importance of noticing external change for willing to use eHealth (I#10, I#11). This corresponds with two respondents of the initiation stage that answered that noticing external change should be done in a strong structural way (R#11; R#16). "Being aware of the changing world, and to be willing to change in accordance with that changing world", explained R#16.

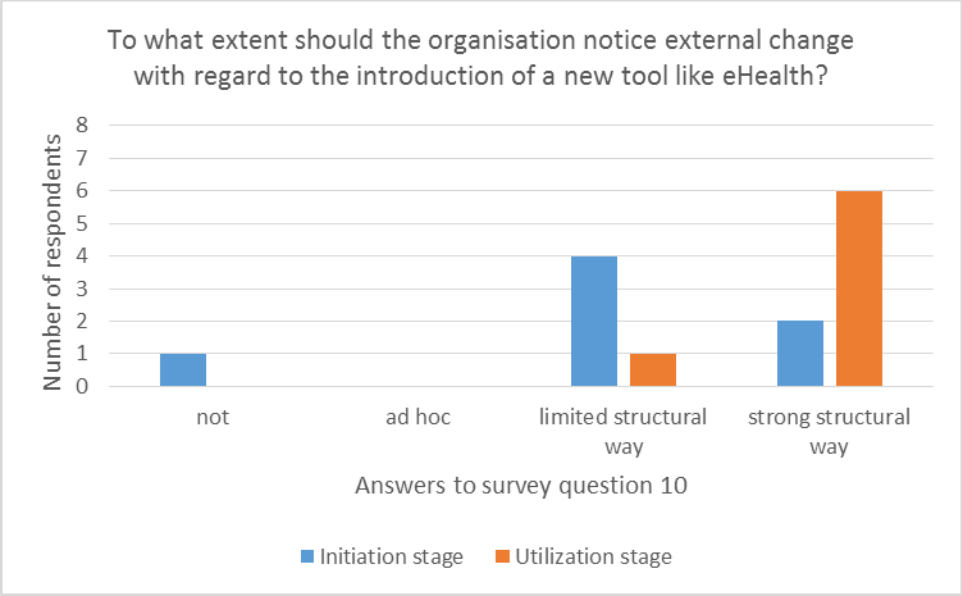

Figure 6: Desired degree of noticing of external change compared between newcomers and experienced hospitals.

External change noticed by hospitals in the initiation stage for instance involves noticing changes in *technologies* presented by the *industry*, changes in other hospitals of the *healthcare regime*, and shifts in *healthcare consumers*' demand. Newcomers notice publications and advertisements about new eHealth

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technologies published by the *industry* (I#11; I#12). Some of the newcomers are also approached by industrial organisations to collaborate in eHealth initiatives (I#12). Newcomers were also aware of eHealth use in other hospitals (I#5; I#13; I#14). R#7 stated that providing internships could contribute to cognitive change of nurses in order to be willing to use eHealth: "during an internship it is possible to see what others are doing outside your own hospitals". Also R#6 addressed that noticing eHealth used by peers, "when talking with other medical specialists about it", is stimulating healthcare professionals to be willing to use eHealth themselves. In H6 information about eHealth use in other hospitals is provided to nurses by sharing publications with them involving studies on eHealth use in hospitals abroad (I#5). H5 tried to notice shifts in healthcare consumer demand, and opinions and ideas of patients by continuously measuring the patients' satisfaction (I#11). "We just stared looking for information obtained from patients. We have done this for one year, so it will probably become more important within a few years", stated R#16. However, none of the cases included in the initiation stage turned out to strongly notice external change (R#7; R#6; R#5; R#16; R#11; R#10; R#13). "Healthcare professionals in our hospital don't really care about eHealth. So, there isn't a need for looking for possibilities externally. When you're not interested, you don't focus on noticing it", explained R#6. Therefore, overall, noticing external change is considered as a potential driver for willing to use eHealth in the initiation stage rather than an activity that is strongly influencing the will to use eHealth in newcomers at the moment.

Table 7: : Main findings about the influence of cognitive change in the initiation stage with regard to noticing external change.

Main findings cognitive change	Case 4	Case 5	Case 6	Ratio of interviews topic is presented in
I: Noticing external change	X	X	X	**6/7**
Looking for new opportunities		X		1/7
Not noticing external change	X			1/7

The newcomers showed that *constructing meaning of external change* led to positive *beliefs regarding eHealth*. All cases in the initiation stage showed that eHealth is believed to lead to advantages as a possible solution for existing problems in healthcare (I#4; I#10; I#11; I#12; I#14). Using eHealth is believed to reduce the additional workload (I#4; I#10; I#11; I#14), which makes it more attractive for healthcare professionals willing to work with eHealth (I#14). However, not all healthcare professionals did experience that an existing problem was solved by the e-care platform in H4 and H6 as they experienced using eHealth as an additional workload then (I#4; I#5; I#13). According to R#20 "It wasn't instead of: the usual contacts and consults with patients remained. Patients were still willing to see their doctor through ordinary human contact". Moreover, the e-care platform did not seem to decrease hospitalisation (I#4, I#5). R#7 stated that "many patients still needed to be checked, while they turned out to be fairly stable". This is also the case with regard to H6's first e-care platform where ranges were determined involving weight, blood pressure, and pulse (I#4; I#5). "If values are above or below the ranges, then we receive an alert and we have to do something. This looks nice, but after five alerts per day it is not so nice anymore because most alerts turned out to be unnecessary", explained R#10. These experiences resulted in a barrier willing to use eHealth in H6, and this hospital quit the first e-care platform. E-care is used in H5 "to prevent exacerbations and that the patient has to be hospitalized again, which causes a lot of additional work", explained R#16. A new e-care platform will be used in H6

for comparable reasons. R#10, a medical specialist at H6, stated that "a driver is for example that patients visit our clinic a lot and we want to do something about it. To me that sounds a bit negative, but it still is a driver. This is especially the case for HF patients: there he is again, again suffering from fluid and water retention". H6's new e-care platform will also be used to anticipate on the first two weeks after hospitalisation of HF patients when it is difficult to make an appointment for patients (I#4). In this period "patients cannot have an appointment at the clinic most of the time, because it is too busy at the clinic to make an appointment at such short-term … we want to accurately telemonitor patients in this period, in order to check if the patients are ok", explained R#10. Furthermore, eHealth is believed to support healthcare professionals in decision-making as they get better insight in patients by access to additional medical data (I#4; I#10), especially improving insight in patients' compliance to therapy (I#5; I#10). "You can be completely wrong in your observation, me too. Sometimes, for example, you don't notice someone's fluid retention of 5L. Then he will be hospitalised again within one week. I believe that technology will help us making better decisions. eHealth can provide much more information," explained R#10.

On the other hand, *resistance to change* is noticed in all cases in the initiation stage (I#4; I#5; I#10; I#12; I#13; I#14). A conservative attitude of healthcare professionals is addressed to be a barrier for them willing to change their routines (I#4; I#5; I#10; I#12; I#13; I#14). "A medical specialist once told me: 'do I have to study for twelve years to be corrected by a machine!?', they don't accept that", explained R#12. R#10, a medical specialist at H6, agreed: "we (healthcare professionals) are pretty conservative. You first have to prove to us that the innovation is better than the conventional way, before we are willing to get involved. This is the case since huge accidents happened with things that were believed to be better, but were". Healthcare professionals are used to their routines and they are not willing to change this (I#4; I#5; I#10; I#12; I#13; I#14). "I think that the medical specialists are not really progressive … the attitude that prevails in the hospital is: we've done it this way for twenty years, why should we change it?", stated R#7. Resistance to change is especially the case for older healthcare professionals "those who are older than 55 or even 60+, it's a hell of a job to convince them", stated R#6, who is an employee of H4's ICT staff. Another example of resistance to change is noticed when implementing a tool that enables patients to make appointments online. "On the one hand I notice that healthcare professionals want the online appointment application because they think that it reduces pressure on the organisation, but when I explain that they have to give open access to their agenda then they are hesitant. They want A, but they don't prefer B", explained R#6. This is in line with R#10 who mentioned that "medical specialists often want to determine themselves when patients will visit the clinic". Moreover, according to several interviewees, eHealth is seen as a threat by healthcare professionals (I#5; I#10; I#14). Medical specialists are afraid to lose control as R#21 explained that medical specialists "want to keep healthcare here with them at the 'right' place … there is only one place where they earn money and that is their medical office". Also nurses consider eHealth as a threat since they are afraid that it will make their job redundant (I#5). This finding is confirmed by R#23, one of the interviewed experts. "I can go work at such a call-center [for telemonitoring of HF patients], but I don't want to. Here I actually see the patients and that is what I like about my job", mentioned R#13. Another interesting point in the light of resistance to change that was made, involved that people who are chronically ill are not inside the hospital all the time and they are therefore not of top priority for the hospital. While eHealth is presented as especially supportive in chronic disease areas (BRON). R#10 explained that "there is no urgency inside the hospital to use eHealth … we want to do something about people who are ill and hospitalized. Patients who are here inside our hospital. But patients who use eHealth are often not hospitalized at a specific department … so these issues do not directly touch the hospital … there is not really an internal incentive for the hospital to think about whether an HF patient has a better life with or without eHealth".

Table 8: : Main findings about the influence of cognitive change in the initiation stage with regard to constructing meaning of external change.

Main findings cognitive change	Case 4	Case 5	Case 6	Ratio of interviews topic is presented in
II: Constructing meaning of external change	X			1/7
Beliefs regarding current routines		X	X	2/7
Beliefs regarding eHealth	X	X	X	**7/7**
Resistance to change	X	X	X	**6/7**
Coping with technological change of the healthcare regime	X		X	2/7

The cases in the initiation stage showed that *new beliefs are developed* and a *shared vision on eHealth is being created* at departmental level. Case 4 and 6 showed that *developing new beliefs* especially played a role at departmental level and that new beliefs are developed bottom-up. The e-care platforms used in H4 and H6 for instance, are mainly initiated by nurses of the HF clinic (I#5; I#12; I#13). Use of an e-care platform for supporting COPD patients and an ICMS for monitoring the heartbeat of HF patients, are initiated by medical specialists in H4 (I#13; I#14). It is explained that only a small group in the organisations has *developed positive new beliefs* regarding eHealth so far (I#4; I#10; I#11; I#14). This implies that a *shared vision* on eHealth throughout the entire organisation is lacking in newcomers. "When I look at how many medical specialists there are at H4, and how many there are really enthusiastic about eHealth; that aren't many", mentioned R#6. In H5, also a small group is involved in thinking about and developing new beliefs regarding eHealth (I#10; I#11). R#10 stated that in H6 "there aren't many persons enthusiastic about eHealth. You start from a small niche which should try to get cooperation with the rest of the hospital". Also *shared vision* at departmental level is considered as influential for healthcare professionals willing to use eHealth (I#5; I#12; I#13; I#14). "Eventually initiatives for eHealth emerge bottom-up, but it depends on the prevailing shared vision", stated R#7. This is in line with R#7 who mentioned that "if we eventually all agree on the idea, then a new initiative gets support from the organisation. I think this could be improved". This reflected the co-evolvement of CC and DC since CC's shared vision is influencing DC's experimenting. Also R#6 agreed on the influence of shared vision among healthcare professionals, but stretched it further to a shared vision throughout the organisation rather than department specific. "I don't think a decision is made on something of which it is known that medical specialists don't agree … a top-down decision especially on eHealth will only be made if the director is certain that healthcare professionals will cooperate. In other words, if there is a shared vision", explained R#6. This explanation reflected the influence of CC on SR; when there is no shared vision throughout the organisation, decision-making on an organisational plan of action in favour of eHealth is not expected to take place. In addition, this also explains why H4, H5, and H6 are situated in the initiation stage because a *lack of shared vision* in favour of eHealth is presented by these cases. Several interviewees experienced a lack of shared vision in their hospital (I#11; I#12; I#14).

R#5 mentioned for example that "there are big differences between employees to create a shared vision and to make sure that everyone participates", and R#16 explained that "does everyone in the organisation care about eHealth? No. Someone has it more than the other. The management side more than the healthcare professionals, of course there are exceptions [among healthcare professionals]". Also shared vision on eHealth use in H6 is questionable as it was only mentioned once in one of case 6' interviews. Some newcomers have tried to solve this by actively stimulating development of new beliefs and creation of shared vision. It is believed that consciously paying attention to eHealth and to keep sharing a clear positive message about it could help (I#10; I#11). *Developing new beliefs* and *shared vision* in favour of eHealth also is created spontaneously, influenced by the *healthcare regime.* "It is a mind-set. The existing world stops. It's a sense of urgency", stated R#16. There are not specific activities focused on stimulating developing new beliefs at H4, where healthcare professionals are influenced by available *technology* instead: "Before you knew it all doctors walked around with an iPad and I was confronted with the question that they wanted to have access to the EHR through their iPads ... Some have started it and found it great, and have shared it with others. Together they forced the organisation to develop a policy on use of EHR on their own devices. This is going very well."

New beliefs are also developed by *building coalitions*. The will to realize video consult at H5 for example resulted from *high involvement of medical specialists, employees regarding innovation and ICT, and employees of H5's support staff* (I#10; I#11). Involvement of nurses and medical specialists in realisation of the e-care platform in H4 and H6 is reflected by discussing everyone's opinion before starting to work with it (I#4; I#5; I#13). R#7, a nurse at H4's HF clinic mentioned that "we were approached, it was communicated to us and it was asked: how do you (the nurses) think about it and what could we do with it?". Although the nurses, R#7 and R#13, also mentioned that the medical specialist's opinion is decisive. This is comparable to R#23, an expert of the Dutch Centre of expertise for standardisation and eHealth, who indicated that "nurses are not being sufficiently involved. So, there is still room for improvement when it comes to the way you introduce change in the workplace. Well, it is true that doctors and nurses within the hospital don't have quite the same role and that doctors have more autonomy ... Partnerships have in that respect also a reasonable form of influence when it comes to ICT which they do or do not wish to use". This is in line with the belief that especially medical specialists need to be enthusiastic about eHealth, in order to drive eHealth use (I#11; I#14). Furthermore, some interviewees expected that *high involvement of employees* by making employees responsible for the innovation, i.e. through ownership, could contribute to cognitive change (I#12). A few healthcare professionals, or called "rebels" by R#16, could influence beliefs regarding eHealth of their peers (I#11; I#14). "What we do must be initiated by the healthcare professionals", added R#16.

Table 9: : Main findings about the influence of cognitive change in the initiation stage with regard to developing new beliefs.

Main findings cognitive change	Case 4	Case 5	Case 6	Ratio of interviews topic is presented in
III: Developing new beliefs	X	X	X	**4/7**
Shared (project) vision	X	X	X	**6/7**
Lack of shared vision	X	X		3/7
Building coalitions / high involvement of employees	X	X	X	**6/7**
Lack of involvement of employees	X			1/7

Summarizing, the initiation stage presented that *cognitive change* is present, but limited. A few examples of *noticing external change* are presented by the newcomers and most examples involved noticing the possibilities of eHealth used by peers in other hospitals. However, none of the cases included in the initiation stage turned out to strongly notice external change (see figure 6). Therefore, the noticing external change dimension is considered as a potential driver for willing to use eHealth and it has hampered the hospitals to become more experienced in using eHealth so far. Furthermore, on the one hand, all cases showed that *constructing meaning of external change* led to positive *beliefs regarding eHealth* as is believed to be a possible solution for existing problems faced by HF clinics. On the other hand, *resistance to change* is present in all cases with regard to the organisational level, and in H4 and H6 at the departmental level as well. Not everyone in the entire organisation beliefs in eHealth, only a small group is not resistant to change, which has hindered broad application of eHealth so far in newcomers. Only small groups, mainly at specific departments, in hospitals situated in the initiation stage have *developed positive new beliefs* regarding eHealth so far, which presented a driver for willing to use eHealth. Findings of case 4 and case 6 showed that a shared vision in favour of eHealth among all healthcare professionals of a specific department is limited. Moreover, a *shared vision* on eHealth throughout the entire organisation *is lacking* in the initiation stage. Co-evolvement of *CC* and *DC* is reflected as this stage slightly showed that the will of an department to use eHealth (presented by *CC's shared vision*) influences if eHealth initiatives are actually carried out by the department (presented by *DC's experimenting*). In addition, especially one case reflect the influence of *CC* on *SR*. Decision-making on an organisational plan of action in favour of eHealth is not expected to take place because of a lacking shared vision on eHealth throughout the organisation. Also *high involvement of employees* seemed limited as the cases only showed a few examples compared to hospitals in the utilization stage.

In short, limited cognitive change in the initiation is showed by the combination of the present drivers and barriers for willing to use eHealth. This combination of positive and negative influences of cognitive change has led to the newcomers' first steps in eHealth use on a small-scale. In all cases in the initiation stage eHealth is used as add-on inside the existing clinical pathway or next to the conventional way of working (I#4; I#5; I#11; I#12; I#13; I#14) (see also the empirical findings of each case in the Appendices).

5.2.2 Dynamic capabilities

Building up resources is predominantly done through *experimenting* in the initiation stage, since it is mentioned during all interviews in case 4, 5, and 6 (see table 10). Besides willing, also taking action and actually doing something is believed to be important to work with eHealth (I#4; I#10; I#11). "How do you change your way of working? You don't change by following the same path … then, nothing big will ever happen", stated R#11. R#10 mentioned that "the proof of the pudding is in the eating". A pilot regarding e-care is carried out by all three hospitals. HF patients at H4, H5 and H6 received a wireless scale and blood pressure monitoring device (I#5; I#10; I#11; I#13; Annual Report H5, 2014). These devices are connected to an online platform visible at the patient's television (I#5; I#13), or the patient's tablet (I#10; I#11; Annual Report H5, 2014). Inclusion criteria allowed *to take out the e-care platform and its devices* only *to* small groups of HF *patients* (I#5; I#10; I#11; I#12). Approximately 15 of H4's 450 HF patients participated in the pilot and used the e-care platform for monitoring their weight, blood pressure, and pulse (I#13). H5 included approximately 20 HF patients in the pilot (I#10; I#11). In H6 approximately seven HF patients were included in the pilot at the most busiest moments (I#5). Inclusion criteria for *experimenting* with eHealth are for example determined by the responsible cardiologist (I#11) or influenced by the healthcare insurer involved in the project (I#5). R#13 explained that "in the beginning we were only allowed to include patients insured at the involved healthcare insurer, because this was the only healthcare insurer which reimbursed telemonitoring. Subsequently, the hospital started to reimburse it and then we were allowed to include every patient". Furthermore, not all HF patients are connected to the e-care platform because they are not obliged to use the e-care platform (I#5). HF patients can choose if they want to be monitored or not. This resulted in a low number of patients included in the pilot in H6. Patients who were already characterized by high compliance, and thus lower hospitalisation, were willing to use the e-care platform, while patients characterized by low compliance did not want to be monitored (I#5). A small amount of HF patients included in pilots is addressed by some interviewees as a reason why their hospital is not experienced in eHealth use yet (I#11; I#12; I#13; I#14). The small size of H4 is for instance mentioned several times as insufficient capacity and small patient population inhibit development and broad application of eHealth (I#12; I#13; I#14). The survey showed for example that H5 is not strongly capable of structurally adapting to new processes (R#11; R#16). R#16 explained that "the hospital is limited in adapting to new processes because telemonitoring is used in a small-scaled pilot". In addition, R#7 pointed out that "only a small group of patients is included in our e-care platform. That should be expanded. You actually should use it all day, every day, in order to become really experienced".

Case 5 and 6 show that *experimenting* and *learning from experience* drive eHealth use in hospitals since plans of action are made at the involved departments to expand existing pilots or add new eHealth projects. This is comparable to the experienced hospitals, where experimenting has also led to taking out eHealth to more and more patients over time. As described in the Appendix, H5 has carried out an eHealth pilot with regard to HF and is planning to execute more pilots regarding both HF and COPD (I#10; I#11). "We will carry out two different pilots, in order to compare those two e-care platforms. Two pilots, at two locations, with two different systems", stated R#16. Comparing these pilots, will enable H5 to learn more about various ways to apply eHealth. In other words, to *build up knowledge* regarding eHealth use by *learning from experience*. In addition, *reflecting on previous experiences* of the first pilot has led to recommendations and improvements for expanding H5's e-care platform to a bigger group of patients (I#11). H5 evaluated this pilot after one year (I#10; I#11). *Reflection* on this firs pilot revealed that patients were satisfied and there were few critical notes from the healthcare professionals (I#10; I#11). "Healthcare professionals were critical with regard to the process, like time for preparation and delivery of the tools which was delayed … we have improved this for the follow-up", explained

R#16. The number of patients included in the expanded pilot will include 120, compared to 20 in the first pilot (I#11).

Building up resources also resulted in adding new eHealth projects at H6 (also see Appendix on eHealth use in H6). However, eHealth use in H6 initially was negatively influenced by *learning from experience*. Learning from H6's first e-care platform induced a very negative experience (I#4; I#5), because "it led to a lot of additional work and it also negatively affected profit", explained R#10. Also R#13 and R#20 indicated that "we didn't experienced added value". R#13 added: "patients in the e-care platform were indeed never hospitalized during the pilot, but the question is whether exacerbations would take place without them being connected to the platform". The negative experience resulted in terminating the pilot and no further plan of action for eHealth use in HF was made at that moment. On the other hand, learning from experience also led to positive influence on eHealth use. The employees of H6's HF clinic have improved their understanding of what features they would like to see in an e-care platform now. Currently, a few years after the first pilot, H6 learned from its negative experience with its first e-care platform and is developing improvements in a new e-care platform for telemonitoring of HF patients. H6 will start with carrying out a pilot involving the new e-care platform. It is expected that the new e-care platform will go live in 2016 (I#4). The new e-care platform is *tested* among employees of H6's HF clinic before taking out the e-care platform to HF patients (I#4).

Also *building up resources* through *research and development* is reflected by the three hospitals situated in the initiation stage. As a Collaborating Top Clinical Educational Hospital (STZ), H5 and H6 are logically involved in *research* focused on patients and innovation (STZ, 2015). Both hospitals are involved in a *collaborative research project* with other hospitals, including a UMC, on usage of a new e-care platform for telemonitoring of HF patients. Also H4 was involved in a *collaborative research project* with regard to eHealth. This hospital was approached by an *industrial* organisation who developed an e-care platform for telemonitoring of HF patients (I#12; I#13). H6 was involved in a comparable collaborative research project with an industrial organisation regarding its first e-care platform (I#4; I#5). R#10, a cardiologist at H6, explained that the hospital prefers to do collaborative research: "the way we like to do research ourselves. So, we want to be involved from the start. If it involves a new pacemaker or a heart valve, then the external party invents and excogitates it and then we prefer to get involved in the development. And we want it to be the same for eHealth. Collaboratively carrying out the research is the desired situation". The *research* performed by the newcomers contributed to the body of *techno-scientific knowledge* on the effects of eHealth use on hospitalisation, which is (limitedly) available in the healthcare regime (I#4; I#5). Furthermore, industrial organisations also played a role in *development* of human resources by training them, in order to prepare employees who were going to use eHealth (I#12; I#13), and additional support is provided by the hospital's own employees who are used to digitalisation (I#12). However, *research and development* in order to *build up resources* for eHealth use in the organisation is not prominently mentioned by interviewees in the initiation stage: in five out of seven interviews and in each interview only once. In contrast to the experienced hospitals, the newcomers did not seem to be involved in development of own eHealth tools which can be applied D2P or P2D. The hospitals preferred to acquire externally available eHealth tools, as described below.

Table 10: Main findings about the influence of dynamic capabilities in the initiation stage with regard to the dimension of building up resources.

Main findings dynamic capabilities	Case 4	Case 5	Case 6	Ratio of interviews topic is presented in
I: Building up resources	X			3/7
Experimenting: testing and taking out products to healthcare consumers	X	X	X	**7/7**
Learning from experience: reflection on the innovation process, examining and reviewing how innovation is managed		X	X	3/7
Learning from others inside the organisation	X		X	3/7
Research and development	X	X	X	**5/7**

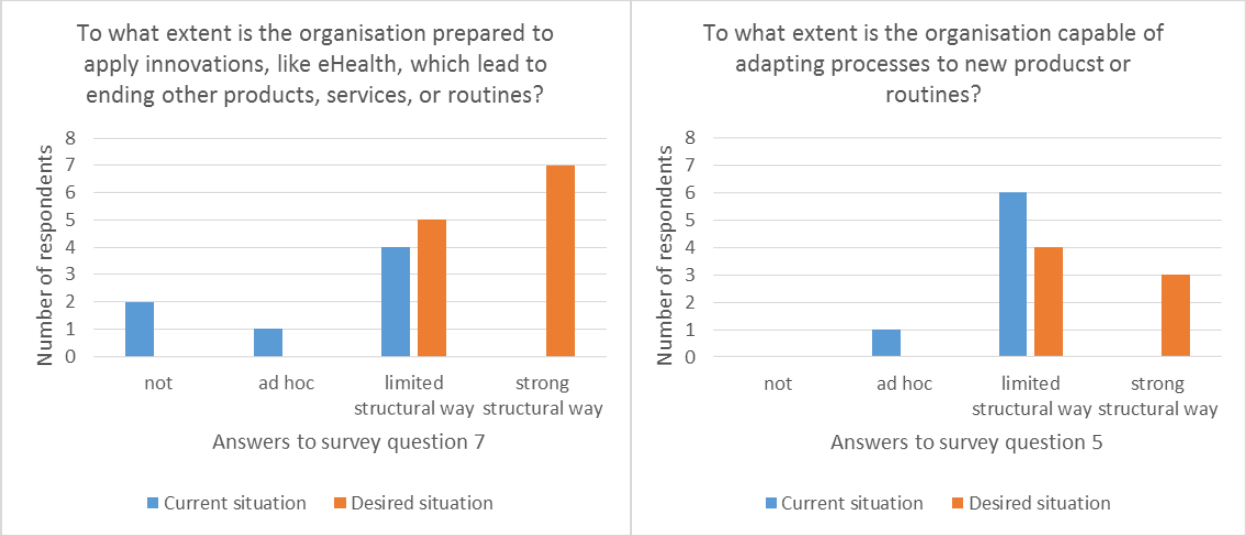

Figure 7: Reconfiguring resources in the initiation stage.

Reconfiguring resources is believed to be an important *dynamic capability* for using eHealth, especially through *combining new and existing resources* (see table 11). However, the survey (see figure 7) and the semi-structured interviews showed that this capability is not strongly developed yet in the initiation stage. Currently, a negative influence of DC on eHealth use is visible with regard to this dimension.

The three cases showed that *combining eHealth and existing resources* resulted in additional information available with regard to patients' health. "To us this it was additional information, and we had to get used to deal with this new flow of information", explained R#10. The flow of additional information is associated with questions and new responsibilities (I#4; I#12). "Someone receives an email. Who receives the email? What are you going to do when this person is absent? When he is on holidays? This sounds silly, but you have to adjust your work flow to these things", stated R#5, a … at H4.

Also healthcare professionals who worked with eHealth themselves mentioned several questions and responsibilities, like R#10 who indicated that “sometimes patients are unstable. Then the question is: when are we going to ring the alarm? When do we need to do something and who receives the alert?”. Because of these new responsibilities it is believed that *combining new and existing resources* in implementation of eHealth should be done adequately, which takes time (I#12; I#13). In addition, *allocating* sufficient *resources* is addressed important for becoming more experienced in using eHealth (I#5; I#11; I#12; I#13).

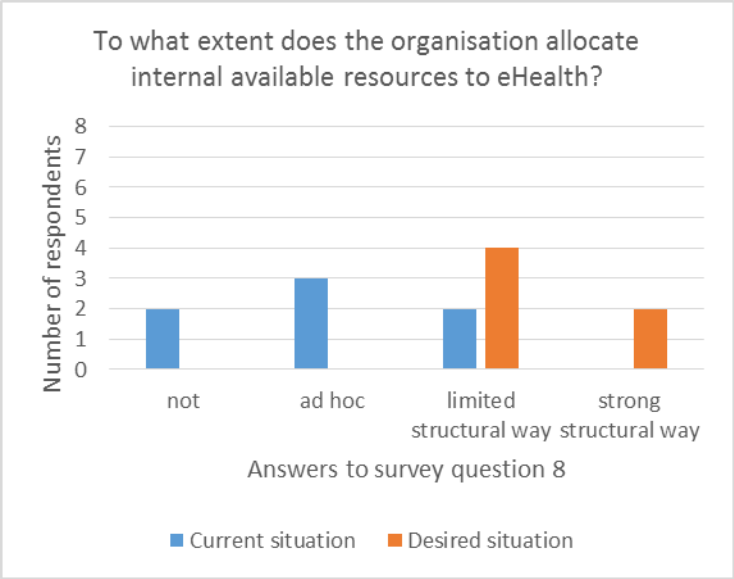

Figure 8: Combining new and existing resources in the initiation stage.

However, both the semi-structured interviews and survey (see figure 8) showed that the hospitals situated in the initiation stage insufficiently allocate resources with regard to eHealth. *Insufficient allocation of financial resources* is presented as a hurdle in all cases in the initiation stage (I#4; I#5; I#10; I#11; I#13). R#7 stated: “We also need financial resources. I think that this is the biggest issue at the moment … we can monitor pacemakers at a distance, but then we have to buy a home transmitter that sends medical data on cardiac arrhythmias to the hospital. That [home transmitter] costs a lot of money and we don’t have that money, so we don’t do it”. Financing capacity is also a barrier with regard to the new e-care platform at H6. “The last time it failed because it there was no sufficient financing assigned to it by the Board of Directors … when it turned out that the hospital had to pay for iPads and the monitoring system, it got cancelled”, stated R#21. The e-care platforms previously used in H4 and H6 for example cost about €100 per month per patient (I#4; I#5; I#12; I#13). E-care platforms for telemonitoring of HF patients are not always reimbursed by all healthcare insurers, therefore some hospitals paid for the e-care platform themselves (I#5; I#13). “Look, if it doesn’t cost much, then it is another story, but it is expensive”, mentioned R#20. Some interviewees doubted if this amount of money could not be allocated differently (I#4; I#5), like R#10 stated that “in my opinion, for €100 per patient per month I can also keep a home care nurse in place who is capable of doing more [than the e-care platform]”. Remarkable is that available financial resources are not always used adequately. R#6 mentioned that “funding for innovation is made available each year, but disappointingly only a small part of the amount is used each year.”

Cases 4 and 6 also reflected *insufficient allocation of human resources* with regard to eHealth. A lack of an in-house ICT platform facilitating eHealth, or an eHealth specialists or ICT staff dedicated to eHealth seemed to be a barrier (I#4; I#12). "When I approached the ICT staff with a request for video consult, they were a bit overwhelmed by it. They've already got plenty of things to do … to my knowledge, no one of the ICT department is engaged in eHealth. That bothers me", explained R#10. One interviewee, R#5, also addressed the preference for allocation of internal human resources, rather than acquiring external human resources because "our own people have a better insight in how things work here. We know each other and are well connected, so we can easily discuss things … the healthcare professionals are the ones who need to do it or use it eventually".

Furthermore, *allocation of technological resources* is done quite ad hoc currently (see also figure 8). A cardiologist, R#10, explained that "sometimes pacemakers including additional features are implanted. This decision does not depend on the advantage of the additional features. The decision is now based on: this pacemaker is smaller than the other. It's about other things. Can we also monitor patients at home? Then they receive a home transmitter. It really is ad hoc". This is underlined by R#13, a nurse at the HF clinic: "it is just what ICDs are supplied … the one supplier delivers ICDs including different features than the other supplier. It is quite random what ICD is used … It seems a bit ad hoc to me".

Reconfiguring resources through *repositioning of products or services* is only mentioned during a couple of interviews (see table 11). R#5 addressed the importance of eHealth substituting the conventional way of working, in order to succeed in using eHealth: "Are you going to work digitally, are you going to work with eHealth, then it is impossible that one half works this [old] way and the other half works that [new] way". Another example is presented by case 5 in which the same eHealth tool will be applied to various chronic disease areas, repositioning how healthcare is provided in the existing clinical pathways. "We now use the app for HF. We can go using the same app for COPD. COPD and HF are often characterized by co-morbidity", explained R#16. In this case repositioning of the e-care app will drive eHealth use among larger patient groups with regard to a broader range of disease areas.

Table 11: Main findings about the influence of dynamic capabilities in the initiation stage with regard to the dimension of reconfiguring resources.

Main findings dynamic capabilities	Case 4	Case 5	Case 6	Ratio of interviews topic is presented in
II: Reconfiguring resources	X	X		3/7
Combining new and existing resources: adequate allocation of resources	X	X	X	**7/7**
Repositioning of products / services	X	X		2/7

The three cases of the initiation stage showed that *integrating resources* mainly is addressed by *acquisition of external resources*. As described above, the newcomers did not reflect internal development of eHealth technologies including hardware and software. It is thus required for using eHealth in these hospitals *to acquire eHealth products from external industrial organisations*. The e-care platform's software and equipment for monitoring HF patients at home for example is acquired by H4 by *collaborating* for research with an *industrial partner* (I#12; I#13). This is also the case with regard to the first e-care platform that was used by H6 (I#4; I#5). R#10, a cardiologist at H6, stated that "we were

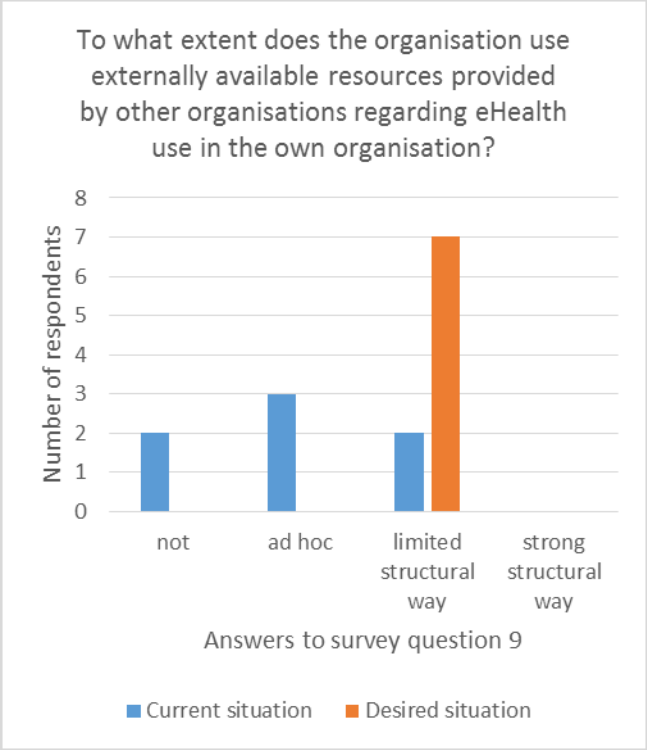

Figure 9: Acquisition of external resources by hospitals in the initiation stage.

approached to get involved in the [telemonitoring] project and use it. I thought that it would be nice to join such a project … it's funny that if you work in this hospital they (the industry) would really like you to use their product, because then they can demonstrate it linked to our name. That is an advantage for them". Also H5 acquired software and hardware required for using the e-care app from an external industrial organisation (I#10; I#11). It is also mentioned that announcements from an industrial organisation can be a bit surprising: "Have you already heard that we will implant a new device for recording cardiac arrhythmias tomorrow and we will also start with telemonitoring? I thought that's nice, but I had never heard of it before", mentioned R#7. Besides, *external services are acquired* by the newcomers. In case of H4's e-care platform, the outcome of a patient's medical data measured by equipment and questionnaires is monitored by an external medical service centre (I#13). "That reduces our workload", explained R#7, "when they (the medical service centre) monitor something remarkable in the questionnaire, they send us an alert". Also H5 uses external available services. H5's HF patients who are included in the e-care app pilot are connected to a medical service centre which they can contact 24/7 through video consult (I#11). In addition, H5 collaborated with an external regional care organisation which is involved in the e-care app and healthcare for HF patients (I#10; I#11). Costs human resources are shared among the two organisations involved (I#11). R#16 explained that "the HF nurses work at our hospital and are employed as home care nurses as well … so these nurses are familiar with both the primary and secondary care situation. This also means that there is a lot of trust between the medical specialists and the nurses. It works well.". Moreover, the organisations collaboratively created a document on long-term goals on how to collaborate with regard to healthcare for chronically ill patients, which led to the collaborative use of eHealth (I#11). This reflects a positive influence of DC on SR. In short, the *acquisition of external resources* enabled newcomers to use eHealth. DC's integrating resources is thus positively influencing eHealth use. Overall, newcomers acquire external resources to quite some extent, but respondents indicated that this should be improved in order to become more experienced with eHealth use (see figure 9).

All cases presented that *integrating resources*, specifically integrating knowledge, is also done by *learning from other organisations outside the hospital* (see table 12). The three cases showed that *learning from other hospitals* stimulated eHealth use in the own organisation. As mentioned above, H5 and H6 are both involved in a *collaborative research project* with a more eHealth experienced UMC on usage of a new e-care platform. By *sharing of experiences*, the involved hospitals broaden their understanding on how to apply eHealth to their own context (I#4; I#5; I#11). Besides, R#13, a nurse at H6, mentioned that "colleagues even went to a call centre to see how it works". This reflects hospitals *looking at best practices* in the healthcare regime. The enthusiasm and positive attitude towards the first e-care platform also exhibited that co-evolvement of DC and CC has led to a positive influence on

willing to use eHealth initially at H6 (I#5). Case 4 showed that industrial organisations also contribute to hospitals learning from each other by inviting hospitals that use the industry's eHealth products to meetings, like sharing experiences on "how does eHealth substitute existing things in our organisation?", says R#5. In case of the e-care app, H5 learned from another hospital which already was a bit more experienced in using the app for monitoring HF patients (I#11). "The other hospital has started using the e-care app half a year before we did. We learned from their experiences with regard to launching the project. That was an advantage. The launch went less smooth in other less smooth, compared to how we did. Because we learned from them", stated R#16. Also case 4 slightly showed an example of how learning from others which contributed to using the e-care platform for COPD patients in the own organisation. R#6 explained that "with regard to the COPD eHealth project, our pulmonologist shared experiences with the pulmonologist of [name hospital X] … they've found each other and they interact with each other. That is what I noticed. But they also have known each other for quite some years … they have a shared curiosity for COPD. Their collaboration is a side-effect rather than a strategic choice". In addition, a few nurses critically stated that learning from other hospitals could be improved (I#5; I#13), in order to "prevent to reinvent the wheel" stated R#20. Furthermore, a few cases showed *involvement of stakeholders* in the healthcare regime and sharing experiences with them. H5 for instance will involve GPs with regard to the pilot of the new e-care platform, which will affect collaborative disease management in the clinical pathway for HF patients (I#10; I#11). In short, *learning from others outside the organisation* seemed to stimulate eHealth use in the initiation stage. Seeing eHealth being used in other more experienced eHealth hospitals improved newcomers' understanding on how to use eHealth. In addition, seeing peers that use eHealth also regards to willing to use eHealth like explained in the previous section. DC's integrating resources thus co-evolves with CC's noticing external change.

Overall, newcomers *integrate resources* to quite some extent by *acquisition of external resources* and *learning from others outside the organisation*. The cases showed that this dynamic capability is positively influencing eHealth use, and also touched upon co-evolvement of DC and CC. However, both the semi-structured interviews and the survey (see figure 9) indicated that *integrating resources* could be improved by newcomers in order to become more experienced with eHealth use.

Table 12: Main findings about the influence of dynamic capabilities in the initiation stage with regard to the dimension of integrating resources.

Main findings dynamic capabilities	Case 4	Case 5	Case 6	Ratio of interviews topic is presented in
III: Integrating resources	X			1/7
Acquisition of external resources	X	X	X	**7/7**
Learning from others outside the organisation	X	X	X	**6/7**
Having a well-developed network of external sources	X	X		2/7

Recapitulating, newcomers showed that they are quite dynamic, but there certainly is room for improvement as well. *Building up resources* reflected a positive influence of *DC* on eHealth use since *experimenting* and *learning from experience* stimulate hospitals to be able to use eHealth. However,

these activities also reflected a negative influence of *DC* on the ability to use eHealth because of small samples included in experimenting and pilots that induced a very negative experience. The results also suggest that a negative influence of *DC* on eHealth use is visible with regard to *reconfiguring resources*. Hospitals situated in the initiation stage insufficiently *combine new and existing* resources with regard to eHealth, and especially allocation of financial resources is presented as a hurdle in all cases. A limited positive influence of DC's *reconfiguring resources* is demonstrated by one case *repositioning* its e-care app, which will drive eHealth use among a larger group of patients with regard to a broader range of disease areas. Newcomers *integrate resources* to quite some extent by *acquisition of external resources* and *learning from others outside the organisation*. The cases showed that this DC is positively influencing eHealth use. However, it also is indicated that *integrating resources* could be improved by newcomers in order to become more experienced with eHealth use, since a lack of learning from other hospitals is criticized.

Hospitals situated in the initiation stage also showed that *DC* influences *SR* to a small extent. A positive influence of DC on SR is visible at the dimensions of *building up resources* and *integrating resources*. Two cases showed that *experimenting* and *learning from experience* have led to plans of action are made at the involved departments to expand existing pilots or add new eHealth projects. One case demonstrated that the hospital and another care organisation collaboratively created a document on long-term goals on how to *collaborate* with regard to healthcare for chronically ill patients, which led to the collaborative use of eHealth. Also *DC* negatively influencing *SR* is visible to a small extent, since a very negative experience induced by *experimenting* resulted in terminating the pilot and no further plan of action for eHealth use in HF was made at that moment.

Cases demonstrated that besides willing, also taking action and actually doing something is believed to be important to work with eHealth. Co-evolvement of *DC* and *CC* influencing eHealth use is visible in newcomers. Like in the utilization stage, first seeing and then believing is addressed in the initiation stage as well. One case showed that the enthusiasm and positive attitude towards the first e-care platform has led to a positive influence on willing to use eHealth and resulted in a first pilot. Besides, seeing eHealth being used in other more experienced eHealth hospitals improved newcomers' understanding on how to use eHealth and seeing peers that use eHealth motivated newcomers to use eHealth as well.

5.2.3 Strategy & Strategic reorientation

Case 4, 5, and 6 demonstrated that newcomers' *strategy* is characterised by actively providing room for renewal and innovative activities that do not directly fit into the organisation's existing plans of action (R#5; R#6; R#10; R#11; R#12; ;R#13; R#16). "When have an idea about something new for the hospital … then it is not immediately rejected. They will listen to you", stated R#13. However, it is critically noted by R#16 that it can be difficult to pursue innovation inside the existing organisational structure. "On the one hand, we have to focus on ensuring today's profit by the by the things you do now, while at the same time with the same people you need to start thinking about quitting the world of today and you should start working towards a new world", explained R#16. This is in line with R#5 who mentioned that "with regard to trying new things, we are strongly imposed to stick to the budget". Furthermore, the newcomers showed that eHealth is not prominently considered in the hospital's strategy (R#5; R#7; R#11; R#12; R#16). Moreover, one respondent, R#6, answered that eHealth is not considered in the organisation's strategy at all: "it is not embedded in any form of strategic policy whatsoever … there is nothing for eHealth". Like addressed in the utilization stage, strategy often is focused on providing high quality healthcare, among others, by applying innovations in general rather than being eHealth specific (I#11).

Despite a limited strategy specifically regarding eHealth, the cases exhibited that newcomers are involved in a few small-scale eHealth projects focused mainly on HF. This could mean that *strategic reorientation of the organisation* is not required for small-scale use of eHealth at departmental level, and that *decision-making at departmental* level is of main interest instead. This is also reflected in the semi-structured interviews by quotes like "the cardiologist decides if we're going to do it or not" (R#5). However, in a few semi-structured interviews it is mentioned that in order to become more experienced - using eHealth on a large scale - organisational strategy is necessary (I#10; I#11; I#12; I#13). Moreover, R#16 addressed the need for guided innovation as eHealth use affects the financial flows in healthcare: "the problem is that we really want to implement and use it, but we also have to survive. We need to keep up a cash flow. So, when we would do it unstructured, we can get in big trouble … video consult will reduce the flow of patients … but what does that yield? And how many FTEs do we still need?" (also see the section on the socio-technical healthcare regime).

5.3 Consideration stage: orienting hospitals

The consideration stage includes three cases: H7, H8, and H9. H7 is a CTCEH[10] and is rather reactive when it comes to eHealth (R#1). During two interviews (I#6 and I#7) questions are answered by one employee of H7's ICT staff (R#1) and one medical specialist (R#22).

H8 is a regional hospital which solely uses eHealth tools that have proven their value in other hospitals when it comes to eHealth (R#3). H8's reactiveness to eHealth is also illustrated by the implementation of its new EHR, where multiple other hospitals already have chosen to implement the same EHR (I#8). During one interview (I#8) questions are answered by one employee of H8's ICT staff (R#3).

H9 is a regional hospital. H9 is reactive when it comes to eHealth and solely wants to use eHealth tools that have proven their value in other hospitals (R#17). During one interview (I#9) questions are answered by one employee of H9's ICT staff (R#17).

5.3.1 Cognitive change

The findings showed that *noticing external change* is addressed to play a role in stimulating future eHealth use in all orienting hospitals (see table 13). The majority of the interviewees mentioned that *noticing external change* is done by an orienting hospital's healthcare professionals working at specific departments (I#7; I#8; I#9). "They indicate that they've heard of it and that they are willing to use it themselves in order to improve healthcare … So, it arises from the nurses, from the departments itself, by hearing it from peers and getting information from peers. That's the trigger to start thinking about using eHealth", explained R#3. "Medical specialists and nurses get to know more and more about the possibilities of eHealth because they read about it in magazines, scientific journals and on the internet, and they notice that eHealth is used in other hospitals", stated R#17. One case, H7, also organised a workshop in order to *look for new opportunities*. "Two years ago, … we organised a workshop and made a big poster about all eHealth applications available", mentioned R#1. The consideration stage indicated that *noticing external change* is a driver for willing to use eHealth because healthcare professionals need to notice the possibilities of eHealth in order to start to believe in it (I#8; I#9).

[10] Collaborating Top Clinical Educational Hospital

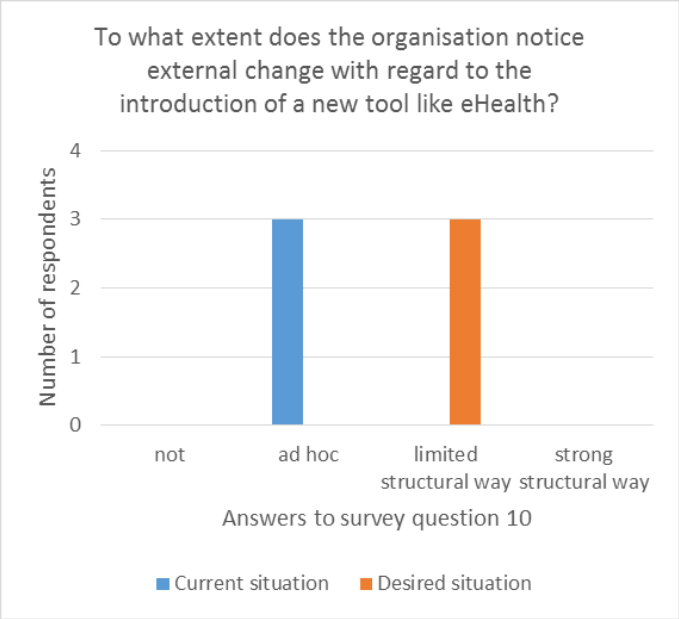

Figure 10: Noticing external change in the consideration stage.

However, the orienting hospitals also demonstrated that *a lack of noticing external change* can be a barrier for CC towards eHealth use at the moment (see figure 10). This is underlined by R#3: "Maybe you must have a kind of national innovation platform. Or that might already exist and we don't know about it. That's the point. You're just focused on your own daily business, which makes it difficult to keep track of what is going on [externally]". Moreover, the findings of the consideration stage suggest that co-evolvement of CC and DC can have a negative influence on eHealth use, like R#22 stated that "the hospital monitors external change, but we adapt very slowly to those changes".

Table 13: Main findings about the influence of cognitive change in orienting hospitals with regard to noticing external change.

Main findings cognitive change	Case 7	Case 8	Case 9	Ratio of interviews topic is presented in
I: Noticing external change	X	X	X	**3/4**
Looking for new opportunities	X			2/4
Not noticing external change		X		1/4

The orienting hospitals demonstrated that *constructing meaning of external change* includes various *beliefs regarding eHealth* and *regarding current routines* in the organisation. According to R#1: "everyone has his opinion on eHealth". The three cases situated in the consideration stage showed that *positive beliefs regarding eHealth* are present in the organisation (see table 14). H9's healthcare professionals believe in eHealth as they are used to ICT at home, using devices like smartphones and tablets in their daily lives (I#9). "Medical professionals want to be able to easily connect and work with their own devices at the hospital as well", stated R#17. R#3 believed that eHealth is a step forward because "then the patient is able to participate in his or her healthcare. That is very important". A new

EHR which includes patient-access will go live in 2016 (I#8), see the Appendix on Empirical Findings of case 8 for more background. Case 7 showed that positive beliefs regarding eHealth are present among a few employees, especially a few medical specialists and persons of the IT staff (I#6; I#7). Compared to the previous two stages of eHealth use, solving existing problems through eHealth is addressed to a smaller extent but it believed to be a contribution (I#6; I#8). According to R#1, "people don't change that fast. There must be a driver in order to be willing to change. What's in it for me?". *Beliefs regarding current routines* involved problems like a high workload (I#8), and that provision of healthcare currently is static and inconvenient for patients (I#6; I#7).

Findings on orienting hospitals showed that *CC* is believed to be required for eHealth use in the organisation (I#6; I#7; I#8; I#9). R#1 explained that using eHealth requires "a change of behaviour or attitude … you must want to use it … if you want to start using eHealth it means that you have to let go off existing structures … that actually is a matter of [changing] attitude". However, a majority of the orienting hospitals exhibited attitudes and beliefs reflecting *resistance to change* as a barrier for willing to use eHealth in the organisation. R#1, an employee at H7's ICT department, mentioned that healthcare professionals are not always willing to change and often react to change the following: "A real change of attitude … but that is scary. Why would I? I've been doing it like this for years". It is underlined by some interviewees, both a medical specialist and ICT related employees, that hospitals and healthcare professionals are quite conservative and traditional (I#6; I#7; I#8). "If you have this [conservative] attitude, then eHealth use probably won't be developed in a strong way in the hospital", stated R#1. Case 7 and 8 showed for instance that medical specialists are afraid that digital exchange of information to patients on their health record will lead to an increase in questions asked by patients and thus additional work (I#6; I#8). According to R#3, a medical specialist said: "Then I will receive a lot of emails from patients that I all need to respond to, I won't do that".

Resistance to change inhibited broad application of eHealth in orienting hospitals (I#6; I#7; I#8). "If a healthcare professional doesn't believe in the added value of eHealth, then eHealth won't get a place in the overall healthcare process. So, then you'll only get add-ons", stated R#3. Moreover, the presence of *resistance to change* demonstrated a negative influence of *CC* on *SR*. R#1 underlined that *CC* would result in plans of action towards eHealth: "if you as a hospital say we want to be a prominent eHealth hospital and if we want that, then we have to do this and this within this period. But H7 hasn't made that statement yet. And therefore you see that a number of these developments aren't high on the priorities' list".

Table 14: Main findings about the influence of cognitive change in orienting hospitals with regard to constructing meaning of external change.

Main findings cognitive change	Case 7	Case 8	Case 9	Ratio of interviews topic is presented in
II: Constructing meaning of external change	X			1/2
Beliefs regarding current routines	X	X		**3/4**
Beliefs regarding eHealth	X	X	X	**4/4**
Resistance to change	X	X		**3/4**

Compared to the previous two dimensions of CC, *developing new beliefs* is addressed less by the hospitals situated in the consideration stage. It is acknowledged by interviewees that *new believes are developed* to a small extent in the organisation and that this needs to be improved in order to stimulate eHealth use (I#6; I#7; I#8). "There simply has to be more space for progressive thinking", stated R#22. Developing new beliefs is associated with younger healthcare professionals in the organisation (I#8). This also showed a *lack of shared vision* at departmental level as "the young medical specialist has fresh new ideas, which are often rejected by the rest of the partnership: you and your ideas, we are busy enough, just do the job", explained R#3. H8 recently started to *highly involve* its *employees* in the implementation of the hospital's new EHR, in order to trigger the development of new beliefs regarding eHealth (I#8). "Some medical specialists are 'ambassadors' that promote the future use of the new EHR among their colleagues of the medical staff … we thought about designating employees, but we didn't. We led the medical staff designate their own ambassadors", illustrated R#3.

Table 15: Main findings about the influence of cognitive change in orienting hospitals with regard to developing new beliefs.

Main findings cognitive change	Case 7	Case 8	Case 9	Ratio of interviews topic is presented in
III: Developing new beliefs	X	X		**3/4**
Shared (project) vision	X			1/4
Lack of shared vision		X		1/4
Building coalitions / high involvement of employees		X		1/4

Summarizing, *CC* is quite limited in the consideration stage. The orienting hospitals are willing to use eHealth and are therefore considering it. However, this positive influence of *CC* among a small part of the organisation is in contrast to barriers for willing to use eHealth which are highly visible in the organisation as well. The findings suggest that *noticing external change* is driving future eHealth use in all orienting hospitals. The orienting hospitals also demonstrated *CC* negatively influencing eHealth use

since a *lack of noticing external change* can be a barrier for willing to use eHealth at the moment. The dimension of *constructing meaning of external change* also reflected a limited positive influence of *CC* on eHealth use in orienting hospitals as only a small part of the organisation seemed to have positive *beliefs regarding eHealth*. In addition, the consideration stage demonstrated *resistance to change* to be a barrier for willing to use eHealth in the organisation. Also *developing new beliefs* reflected a limited positive influence of *CC* on eHealth use in the consideration stage. It is acknowledged by interviewees that *new believes are developed* to a small extent in the organisation and that this needs to be improved in order to stimulate eHealth use. Overall, H9 seemed to be more willing to use eHealth than H7 and H8. However, it is important to bear in mind the possible bias in the responses of case 9 as only one semi-structured interview is conducted.

The findings with regard to the consideration stage also suggest a negative influence of *CC* on *SR* towards eHealth use. *Resistance to change* inhibited broad application of eHealth in orienting hospitals. Plans of action towards broad application of eHealth in the organisation are not realized yet because the orienting hospitals cognitively changed only to a small extent.

5.3.2 Dynamic capabilities

The consideration stage demonstrated that especially *experimenting* is addressed with regard to *building up resources*, since it is mentioned during all interviews in case 7, 8, and 9 (see table 16). None of the orienting hospitals is testing or taking out eHealth to healthcare consumers regarding CRDs or HF at the moment (I#6; I#7; I#8; I#9). The three hospitals are situated in the stage prior to usage of eHealth, considering to carry out pilots regarding eHealth in the future. H7 *experimented* with eHealth among 20 to 40 COPD patients, but quit the pilot some time ago and it is currently not planning on continuing the project (I#7; see also the 'Empirical findings of case 7' in the Appendices). H7 is currently considering possible applications and options that the new EHR offers for e-diagnosis, e-therapy, and e-care like video consult (I#6; I#7). H8 will start with digital P2D communication and providing access for patients to their own portal, when its new EHR will go live in October 2016 (I#8; Annual Report H8, 2014). H9 is considering providing access for patients to their own portal as well (I#9), and is also considering telemonitoring to improve its clinical pathway regarding HF (Hart & Vaatgroep, 2014).

Thinking about the future, the semi-structured interviews showed that *experimenting* is believed to be a potential driver for using eHealth in the organisation (I#6; I#7; I#8; I#9). Firstly, *experimenting* is seen as contributing to *building up knowledge* on how to use eHealth because pilots show an eHealth tool's feasibility and if using eHealth leads to improvements (I#7; I#8; I#9). R#22 stated: "I think it would help if a hospital has a kind of a testing ground. A testing ground which is situated outside the current interests and complexity of the healthcare regime. That would be a nice space to work on eHealth developments yourself. Then there hopefully will emerge a few working concepts and we can continue subsequently with the proven pilots". Also R#17 addressed the need for a platform dedicated to facilitating innovative ideas: "there are a lot of stimuli, but structurally gathering all those stimuli and ideas is lacking unfortunately". Secondly, like described in the utilization stage as well, *experimenting* is associated with *learning from others inside the organisation* and stimulating *CC* towards eHealth in the organisation (I#8). R#3 underlined this by explaining that "you need to break through the traditional attitude of healthcare professionals … by starting pilots that show that it leads to improvements".

Table 16: Main findings about the influence of dynamic capabilities in orienting hospitals.

Main findings dynamic capabilities	Case 7	Case 8	Case 9	Orienting total
I: Building up resources				
Experimenting: testing and taking out products to healthcare consumers	X	X	X	**3/4**
Learning from experience: reflection on the innovation process, examining and reviewing how innovation is managed	X			1/4
Learning from others inside the organisation	X			2/4
Research and development	X			2/4

The orienting hospitals showed that predominantly *combining new and existing resources* is addressed with regard to *reconfiguring resources*, since it is mentioned during all interviews in case 7, 8, and 9 (see table 17). Compared to the first two stages, repositioning of products or resources is not mentioned at all by interviewees of the consideration stage (see table 17).

Combining new and existing resources is touched upon by the interviewees in several ways. First of all, *allocation of technological resources* is assigned a major part since an adequate ICT base or platform is required for using eHealth. According to R#17, "such a platform is required to share information. The platform has to be comprehensible". In addition, R#22 explained that "for stimulating eHealth use it is important that the technique works. Everything has to work without failures. It thus must be connected well. If there are often failures, then it is not reliable and me as a doctor can't be sure if it works well. So, then I can't work with it". Krijgsman et al. (2015) presented that nine out of ten medical specialists experienced problems with regard to using ICT in their work. The interviewees, all employees related to ICT departments, underlined the importance of an up to date EHR required as basic infrastructure for running multiple eHealth applications (I#6; I#8; I#9). "Each initiative asks for other resources. Sometimes the EHR needs to be rearranged. Sometimes only a little reconfiguration, but sometimes a lot needs to be changed … if a project fits, it must fit within the resources we have, like EHR and ICT", stated R#1. In case of providing e-care to patients, a lot needs to be changed to a hospital's EHR explained R#1: "offering video consult and tracking vital signs through wearables which must be included in the EHR, means that the EHR has to be reconfigured". H7 recently implemented and started to use a new EHR which includes several possibilities for future eHealth use (I#6; I#7). H8 and H9 are implementing a new EHR in order to prepare an adequate platform for future eHealth use (I#8; I#9). Case 8 demonstrated that the current old HIS[11] can be a barrier for eHealth use as R#3 mentioned that "there are about six doctors who always asked me about new possibilities and if we could work out their new ideas. I had to disappoint them because it was not possible with the current HIS … our ICT system really needs to be replaced … we still got the old HIS … which is still running only in a few hospitals, but the support of this system will end in 2017. That's the end of life situation". H8 is therefore, like H9, implementing a new

[11] Hospital Information System

EHR. “I think it will be better than before … [the new EHR] features a lot of functionalities which support collaborative health management, participation of patients, etc. … such a far more modern EHR provides way more functionalities”, explained R#3. The orienting hospitals thus showed that *allocation of technological resources* is a potential driver for being able to use eHealth in the organisation because of their new EHRs.

Secondly, *allocation of human resources* is addressed by case 7 and 8. *Lacking allocation of human resources* seemed to be a barrier for being able to use eHealth in orienting hospitals. R#22 stated that “it is technologically not impossible to realize the connection [of eHealth applications], but we depend on the ICT department. They say that they have enough things to do, so they need human resources to realize such a thing, which isn’t there now”. R#1, an employee at the ICT department, underlined this lack of human resources: “ICT departments don’t possess lots of app developers and eHealth experts … suppose that you’re an advanced app developer, then you’re able to develop a lot more at a company than at an hospital … [this resulted in] a high throughput of personnel or you don’t even get them … a hospital doesn’t retain the knowledge and expertise”. Furthermore, the need for an innovator is addressed since people responsible for innovation now, healthcare managers, do not prioritize innovations like eHealth (I#8). “Often users, the healthcare professionals, have many good ideas. But if these aren’t given attention to, then it won’t lead to anything. We don’t possess someone that specifically focuses on picking up on these innovative ideas”, indicated R#3.

Thirdly, the three cases addressed *allocation of financial resources* as important for being able to use eHealth in the organisation (I#6; I#7; I#8; I#9). *Lacking allocation of financial resources* seemed to be a barrier for being able to use eHealth in H7 and H8. “In order to launch such a project takes time and money. The limited resources of a hospital caused that developments regarding eHealth don’t go that well”, stated R#1. This is in line with the information provided by R#3 and R#22. “When the eHealth pilot on COPD finished, also the financing quit. Then H7 had to make a difficult choice, because there were multiple things on the list [like procurement of the new EHR] … we couldn’t do everything since we didn’t have the money”, explained R#22.

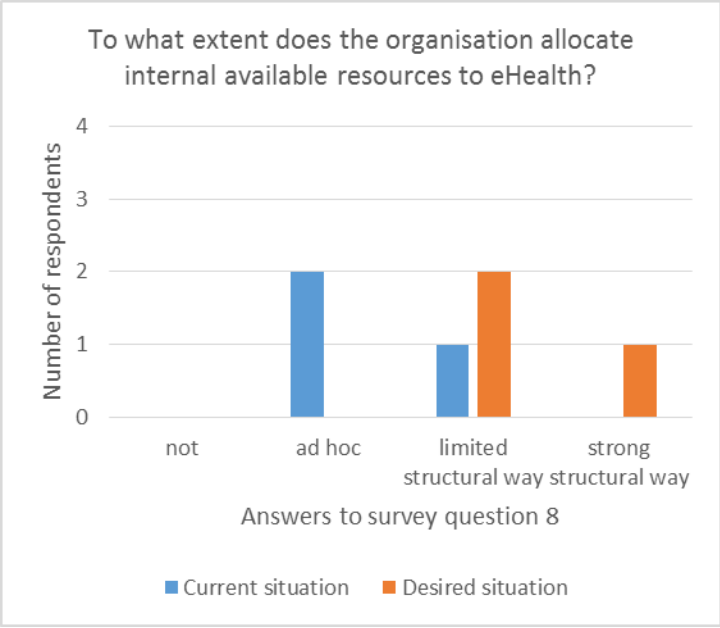

Figure 11: **Allocation of internal resources in orienting hospitals.**

Furthermore, R#1 indicated that “it is actually a matter of attitude. Do we really want to do it (using eHealth)? And do we want to invest in it? … a basic point always is: it is not about ICT, it is not about technology, a lot of things are possible, but what do we really want to achieve and what do we allocate to it?”. This reflected the (currently negative) influence of *CC* on *DC*.

Overall, orienting hospitals demonstrated that *combining new and existing resources* can drive eHealth use in hospitals. However, allocation of resources mainly seemed to be lacking – also in the light of co-evolvement of CC and DC – and improvements are desired

with regard to usage of available internal resources for eHealth (also see figure 11).

Table 17: Main findings about the influence of dynamic capabilities in orienting hospitals.

Main findings dynamic capabilities	Case 7	Case 8	Case 9	Orienting total
II: Reconfiguring resources	X			1/4
Combining new and existing resources: adequate allocation of resources	X	X	X	**4/4**
Repositioning of products / services				

Orienting hospitals reflected a low capacity of in-house development of resources regarding eHealth. *Integration of* complementary external *resources* is therefore required in order to be able to use eHealth in the organisation. This dimension is mainly visible in the consideration stage as *acquisition of external resources* and *learning from others outside the organisation*.

Acquisition of external resources seemed necessary for orienting hospitals to be able to use eHealth in the near future. "Lately, resources are acquired mainly externally because when you don't have the resources yourself to do it, then you have to do it in another way. Then you have to add something externally", explained R#1. The following examples demonstrated the importance of acquiring knowledge and tools from the hospital's external environment for eHealth use. eHealth tools developed externally can be integrated in the hospital, like the e-care platform for COPD patients previously used by H7. Another example involved websites regarding e-care for diabetes patients in H8, where "various websites are used where patient and healthcare professional together compose a health record" mentioned R#3. Working with established products is preferred by orienting hospitals. According to R#1, it is more realistic to further develop, improve, and tweak existing products in order to create adequate eHealth tools for usage in the hospital, instead of full development of eHealth by the hospital. "External suppliers invent smart tools which we can use in the hospital … like video consult. You could develop it yourself, but there are also parties who can perfectly supply it. I envision that eHealth applications won't be developed inside hospitals, but will emerge from the consumer market … it's common for people to use facetime or skype. When you want to do something [with video consult] it's better to get involved with facetime or skype", stated R#1. Orienting hospitals also are involved in integrating a new EHR in their organisation as technological base for future eHealth use, like mentioned in the previous section (I#6; I#7; I#8; I#9). "We've got a broad range of possibilities in-house with the EHR. We've got a lot of techniques in-house", stated R#1. With acquisition of a new EHR also comes access to knowledge and service of the EHR supplier, which can be useful for new ideas for eHealth use (I#6; I#8). "When it (a new idea) is too complex to us and we can't figure it out, then the EHR supplier will change it for us", mentioned R#1. These examples showed that acquisition of external resources is driving future eHealth in orienting hospitals.

However, the survey showed that improvements are desired with regard to acquisition of external resources for eHealth use (see figure 12). Problems regarding acquired external resources for example involved the newly implemented EHR in H7. Changes that need to be made to the EHR in order to implement new eHealth applications is experienced as a complex and time consuming process (I#6; I#7). "When a healthcare professional has a really nice idea, it can be frustrating for them. [Healthcare

professionals say:] 'How hard can it be? I want to have video consult and measurements of my patients in the EHR. That has to be doable in two weeks, right?' But in reality this can take half a year or even one year because it can be too complex at that moment", explained R#1. This frustration is underlined by R#22, a medical specialist at H7, stating that "according to the EHR supplier there would be many things possible. Unfortunately, none of the eHealth features has been available so far. That's a pity, because we really want to work with [video consult and telemonitoring]". In addition, R#22 indicated that "the EHR supplier seemed to be an enormous inhibitor. It is of course an American company, and then we present them a Dutch e-care platform for COPD patients that we want to use. They just don't want that. We've tried to convince them, but it didn't succeed … this is also the case for video consult. As an American company they don't want to be interfered by local [Dutch] initiatives". Acquisition of external resources can thus also be barrier delaying eHealth use in hospitals.

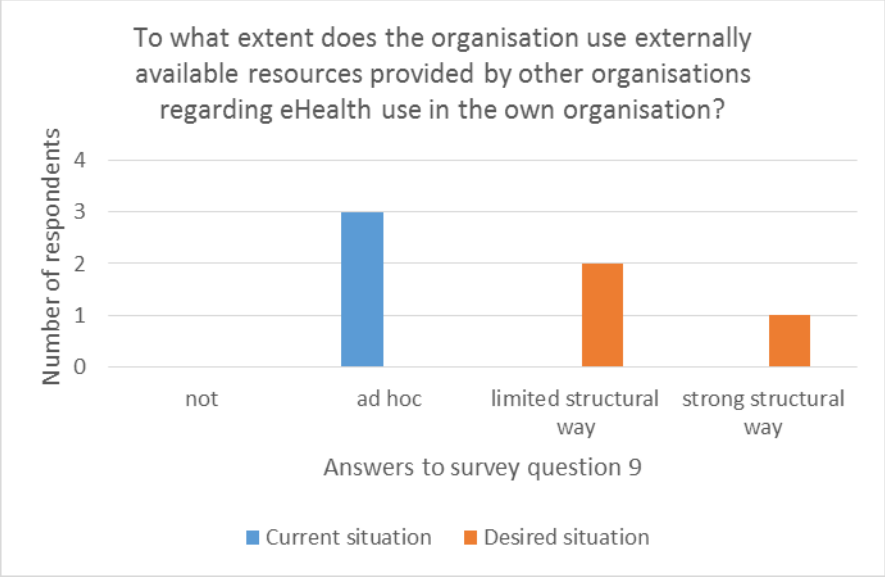

Figure 12: Acquisition of external resources in orienting hospitals.

Integrating resources, specifically knowledge, is also done through *learning from others outside the organisation* by orienting hospitals (see table 18). Learning from other organisations helped orienting hospitals to broaden knowledge and understanding about eHealth possibilities. R#3 mentioned that considerations for eHealth use "emerged from hearing from others, getting information from others [about eHealth use]". In addition, it is believed that sharing of knowledge which addresses external developments in the field of eHealth is important for change and being dynamic as a hospital. "We have to switch eventually as a hospital. Look at other industries where big companies perished because they weren't able to change … I think that knowledge sharing is important. We have to watch out for external disruptive ideas for facilitating communication with patients … current technologies could lead to emergence of an outsider offering high quality healthcare with patients being involved in decision-making. If that happens, what would we do?", stated R#22. Examples showed that orienting hospitals learned from professional associations (I#6; I#8), the industry (I#6; I#9), or other hospitals (I#7; I#9). Learning from industry is emphasized by R#17, who stated that "ideas [for eHealth] also come from the suppliers. They present their ideas at trade fairs and conferences where our [ICT] employees or healthcare professionals get to know it". Learning from peers at other hospitals is underlined by R#22 "as medical specialists we have conversations with each other regularly. We meet each other at conferences or symposia and hear how things are done in other hospitals". Learning from other

organisations is slightly addressed to stimulate being able to use eHealth and willing to use eHealth as well, since getting to know eHealth possibilities used by peers also resulted in some positive attitudes regarding eHealth (I#8; I#9). This reflected co-evolvement of *DC* and *CC*.

However, a *lack of learning from others outside the organisation* is also experienced by orienting hospitals. Especially, a lack of learning from other hospitals is noticed by the interviewees (I#6; I#7; I#8). "I think that hospitals must collaborate involve each other more intensively … now it is really fragmented. Everyone just does a little something. If you combine that, then you have lot. There is a lot of substantive knowledge and skills in a hospital", stated R#1. "Suppose that I lend a few of my people to another hospital. Do I get money for that? They can obtain a lot of new information from another hospital which we can use ourselves. But we are doing that far too little and I don't really know why", mentioned R#3. Hospitals are believed to be hesitant to collaborate with other hospitals (I#7; I#8). "Sometimes people are a bit scared to share information because one could use it for competitive goals. But that is old thinking. Healthcare won't improve if we keep thinking like that", stated R#3. This is in line with R#22 who regarded structural collaboration with other hospitals as complex: "I think it's difficult because you are competitors. So, I don't know if collaborating with other hospitals is possible". Furthermore, the prominent focus on the own daily business is addressed as a reason for inhibiting learning from other hospitals (I#8).

Table 18: Main findings about the influence of dynamic capabilities in orienting hospitals with regard to integrating resources.

Main findings dynamic capabilities	Case 7	Case 8	Case 9	Orienting total
III: Integrating resources				
Acquisition of external resources	X	X		**3/4**
Learning from others outside the organisation	X	X	X	**4/4**
Having a well-developed network of external sources	X	X		2/4

Recapitulating, the consideration stage demonstrated to be quite static compared to the first two stages. None of the orienting hospitals is *building up resources* regarding eHealth use in CRDs or HF at the moment, and *experimenting* is believed to be a potential driver for being able to use eHealth in the organisation. DC's dimension of *reconfiguring resources* demonstrated a positive influence on future eHealth use since *combining new and existing resources* could potentially drive eHealth use in hospitals. However, currently a negative influence of *DC* on eHealth use is visible because *reconfiguring resources* mainly seemed to be lacking and improvements are desired with regard to usage of available internal resources for eHealth. *Integrating resources* also showed both sides of the coin. On the one hand, integrating complementary required software and knowledge on eHealth possibilities is driving future eHealth use in orienting hospitals. On the other hand, acquisition of external resources and a lack of learning from other organisations presented to be a barrier delaying eHealth use in the consideration stage. Co-evolvement of *CC* and *DC* positively influencing eHealth use is slightly addressed by the interviewees. *Building up resources* and *integrating resources* seemed to stimulate *CC* towards eHealth. Also co-evolvement of CC and DC negatively influencing eHealth use is reflected a little by one case, since limited CC seemed to inhibit allocation of sufficient resources in order to use eHealth.

5.3.3 Strategy & Strategic reorientation

Currently, the strategy of orienting hospitals does not prominently pay specific attention to eHealth (R#1; R#3; R#17) and a clear strategy for eHealth is lacking (I#6; I#7; I#8; I#9). "If you don't consider ICT and eHealth, sharing of information, of high priority at the management level then it becomes difficult", stated R#3. Orienting hospitals showed that employees are often focused on the daily business (I#6; I#8) and that strategy is aimed at the short-term rather than the long-term (R#1). "It (an eHealth initiative) is situated at the healthcare managers and often a bit of a traditional attitude is visible. Like I just need to make sure that I have enough beds available, and that the waiting time does not rise excessively, and that the emergency department functions well", explained R#3. eHealth is not a strategic priority because it is not in the minds of healthcare managers in orienting hospitals, which thus demonstrated that lacking *CC* is negatively influencing *SR* towards eHealth.

Findings with regard to the consideration stage also suggest a negative influence of *DC* on *SR*. The cases showed that making strategic choices for eHealth is based on assigning priorities to projects of the overall portfolio and the available in-house resources that can be allocated to new initiatives (I#6; I#7; I#8; I#9). Daily business like maintenance, updates and upgrades of ICT have had priority at H7 so far (I#6; I#7). According to R#3, assigning priorities involves "that replacements often have priority. If you have an almost collapsing CT scanner, then replacement of the CT scanner has priority … that's the game that is played: then the healthcare manager puts pressure on the board of directors that it is of major importance to purchase a new CT scanner". In addition, R#17 indicated that projects are assigned priority based on "what problems does it solve? What will be the result? Can one make a sound business case? … you start with the most promising idea". "If a department approaches us [the ICT department] that wants video consult within two months, then it interferes with the entire course and all appointments and limited resources you have with each other", explained R#1. Subsequently, strategic choices are made based on available resources (I#6; I#8; I#9). According to R#3, "the question is how much money is available for investments". However, as explained previously, *reconfiguring resources* through *combining available existing and new resources is lacking* and negatively influencing eHealth use.

Furthermore, some cases demonstrated that there are hardly any clear criteria for decision-making with regard to eHealth (I#6; I#9). "There are enough ideas but a model lacks to decide on which initiatives we will carry out", mentioned R#17. This is in line with R#1, who stated that "currently, we don't really have criteria [for decision-making on eHealth]. It is too much ad hoc. And maybe that's the problem". A lack of clear criteria for strategic decision-making on eHealth projects seemed to be a barrier for eHealth use, which reflects a negative influence of strategy on eHealth use.

5.4 Analysis of the socio-technical healthcare regime

The socio-technical healthcare regime exhibits the contextual background in which CC, DC, and SR are influencing use of eHealth in incumbents (hospitals). The theoretical concepts are focused on incumbent internal processes for structural change towards use of eHealth. However, the semi-structured interviews also revealed outside-in influences from regime dimensions on eHealth use in hospitals (see table 19). These (potential) barriers and (potential) drivers are important findings that cannot be denied. This section presents main findings on additional dimensions specific to eHealth use in the healthcare regime that emerged from the data and how Geels' (2002) existing dimensions of the socio-technical regime are refined to the healthcare context. Coded data and additional findings on the remaining dimensions of the healthcare regime are presented in Appendix V.

Table 19: Barriers and (potential) drivers indicated by experienced hospitals, newcomers, and orienting hospitals.

Dimensions of the socio-technical healthcare regime	UTILIZATION STAGE			INITIATION STAGE			CONSIDERATION STAGE			EXPERT INTER-VIEWS
	H1	H2	H3	H4	H5	H6	H7	H8	H9	
Culture – (potential) barrier		X	X		X	X	X	X		
Culture – (potential) driver		X		X	X		X	X		X
Healthcare consumers user practices and characteristics – (potential) barrier	X		X			X	X		X	
Healthcare consumers user practices and characteristics – (potential) driver	X	X	X	X	X	X	X			
Industry (eHealth suppliers) – (potential) barriers	X		X					X		
Industry (eHealth suppliers) – (potential) drivers		X	X	X	X	X	X			
Infrastructure – (potential) barrier				X	X	X		X		X
Infrastructure – (potential) driver										
Sectoral policy & government – (potential) barrier						X		X	X	X
Sectoral policy & government – (potential) driver		X	X		X	X				X
Technology – (potential) barrier	X			X	X	X		X		
Technology – (potential) driver	X			X	X		X	X	X	X
Techno-scientific knowledge – (potential) barrier	X	X	X	X		X			X	
Techno-scientific knowledge – (potential) driver										
Financial structure healthcare regime – (potential) barrier	X	X	X	X	X	X	X	X		
Financial structure healthcare regime – (potential) driver	X	X		X		X				X
Sector structure healthcare regime – (potential) barrier					X	X	X	X		X
Sector structure healthcare regime – (potential) driver						X				X

Culture

Cultural change in the healthcare regime is visible with regard to the relationship between doctor and patient (D2P or P2D). While decision-making with regard to a patient's healthcare process rests with healthcare professionals in the existing regime, it is slightly visible that a focus on the role of the patient in this process is rising (I#7; I#8; I#10; I#13; I#16; I#20). Healthcare consumers are more and more empowered and informed about their disease, like decisions with regard to their own health on

available options in the therapeutic process, or hospital choice based on information available with regard to quality and waiting times (I#8; I#10; I#13; I#16). According to Nictiz and NIVEL (2015), the number of patients[12] who keeps information online on doctor's visits and treatments slightly increased. The eHealth monitor 2015 shows that there is a big difference between healthcare consumers who have online access to their health record (0-1%) and who want to have online access to it (40-46%) (Krijgsman et al., 2015). "You prescribed me the green pill, but I've read that the orange one is better. Why do I not get the orange pill?; patients being more empowered happens in small steps, but it happens. eHealth will thus help and support me when I as a patient take over the control", explained R#11. Besides, R#15 underlined that "the current generation isn't like our generation: I will go to the doctor en the knows what is best for me". Digital exchange of medical data and the role of the patient in the healthcare process of diagnosis, therapy, and care increasingly has gained importance. This is concerned as a potential driver for eHealth use in hospitals. "I expect that this will influence it … I have the impression that topics involving the role of the patient and sharing of patient's data were less important 5 years ago compared to the current situation. Societal discussions about the role of the patient and the degree to which he should be empowered does influence how hospitals deal with eHealth internally", explained R#23. A change is also indicated by R#12: "we've come to the moment that we say: listen, the pyramid will be inverted because with eHealth the power will be in the hands of the healthcare consumer. And I will decide myself what I want to purchase. So briefly said: supply-oriented healthcare becomes demand-oriented healthcare". R#22, a medical specialist at H7, agreed: "Soon, healthcare we provide will become more demand-oriented. I expect that the patient will be really in the lead then". In short, the changing relationship between healthcare professionals and healthcare consumers is expected to potentially drive eHealth use in the future.

However, the rigidity of the existing regime based on a strong D2P hierarchy is believed to prevail at the moment (I#4; I#7; I#8; I#10; I#16; I#19). R#12 explained that over time a hierarchical relationship is built between doctor and patient "through which we determine from the top: this is good for you". Also R#10, a medical specialist at H6, mentioned that "now, everything is decided first by us". This hierarchical culture seemed to be a barrier for use of eHealth since this innovation allows for a more patient-oriented relationship. "Healthcare professionals really have to get used to this. They find themselves the professional who knows everything. But there is so much information available for the patient, that he has his own story", stated R#3. This is also reflected by Krijgsman et al. (2015) who showed that a minority[13] of medical specialists thinks that access of healthcare consumers to their own health record is desired

Healthcare consumers user practices and characteristics

Healthcare consumer user practices and characteristics are considered influential for broad application of eHealth. Several user practices and characteristics of healthcare consumers are mentioned by interviewees can be addressed as (potential) barriers for eHealth use in hospitals (I#1; I#2; I#4; I#5; I#9; I#18; I#19). Barriers for example involve the ease of use of eHealth for patients (I#2; I#19). R#2 stated that "DigiD[14] seems to be a big problem for patients. They find it difficult to log on, and therefore the respons rates are low".

[12] 3% in 2014, 7% in 2015 (N=689) (Nictiz and NIVEL, 2015)

[13] 40% (N=385) of the medical specialists thinks that access of patients to their own health record is desired (Krijgsman et al., 2015)

[14] DigiD is a citizen's digital identity in the Netherlands for secure digital exchange of personal information

Besides, especially the age characteristic of healthcare consumers in the external healthcare regime seemed to influence eHealth use in hospitals, either negatively or positively. Older patients are less willing to accept eHealth as first point of contact with the hospital because they appreciate to actually meet the doctor and they are afraid that eHealth is scrimping the offered healthcare (I#1; I#2; I#5). Elderly are also less used to internet, smartphones and tablets (I#1; I#4; I#5; I#18; I#19), which limits the older generation in digital P2D through eHealth. Furthermore, older patients often suffer from comorbidity and therefore must be clinically examined at the hospital (I#3). In contrast to older patients, younger patients have seemed to be more willing to use eHealth so far (I#2; I#3; I#7). With regard to HF, patients are considered young when they are approximately 50 years old (I#3). R#19 mentioned that during an informative event for HF patients "someone, an independent professional, said: I actually find it quite annoying that I have to come to the hospital, because that takes about my whole morning". This is in line with the eHealth monitor 2015, which states that eHealth has potential added value for 39%[15] of the healthcare consumers which regards "having to leave the house to talk to a healthcare provider" as a problem (Nictiz and NIVEL, 2015). R#22, a medical specialist at H7, indicated that "I especially notice that young asthma patients want things to be different and they know that it is technologically possible to do it different because of all the devices they possess … they don't want to be tied to appointments at the hospitals and wasting time. They just want to go to their work". Younger patients are also considered to be used to the internet and using various devices (I#6; I#13; I#16). Healthcare consumers of the younger generations are thus considered as a potential driver for eHealth use in hospitals (I#2; I#3; I#4; I#12; I#13; I#16).

Like the age characteristic, healthcare consumer user practices and characteristics widely differ among patients of a population with regard to a specific chronic disease (I#1; I#2; I#6; I#18; I#19). However, eHealth is often applied to a very broad population of patients (I#1; I#2; I#19). Difference among a specific population of patients are often not noticed by the healthcarer regime (I#1; I#2; I#6; I#19). "As doctors or software developers we are tended to think that the one patient is similar as the other. That is just not true!". Also R#1 underlined that "you thus have to notice very specifically: what target group do you need to involve in eHealth? Which patient wants eHealth?". Not being patient-specific is thus regarded as barrier for eHealth use.

Techno-scientific knowledge

Several interviewees addressed that limited techno-scientific knowledge is available which proves the added value of eHealth use (I#1; I#4; I#5; I#12; I#16; I#19). R#13 stated that "I think that decision-criteria for eHealth use in our hospital are basically the output of the scientific studies … which show a decreas in hospitalisation", however "if those reports are available, I'd really like to see them, but I haven't so far" (R#13). This way of decision-making with regard to eHealth use is also addressed by R#5: "I can imagine that hospitals don't focus on eHealth initially because it is not really proven that eHealth can replace specific things". Techno-scientific knowledge is thus regarded as a barrier for future eHealth use in the healthcare regime because it makes healthcare professionals resistant to use eHealth as their new daily practice.

Financial structure healthcare regime

The current financial structure of the healthcare regime is noticed as a dimension negatively influencing eHealth use in hospitals in several ways (I#7; I#10; I#11; I#14; I#15; I#16; I#17; I#18; I#19). First of all, in the current structure a hospital is paid for practice rather than the quality provided by that practice

[15] N=669 (Nictiz and NIVEL, 2015)

(Schrijvers, 2014), which does not stimulate eHealth use (I#7; I#10; I#11; I#14; I#15; I#16; I#19). "So, there is no incentive for quality improvement with innovations like eHealth", stated R#14. Also R#12 critisized the financial structure of the healthcare regime: "So we have earned massively because of diseases. Our whole system is built on it … it is perverse that we make money out of diseases". The e-care platform used by H2 for example drastically reduced the amount of hospitalisation, but it also diminished the hospital's financial reward as it was paid based on a payment for practice structure (I#15; I#16). This reward-structure has recently changed for H2 as the hospital discussed this with the healthcare insurer and they agreed on including e-monitoring in the diagnosis-therapy-combination (DTC) (I#16). However, this agreement has not been applied for all Dutch hospitals yet (I#16).

Secondly, the financial structure of the regime is considered inhibiting eHealth use in hospitals because it is not clear yet who has to pay for an eHealth solution and if eHealth can be reimbursed (I#2; I#4; I#5; I#7; I#8; I#15; I#18; I#19). "You can't claim a video consult with patients as a regular consult, like it is possibile in case of consults by phone. This is financially impossible for us", stated R#8. Moreover, healthcare insurers do not provide money for prevention, while a lot of e-care tools do focus on prevention (I#17).

In contrast to these barriers, it is visible that healthcare insurers as part of the regime's financial structure can also drive eHealth use in hospitals (I#2; I#5; I#11; I#16). At H1 for instance, a healthcare insurer participates in several eHealth projects of the hospital. R#16, a healthcare manager at H5, stated that "we are currently writing a business case [on an eHealth project] mainly because the healthcare insurer indicated that they want to make agreements with a few hospitals about telemonitoring in 2016".

Sector structure healthcare regime

The Dutch healthcare regime is characterized by a specific sector structure with regard to various levels where healthcare is provided. Primary care concerns directly accessible healthcare which is provided, among others, by GPs. When more specialized healthcare is required, patients will be referred to secondary care which includes, among others, hospitals. Tertiary care consists of hospitals and other organisations which provide top specialized healthcare, like CTCEHs[16] or UMCs[17] (Post and Gijsen, 2013).

Results showed that primary, secondary, and tertiary care being separated in the existing system can be a barrier for eHealth use (I#7). "Integration of primary and secondary care plays an important part … GPs and the hospital or medical specialist are strictly separated in the current system", explained R#22, which inhibits the digital exchange of medical data. This can be a barrier for repositioning of clinical pathways in order to use e-care for which exchange of medical data between chronic patients and different healthcare organisations is required. Furthermore, it seemed that hospitals can be quite isolated (I#21). Also hospitals which are experienced in eHealth use are considered to be quite closed according to orienting hospitals (I#6; I#8). "It's curious that the eight UMCs don't agree on one approach on eHealth for instance … If the eight UMCs really would have been one stronghold with regard to development of EHR and national standards, then we would have been much further [with eHealth use in the healthcare regime]", stated R#1. R#3 added that "it (stimulating sharing of knowledge regarding eHealth) might be a task for the associations? If you don't facilitate anything their, then it won't get

[16] Collaborating Top Clinical Educational Hospital
[17] University Medical Center

started … the DHA tries to do something about it. But if you see that there is only one person of the DHA who focuses on the ICT context of a hospital. So, it is a matter of setting priorities".

The findings also demonstrated that in addition to hospitals other healthcare related organisations influence eHealth use in the healthcare regime as well. The Netherlands Society of Cardiology, an assosication for healthcare professionals in the field of cardiology, for instance stated that they are not in favour of eHealth (I#4; I#5). "The Netherlands Society of Cardiology is a stronghold which you can not easily pass, so they have also something to say about it. They think it is going too fast. They thinkt that it (eHealth) has not proven enough to be of added value for the patient … the association wants to slow it down: first lets see what happens and implement it under controlled conditions, so that it can be perfectly analysed from all perpectives.", indicated R#10. Besides, patient associations do seem to stimulate use of eHealth in the healthcare regime by addressing the importance and added value of eHealth (I#4; I#5; I#20). "The patient association for cardiovascular disease gave its approval to telemonitoring … and it of course looks nice if the associations does associate you[r hospital] with providing telemonitoring", mentioned R#13. R#10 added that "the PACD asks us about it … they often send us questionnaires: have you already started providing telemonitoring?". The patient association for cardiovascular disease (PACD) made an overview of where telemonitoring for HF patients is provided in the Netherlands in April and December 2013 (PACD, 2016).

6 Conclusions

Structural change or destabilisation of the Dutch healthcare regime is necessary because major healthcare challenges rapidly emerge and put pressure on the sustainability of the current regime: demographic changes will lead to an increasingly aging population and an enormous increase in prevalence of chronic diseases, which in turn is expected to result in higher healthcare costs and rising indirect costs, because of absenteeism and less labour productivity (Nauta et al., 2011; European Commission, 2012; Trappenburg and Schuurmans, 2013). Over the past years, structural change within the healthcare regime towards using radical innovations like eHealth has been slow and the Dutch healthcare regime seemed locked-in. Incumbents, in this research Dutch hospitals, can contribute to regime destabilisation: influencing structural change from inside-out the regime's main organisations. In order to radically change, incumbents need to strategically reorient. They need to adapt their strategic focus to the new regime, which takes time (Turnheim and Geels, 2012). This makes strategic reorientation (SR) a relevant concept to consider with regard to regime destabilisation. Elements important for SR are dynamic capabilities (DCs) (Teece et al., 1997) and cognitive change (CC) (Barr et al., 1992). A dynamic incumbent is capable to reconfigure its competences and resources into a new, reoriented strategy, while a static incumbent remains stuck in its routines. Incremental solutions are not likely to be sufficient when an incumbent is confronted with huge challenges, like major healthcare challenges, because such confrontations ask for an organisation's direction and attitude to be drastically changed. Then CC is required for being able to reorient strategy that focuses on radical ideas. Therefore, this research aimed to explore DC and CC as underlying processes of SR of Dutch hospitals towards using eHealth niche innovations, in order to address the rising healthcare challenges. This has led to the following research question: *In what way do dynamic capabilities and cognitive change influence strategic reorientation of incumbents towards use of eHealth in the Dutch healthcare regime?*

This research question is studied through a multiple case study of nine hospitals. The cases are distinguished in three stages of eHealth use which indicate the degree of experience with eHealth use over time (Chiu and Eysenbach, 2010). Each stage included three hospitals. This research focused on eHealth innovations that enable digital communication and exchange of medical data between patients and healthcare professionals used by Dutch hospitals in diagnosis, therapy, and care with regard to chronic respiratory diseases and/or chronic heart failure. In order to explore and to get in-depth insight in underlying processes of CC, DCs, and SR of incumbents regarding eHealth innovations, a qualitative research design is used. The research design is inspired by an inductive approach, which allowed additional conceptual relations to emerge from the obtained data.

The refined conceptual model exhibits three adjustments compared to the model presented in the 'Theoretical Framework', which are demonstrated by yellow arrows in figure 13. Analysing nine cases led to results on the positive and negative influence of CC and DCs through SR on eHealth use. In addition, the analyses showed a direct positive and negative influence of CC and DCs on eHealth use in incumbents without SR coming into play. Furthermore, the findings suggest that the context of the socio-technical healthcare regime can positively and negatively influence eHealth use and organisational processes inside of incumbents. Aspects stimulating eHealth use in incumbents are referred to as drivers, and elements inhibiting eHealth use in incumbents are called barriers. All conceptual relations that reflected a positive or negative influence on eHealth use in incumbents, are designated a number (see figure 13). Main findings of each conceptual relationship are explained below in numerological order.

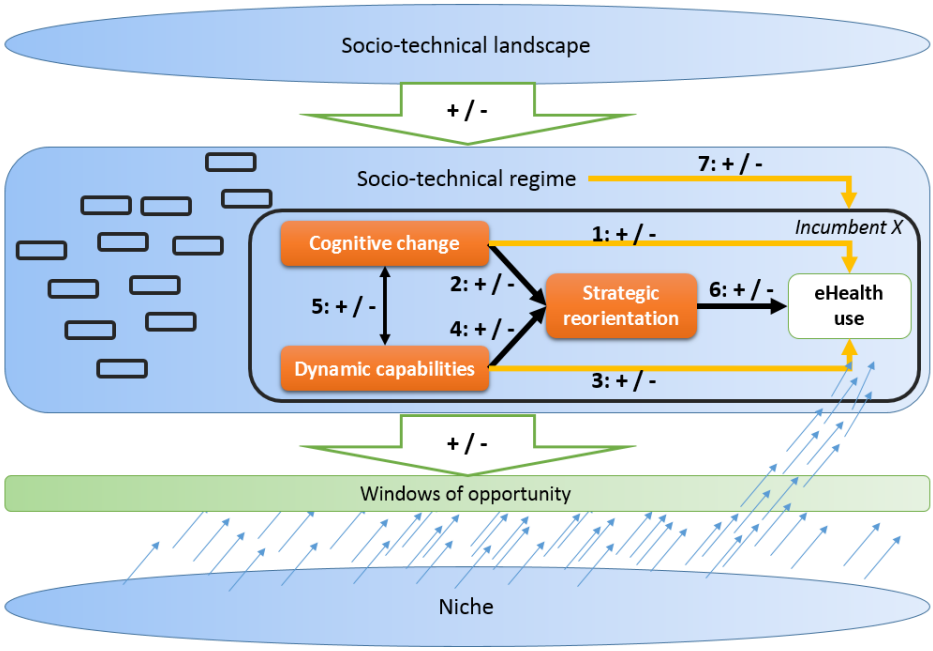

Figure 13: Refined conceptual model.

1: Influence of CC on eHealth use

The analyses showed that a positive influence of CC on eHealth use is mainly present in the utilization stage, to a less extent visible in the initiation stage, and limitedly reflected by the consideration stage. First of all, noticing external change is a driver for willingness to use eHealth. Noticing the possibilities of eHealth used by peers in other hospitals, for instance, stimulated attitude to be willing to use eHealth in the own organisation. Though, all stages showed that this process could be improved in order to stimulate eHealth use since none of the hospitals structurally noticed external change. The utilization stage, however, demonstrated that three hospitals did succeed in becoming experienced in using eHealth despite of lacking structurally noticing external change. This finding suggests that the organisational process of noticing external change might not be required for CC, though it could accelerate eHealth use by incumbents in the healthcare regime. Secondly, constructing meaning of external change seemed to be a driver for willingness to use eHealth, mainly in experienced hospitals and newcomers. This organisational process led to positive beliefs regarding eHealth. As the innovation is believed to be a possible solution for existing problems faced by hospitals. The cases showed that eHealth solves problems specifically at departmental level, like a hospital's heart failure clinic. Furthermore, new beliefs which stimulate eHealth are developed through building coalitions and having a shared vision at departmental level. Also at this dimension the increase of CC over time is visible. Only one orienting hospital limitedly reflected to develop new beliefs, compared to all experienced cases demonstrating that building coalitions and shared vision at departmental level stimulated eHealth use.

The analyses also demonstrated a negative influence of CC on eHealth use in all stages. The experienced hospitals revealed that resistance to change was and still can be a barrier for willingness to use eHealth in the organisation. Although a negative influence of CC is predominantly present in the initiation stage and consideration: the two less experienced stages. In all newcomers and orienting hospitals only a small group of employees seemed not to be resistant to change. A major part of the entire organisation

being resistant to change presented a barrier for broad application of eHealth in these hospitals. Furthermore, limited development of new beliefs is presented as a barrier for willingness to use eHealth in the initiation and consideration stage.

2: Influence of CC on SR

Both newcomers and orienting hospitals slightly reflected a negative influence of CC on SR. One newcomer indicated that decision-making on an organisational plan of action in favour of eHealth is not expected to take place because of a lacking shared vision on eHealth throughout the organisation, especially among healthcare professionals. The consideration stage showed that eHealth is not a strategic priority because it is not in the minds of healthcare managers, which thus demonstrated that lacking CC is negatively influencing SR towards eHealth. Moreover, the presence of resistance to change demonstrated a negative influence of CC on SR as one case underlined that CC would not result in plans of action towards eHealth since the organisation has not expressed to be willing to become an experienced eHealth hospital so far. Contrastingly, two experienced hospitals showed a positive influence of CC on SR through developing new beliefs.

Furthermore, CC rather seemed to take place at departmental level of experienced hospitals and newcomers, instead of full CC throughout the whole organisation. Therefore, the results suggest that no hospital is fully strategically reoriented towards eHealth yet. Departments are addressed to vary since different disease areas are associated with different healthcare professionals varying in attitudes and beliefs. The experienced hospitals demonstrated that CC towards eHealth is department specific. Not all departments involved in chronic diseases of an experienced hospital are by definition cognitively changed towards eHealth yet. Departments can vary in their constructed meaning and beliefs regarding eHealth, and prevailing shared vision on eHealth. However, various departments can face similar or comparable problems, like reducing preventable flow of patients by checking up on them through video consult.

3: Influence of DC on eHealth use

All stages demonstrated DC to be both positively and negatively influencing eHealth use. The experienced hospitals showed that building up resources made them capable of being dynamic, to change and to work with eHealth. Over time, building up resources has led to broader application of eHealth in the experienced hospitals. Moreover, research on eHealth use by the experienced hospitals contributed to the available techno-scientific knowledge on eHealth in the regime, which has positively influenced eHealth use by other hospitals. Two newcomers also demonstrated building up resources as a driver for eHealth use, as experimenting and learning from experience led to plans for future extension of existing pilots or adding new eHealth projects. None of the orienting hospitals is building up resources with regard to eHealth use involving CRDs or HF at the moment, but it is believed to be a potential driver for being able to use eHealth. The utilization stage also showed that all cases have reconfigured their resources through adequately allocating resources and they are repositioning healthcare into new clinical pathways, in order to stimulate further development and usage of innovations like eHealth. This is done to a limited extent in the other two stages. Currently, a negative influence of DC on eHealth use is visible with regard to reconfiguring resources in both newcomers and orienting hospitals, which insufficiently allocated resources with regard to eHealth. Insufficient allocation of financial resources is presented as a barrier in all cases in both stages. All stages addressed the importance of integrating resources as a driver for being able to use eHealth by acquisition of external complementary resources. External knowledge is also integrated by learning from others outside the organisation, which seemed to stimulate eHealth use in the initiation stage and has helped orienting hospitals to broaden knowledge and understanding about eHealth possibilities. However, all

stages addressed a lack of learning from others outside the organisation which could be a barrier for eHealth use. A positive influence of DC on eHealth use is mainly reflected by experienced hospitals, which suggests that also an incumbent's DCs become more visible over time.

4: Influence of DC on SR

Only one stage slightly revealed a positive influence of DC on SR. Two newcomers showed that experimenting and learning from experience resulted in plans of action at departmental level to expand existing pilots or add new eHealth projects. This also reflects a positive influence of DC on SR, though limited to SR at the departmental level. In addition, one case indicated that integrating services from an external care organisation resulted in long-term goals on how to collaborate with regard to healthcare for chronically ill patients, which led to the collaborative use of eHealth. This reflects a positive influence of DC on SR. However, the three stages in general demonstrated a slightly negative influence of DC on SR or no influence at all.

5: Co-evolvement of CC and DC

The findings also revealed various ways of how CC and DC relate to each other. A combination of these concepts either is stimulating or hampering eHealth use. The main findings showed that learning from others inside or outside the organisation is associated with contributing to both knowledge and positive beliefs regarding eHealth, which (potentially) drives eHealth use in the organisation. Seeing eHealth being used by peers in other more experienced eHealth hospitals for instance improved understanding on how to use eHealth. In addition, seeing peers that use eHealth is also regarded as stimulating healthcare professionals to be willing to use eHealth. This example shows that DC's integrating resources thus co-evolves with CC's noticing external change. By first seeing and then believing, use of eHealth is spreading throughout a hospital.

6: Influence of SR in order to use eHealth

None of the cases turned out to be fully strategically reoriented towards eHealth. A positive influence of SR on eHealth use is only slightly present in the utilization stage, while the least experienced hospitals showed a negative influence of a non-reoriented strategy on eHealth use. In an orienting hospital a lack of clear criteria for strategic decision-making on eHealth projects seemed to be a barrier for eHealth use. Despite a limited strategy specifically regarding eHealth, the cases exhibited that experienced hospitals and newcomers are using eHealth. This could mean that strategic reorientation of the organisation is not required for small-scale use of eHealth at departmental level, and that decision-making at departmental level is of main interest instead. Another reason for the absence of full SR towards eHealth could be that eHealth is seen as a means instead of the goal itself. Several cases indicated that eHealth is seen as contributing to innovation or patient-centred healthcare, but no hospital has the goal to become the most experienced eHealth hospital.

7: Influence of the socio-technical healthcare regime on eHealth use by incumbents

The findings suggest that the socio-technical healthare regime both negatively and positively influences eHealth use by incumbents. Results showed that dimensions of the healthcare regime can be (potential) drivers or (potential) barriers for eHealth use by hospitals. Dimensions of healthcare regime are derived from the seven dimensions of the socio-technical regime of Geels (2002, 2004): culture, healthcare consumers user practices and characteristics, industry, infrastructure, sectoral policy & government, technology, and techno-scientific knowledge. The data revealed two additional dimensions of the healthcare regime: the financial structure of the regime, and the specific sector structure in healthcare. The financial structure covers the the pay for practice model and the role of the healthcare insurer and reimbursements (Schrijvers, 2014). The sector structure involves the distribution of healthcare

organisations across primary, secondary, and tertiary care (Post and Gijsen, 2013) and other healthcare related organisations like associations for patients and healthcare professionals. The financial structure dimension seemed to be the biggest barrier for eHealth use in the current healthcare regime. Firstly, because of the pay for practice reward-structure there is no incentive for using eHealth innovations: eHealth use can reduce the amount of hospitalisation, but this also diminishes the hospital's income. Secondly, the financial structure of the regime is considered inhibiting eHealth use in hospitals because it is not clear yet who has to pay for an eHealth solution and if eHealth can be reimbursed. Especially healthcare consumer user practices and characteristics are considered to potentially drive broad application of eHealth. Younger patients have seemed to be more willing to use eHealth so far and they are considered to be more used to the internet and various devices, compared to older patients. Healthcare consumers of the younger generations are thus considered as a potential driver for eHealth use in hospitals.

6.1 Societal implications

Main similarities and differences between stages regarding the conceptual relations influencing eHealth use in incumbents has led to five societal implications. This research provides advise on how to enlarge drivers and how to resolve barriers for eHealth use in the healthcare regime. This can also assist in anticipating on potential drivers and barriers for eHealth use in the future. The advice is directed to hospitals' healthcare professionals, employees related to ICT and/or innovation, and healthcare managers. The advice will hopefully increase the success of the breakthrough of ICT related innovations in the healthcare regime, specifically with regard to eHealth that connects and enables digital communication and exchange of medical data P2D or D2P in diagnosis, therapy, and care for CRDs or HF.

1. First of all, focus should be on solving existing problems experienced by healthcare professionals. *Solving existing experienced problems* results in positive beliefs regarding eHealth, which is a driver for willingness to actually use eHealth.

2. Secondly, an *innovative culture should be realised* within a specific department or the entire organisation. Creating a shared vision on what problems to solve with eHealth and high involvement of employees stimulate willingness to use eHealth. This should especially be improved by hospitals situated in the initiation and consideration stage.

3. Furthermore, carrying out pilots and structurally sharing positive results with others in the organisation is considered important. Healthcare professionals can learn from each other as peers about best practices on how to use eHealth. This also stimulates positive beliefs and attitudes towards eHealth. *First seeing eHealth* being put into practice *triggers to start believing* in this innovation.

4. Besides, *sharing is caring*. Learning from healthcare professionals outside the own organisation can contribute to eHealth use as well. It is important to go beyond the boundaries of the own hospital because this prevents multiple reinventions. Furthermore, positive attitudes towards eHealth can be triggered by noticing eHealth possibilities used by external peers, which is comparable to the previously mentioned implication.

5. Lastly, *resources should be reconfigured* in order to create room for eHealth use in the organisation. New and existing resources should be adequately combined into eHealth initiatives. Sufficient allocation of financial-, human-, and technological resources is required for stirring eHealth use in the organisation.

7 Discussion

A note of caution on the internal validity of some individual cases is due here, mainly with regard to cases of the consideration stage. It was desirable to conduct three semi-structured interviews per case (thus nine interviews per stage and 27 in total), in order to check findings among multiple interviewees per case. However, it has been challenging to include interviewees in the research since eHealth use is quite new in hospitals. In total 24 interviewees participated, spread over 21 semi-structured interviews: nine interviewees are included in the utilization stage, the initiation stage covered ten interviewees, four interviewees are included in the consideration stage, and two experts are interviewed (see Appendix I). With regard to the three hospitals situated in the consideration stage that were willing to be included in this research, a small number of semi-structured interviews is realized because it was difficult to find employees who had insight in the organisation's considerations on future eHealth use. Especially healthcare professionals were not always willing to talk about the topic since the idea of using eHealth is quite new in their organisation. Results of the consideration stage therefore need to be interpreted with caution. Besides, it has been challenging to include three cases in the consideration stage. Some approached hospitals turned out to be less orienting on eHealth than presented in available secondary data. One approached hospital for instance was involved in a merger and the considerations for eHealth were therefore considerably reduced. Despite promising results, questions on drivers and barriers of future eHealth use in orienting hospitals remain.

The findings demonstrated a prominent role of a hospital's specific department with regard to eHealth use. This could have been caused by the chosen way of selecting cases and interviewees. Since this research obtained data from one medical department only per case – a medical clinic either involved in CRDs or HF – findings could have enlarged the focus on departments in contrast to the overall organisation. The iterative research process of obtaining and analysing data addressed possible differences between departments. This is an important issue with regard to the generalizability to eHealth use at different medical departments. Due to time constraints, it was not possible to include multiple medical departments per case. For future research it is therefore recommended to obtain data from additional medical departments which are involved in highly prevalent chronic disease areas as well. Besides, additional cases are required for drawing reliable conclusions on conceptual relationships with regard to eHealth use in the two specific chronic disease areas because the sample size is quite small. Two cases (H3 and H7) presented (former) use of eHealth regarding COPD and five cases (H1, H2, H4, H5, and H6) demonstrated eHealth use with regard to HF. The small sample size for each disease area resulted from a research design which focused on having a reliable sample with regard to experience in eHealth use instead. It is recommended for future research to include at least three hospitals with similar experience in eHealth per disease area. Though, experience of hospitals in using eHealth regarding CRDs was not as developed as expected.

The findings of this research cannot be extrapolated to healthcare regimes in all other countries because there are big differences between the Dutch healthcare regime and other healthcare regimes, for instance with regard to the financial structure. Struggles in use of eHealth are also present in cases like Denmark, United Kingdom, and Sweden (Jha et al., 2008; Ludwick and Doucette, 2009). These countries have comparable public national healthcare systems, which makes findings of this research generalizable to an international context as well. However, the findings of this research may be somewhat limited to make robust assumptions about other healthcare regimes, since this research did not involve an international comparison. Future research on destabilizing healthcare regimes from inside-out could be done through a multiple case study comparing structural change towards eHealth in various public healthcare systems.

7.1 Theoretical implications

This research contributed to the innovation and transition literature in several ways. First of all, knowledge is broadened on destabilisation of the regime through internal processes of change in incumbents. The literature of the multi-level perspective (MLP) is extended with insights in cognitive change (CC), dynamic capabilities (DCs), and strategic reorientation (SR) of incumbents in the healthcare regime. The comparison of the three stages of experience with eHealth use showed that a positive influence of CC on eHealth use increases over time. CC in the context of inside-out regime destabilisation therefore provides further support for the idea that CC takes time as presented by Barr et al. (1992). The findings also demonstrated a positive influence of DCs on eHealth use over time. DCs in the light of inside-out regime destabilisation thus confirmed the assumption that DCs takes time as reflected on by Teece et al. (1997). Findings with regard to CC and DCs over time involving eHealth use by incumbents could be extended by future research which combines a survey among a larger sample of employees of hospitals situated in each stage of experience with eHealth, and a history event analysis of eHealth use including figures on size of population of patients for which eHealth is applied. These findings could lead to improved insights in drivers and barriers for eHealth use at specific moments in time, which could assist hospitals in how to improve and broaden their eHealth use over time.

In contrast to CC and DCs, a clear confirmation is not found of SR over time for inside-out regime destabilisation as proposed by Turnheim and Geels (2012). Several questions regarding the influence of SR towards eHealth use remain unanswered at present, like why has strategic reorientation of incumbents not had a prominent role with regard to use of eHealth so far? Nevertheless, the idea that inside-out regime destabilisation can be influenced by incumbents in the regime (Kern and Smith, 2008; Stenzel and Frenzel, 2008; Penna and Geels, 2012; Smink et al., 2015), can be confirmed by this research with regard to the context of the healthcare regime. Experienced hospitals, and newcomers to a lesser extent, contributed to the techno-scientific knowledge on eHealth available in the healthcare regime and other hospitals learned from this. Further reseach on the contribution of incumbents to destabilisation of the regime is required in order to draw more generalizable conclusions, because this research mainly found results on structural change and reorientation of hospitals individually.

Furthermore, a theoretical comparison can be made to the application of institutional logics to the MLP literature. The focus of this research concerned CC involving changes in shared beliefs in an organisation and DCs involving changes in resources, routines, and capabilities of an organisation in the context of regime destabilisation. This is related to the institutional theory literature, where institutional logics refer to “the belief systems and related practices that predominate in an organisational field” (Scott, 2001, p. 139). Belief systems are related to the studied changes in shared beliefs. Predominating practices are related to the studied changes in resources, routines, and capabilities. Findings suggested by this research could thus contribute to studies on how insititutional logics affect use of radical innovations in the context of the healthcare regime.

Furhtermore, co-evolvement of CC and DCs affecting eHealth use in incumbents in the context of the socio-technical healthcare regime, indicates that links can be made between the MLP literature and the literature on diffusion of innovaitons. As presented by the fifth conceptual relationship influencing eHealth use in incumbents (see the ‘Conclusions’ chapter), use of eHealth is spreading throughout a hospital in small steps by first seeing and then believing. A comparison can be made to the theory of Rogers (2003), which explains the adoption and diffusion of innovations. One of the presented variables which determines the rate of adoption of an innovation is observability, which is defined as “the degree to which the results of an innovation are visible to others” (Rogers, 2003, p. 258). According to Rogers

(2003), innovations that possess high observability are easily noticed by people and communicated to others, which positively influences the rate of adoption of the innovation. The findings of this research also touched upon observability, since eHealth used by peers is noticed by healthcare professionals and can lead to use of the innovation in the own hospital. The theory of Rogers (2003) on diffusion of innovation among people is thus reflected at organisational level in this research.

This research also contributed to knowledge in the innovation literature with regard to systemic and dynamic aspects of healthcare. The results revealed that the socio-technical regime needed to be extended and refined to the healthcare context. This is required in order to adequately reflect the influence of the contextual background on regime destabilisation. Despite these promising results, questions remain for instance on the influence of the financial structure on use of radical innovations in the healthcare regime. Future research is recommended to further unravel the specific dimensions of the healthcare regime, since this research mainly focused on inside-out destabilisation of the regime by internal processes of incumbents.

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Appendices

Appendix I: List of interviewees (anonymized)

Semi-structured interviews are referred to as 'I#N'. Quotes and survey data of specific respondents are referred to as 'R#N'. Respondents are labelled as employees with regard to ICT or innovation (green), employees of a hospital's support staff (orange), nurse or nurse practitioner (yellow), or medical specialist (blue).

Case / Hospital nr.	Type of organisation	I#N	R#N	Job description
H1	UMC	I#1	R#18	Medical specialist and Professor eHealth and disease management
		I#2	R#2	Medical specialist (cardiologist)
			R#20	Nurse practitioner
		I#3	R#19	Researcher e-Cardiology
H2	Regional hospital	I#15	R#9	Nurse practitioner
		I#16	R#15	Nurse practitioner
H3	UMC	I#17	R#4	Program manager eHealth platform
		I#18	R#8	Medical specialist (pulmonologist)
		I#19	R#14	Program manager COPD
H4	Regional hospital	I#12	R#5	Team Leader Cardiology
		I#13	R#7	HF nurse
		I#14	R#6	Head of Information Management
H5	CTCEH	I#10	R#11	Program manager
			R#12	Healthcare manager
		I#11	R#16	Healthcare manager
H6	CTCEH	I#4	R#10	Medical specialist (cardiologist)
		I#5	R#13	HF nurse
			R#20	HF nurse
			R#21	Support staff HF clinic
H7	CTCEH	I#6	R#1	Manager Information & Medical Technology
		I#7	R#22	Medical specialist (pulmonologist)
H8	Regional hospital	I#8	R#3	Senior Project Manager EHR
H9	Regional hospital	I#9	R#17	Healthcare Innovation Team Leader & Project manager
Expert interview	Centre of expertise for standardisation and eHealth	I#20	R#23	Manager Monitoring & Trends with regard to eHealth
Expert interview	Dutch Hospital Association	I#21	R#24	Policy advisor focused on ICT in healthcare

Appendix II: Interview topics and questions (in Dutch)

Voorbeelden eHealth toepassingen

- Kunt u enkele voorbeelden noemen van succesvolle eHealth toepassingen voor longziekten/chronisch hartfalen binnen uw organisatie in de laatste 3 jaar?

- Kunt u enkele voorbeelden noemen van mislukte eHealth toepassingen binnen uw organisatie in de laatste 3 jaar?
- Op wat voor manier wordt eHealth toegepast? diagnose / behandeling / care

Niveaus ervaring eHealth gebruik
Zoekende / nieuwkomer / ervaringsdeskundige → huidig vs. gewenst → waarom?

Veranderingen algemeen
Welke veranderingen denkt u dat een ziekenhuis moet doormaken om eHealth succesvol te kunnen toepassen tussen arts en patiënt?

Verandering I: herzien en veranderen van strategie voor het gebruik van eHealth (strategic reorientation)

- Op basis waarvan wordt besluit genomen voor gebruik ehealth? Waarom juist deze besluitvormingscriteria?
- Merkt u dat herzien en veranderen van strategie voor het gebruik van eHealth binnen een ziekenhuis aan de orde is? Waarom wel/niet? Waaruit blijkt dit?
    - Hoe gaat zo'n verandering van strategie voor het gebruik van ehealth in z'n werk?
    - Door wie? afdeling / ziekenhuis / maatschap
    - Doelen?

Verandering II: middelen en competenties (dynamic capabilities)
De middelen en competenties in huis hebben om eHealth te gebruiken → het <u>kunnen</u> gebruiken van een nieuwe technologie

- Welke middelen en competenties zijn van belang om eHealth te kunnen gebruiken?
- bijv.: tastbare/fysieke middelen (zoals apparatuur), personeel/HR, financiële middelen, organisationele (zoals kwaliteitscontrole systemen, infrastructuur EPD/software platform), technologische capaciteit, competenties (skills en kunde)

- **Opbouwen/ontwikkelen van middelen en competenties (building up resources)** → bijv. leren van anderen binnen de eigen organisatie, onderzoek naar en ontwikkeling van kennis of technologieën (software, apps, etc.), experimenteren of testen met pilots, leren vanuit eigen ervaring
    - van belang voor het gebruik van eHealth? Waarom wel/niet?
    - hoe gaat dit in zijn werk? wat voor activiteiten en/of processen?
    - Door wie? afdeling / ziekenhuis / maatschap
    - wanneer was de laatste keer dat u betrokken was in zo'n activiteit/proces? waarom?
    - wat zijn de belangrijkste problemen waar u tegenaan loopt in zo'n activiteit/proces? waarom zijn juist dit de problemen?
    - Wat zijn de belangrijkste zaken die goed gaan in zo'n activiteit/proces? Waarom is dat essentieel/relevant?
    - wat voor invloed heeft het opbouwen/ontwikkelen van middelen/competenties op strategische verandering? Waarom?

- **Anders inzetten van resources (reconfiguring resources)** → nieuwe combinaties van middelen en competenties die je in huis hebt, keuzes maken over het anders inzetten van middelen bijv. financiële middelen anders besteden of medewerkers op een andere manier inzetten, om zorg op een andere manier te kunnen aanbieden.
    - Van belang voor het gebruik van eHealth? Waarom wel/niet?
    - hoe gaat dit in zijn werk? wat voor activiteiten en/of processen?
    - Door wie? afdeling / ziekenhuis / maatschap
    - wanneer was de laatste keer dat u betrokken was in zo'n activiteit/proces? waarom?
    - wat zijn de belangrijkste problemen waar u tegenaan loopt in zo'n activiteit/proces? waarom zijn juist dit de problemen?
    - Wat zijn de belangrijkste zaken die goed gaan in zo'n activiteit/proces? Waarom is dat essentieel/relevant?
    - Wat voor invloed heeft het anders inzetten van middelen/competenties op strategische verandering? waarom?

- **integreren van aanvullende externe resources (integrating resources)** → bijv. acquisitie van kennis of expertise, benutten en onderhouden van netwerk, leren van anderen buiten de eigen organisatie (bijv. adopteren van methodes van andere ziekenhuizen), etc.
    - van belang voor het gebruik van eHealth? waarom wel/niet?
    - hoe gaat dit in zijn werk? wat voor activiteiten en/of processen?
    - Door wie? afdeling / ziekenhuis / maatschap
    - Welke partijen worden hierbij betrokken?
    - wanneer was de laatste keer dat u betrokken was in zo'n activiteit/proces? waarom?
    - wat zijn de belangrijkste problemen waar u tegenaan loopt in zo'n activiteit/proces? waarom zijn juist dit de problemen?
    - Wat zijn de belangrijkste zaken die goed gaan in zo'n activiteit/proces? Waarom is dat essentieel/relevant?
    - Wat voor invloed heeft het integreren van middelen/competenties op strategische verandering? waarom?

Verandering III: cognitieve verandering

Heeft te maken met hoe medewerkers van ziekenhuis over eHealth (nieuwe manier) en huidige manier van werken/bieden van zorg denken + de impact van externe veranderingen hierop. Verandering/innovatie roept vaak weerstand op → Het gaat hier om het willen gebruiken van nieuwe technologie.

- **Welke veranderingen spelen er in de zorgsector die van invloed zijn op eHealth gebruik binnen uw organisatie? (socio-technical healthcare regime)** → bijv. Veranderende cultuur? Veranderingen m.b.t. invloed van patienten? Verandering zichtbaar in industrie/aanbieders? In de infrastructuur? Veranderingen op de politieke agenda en regelgeving? Veranderende technologie? Veranderingen in de stand van de wetenschappelijke kennis?

- **opmerken/herkennen van externe verandering (noticing external change)**: bijv. monitoren en spotten van trends.
    - belangrijk voor het gebruik van eHealth? waarom wel/niet?
    - hoe gaat dit in zijn werk? wat voor activiteiten en/of processen?
    - door wie?
    - wanneer was de laatste keer dat u betrokken was in zo'n activiteit/proces?
    - wat zijn de belangrijkste problemen waar u tegenaan loopt in zo'n activiteit/proces?
    - Wat zijn de belangrijkste zaken die goed gaan in zo'n activiteit/proces? Waarom is dat essentieel/relevant?
    - wat voor invloed heeft het opmerken/herkennen van externe verandering op strategische verandering?

- **betekenis geven aan externe verandering (constructing meaning of external change)** → iets van deze verandering vinden en erop reageren. Bijv.: op een bepaalde manier aankijken tegen culturele of technologische veranderingen binnen de zorgsector
    - belangrijk voor het gebruik van eHealth? waarom wel/niet?
    - hoe gaat dit in zijn werk? wat voor activiteiten en/of processen?
    - door wie?
    - wanneer was de laatste keer dat u betrokken was in zo'n activiteit/proces?
    - wat zijn de belangrijkste problemen waar u tegenaan loopt in zo'n activiteit/proces?
    - Wat zijn de belangrijkste zaken die goed gaan in zo'n activiteit/proces? Waarom is dat essentieel/relevant?
    - wat voor invloed heeft het betekenis geven aan externe verandering op strategische verandering?

- processen voor het **ontwikkelen van nieuwe overtuigingen** gericht op de externe veranderingen **(developing new beliefs)**: veranderen van perceptie / houding t.o.v. eHealth, ervoor zorgen dat alle neuzen dezelfde kant opstaan
    - hoe kan je tot verandering in cultuur komen voor gebruik eHealth?
    - Hoe verandering intrinsieke motivatie voor gebruik eHealth?
    - hoe gaat dit in zijn werk? wat voor activiteiten en/of processen?
    - Waarom is het het ontwikkelen van nieuwe overtuigingen (en ideeën) belangrijk voor het gebruik van eHealth?
    - wat voor invloed heeft het het ontwikkelen van nieuwe overtuigingen (en ideeën) op strategische verandering?
    - wanneer was de laatste keer dat u betrokken was in zo'n activiteit/proces?
    - wat zijn de belangrijkste problemen waar u tegenaan loopt in zo'n activiteit/proces?
    - Wat zijn de belangrijkste dingen die goed gaan in zo'n activiteit/proces? Waarom is dat essentieel/relevant?

Evalueren / concluderen

- Welke andere elementen of processen zijn relevant voor het veranderen strategie m.b.t. gebruik eHealth?
- Van alle genoemde processen:
    - Top 3 meest belangrijk zijn voor succesvol gebruik van eHealth → waarom?
    - Top 3 minst belangrijk zijn voor succesvol gebruik eHealth → waarom?

Afsluiting

- Hoe heeft u het gesprek ervaren?
- verkrijgen contact info voor verdere vragen
- wie raad u aan om nog meer te spreken?

Appendix III: Intake survey (in Dutch)

Inleiding survey

Beste lezer,

Als voorbereiding op ons gesprek over het gebruik van eHealth in ziekenhuizen zou ik u willen verzoeken deze vragen te beantwoorden. De enquête geeft mij een eerste inzicht in het gebruik van eHealth binnen uw ziekenhuis en geeft u de gelegenheid om alvast over de te bespreken onderwerpen na te denken. Mocht u vragen niet kunnen beantwoorden voor de gehele organisatie, dan kunt u de vragen betrekken op uw eigen afdeling. U krijgt de gelegenheid om tijdens het interview uw antwoorden toe te lichten.

De vragenlijst bestaat uit dertien vragen. U kunt de vragenlijst afsluiten en op een later moment hervatten door opnieuw op de link in de email te klikken.

Mocht u vragen hebben, neem gerust contact met mij op (fabiana.keller@bebright.eu).

Alvast hartelijk dank voor de door u geïnvesteerde tijd en moeite.

Met vriendelijke groet,

Fabiana Keller

Algemeen & strategie

1. Is er binnen de strategie van uw organisatie specifiek aandacht besteed aan het onderwerp eHealth?
    - ja prominent top 1
    - ja prominent top 3
    - ja maar niet prominent
    - nee
    - weet niet

2. Welke karakterisering past het beste bij de strategie van uw organisatie?
    - De strategie focust zich met name op de huidige gang van zaken en heeft meer aandacht voor de korte termijn dan voor de lange termijn
    - De strategie gedoogt en/of creëert actief ruimte voor vernieuwende activiteiten die niet direct binnen het beleid passen

- De strategie stuurt actief op de innovatieactiviteiten en faciliteert met de benodigde middelen
- De strategie draagt innovatie uit en faciliteert met de benodigde middelen.

3. Waar ligt het zwaartepunt binnen de strategie van uw organisatie?:
- een sterke focus op de patiënt
- een sterke kostenoriëntatie
- een sterke focus op de innovatie van producten en diensten

4. Welke karakterisering past het beste bij de ambitie van uw organisatie?
- Reactief: onze organisatie maakt uitsluitend gebruik van eHealth toepassingen die hun waarde hebben bewezen in andere ziekenhuizen
- Fast follower: onze organisatie wil binnen afzienbare tijd na de marktleider gebruik maken van een eHealth toepassing die nieuw is op de markt
- First to market: onze organisatie wil de eerste zijn die gebruik maakt van een nieuwe eHealth toepassing

Veranderingen om eHealth te kunnen gebruiken

5. In hoeverre is uw organisatie in staat de processen goed aan te passen aan nieuwe producten of werkwijzen?

	niet	ad hoc	beperkt op structurele wijze	sterk op structurele wijze
Huidig				
Gewenst				

6. Waar zijn in de afgelopen 3 jaar de ideeën ontstaan voor gebruik van eHealth binnen uw ziekenhuis? (% is aandeel in nieuwe ideeën, totaal 100% te verdelen over de zes opties)

	Percentage
Vanuit een speciale innovatie / onderzoeksafdeling	
Spontaan vanuit de eigen organisatie	
Spontaan vanuit de eigen afdeling	
Vanuit leveranciers & partners	
Vanuit patiënten	
Overige	

7. In hoeverre is uw organisatie bereid om innovatieve toepassingen, zoals eHealth, in te zetten die leiden tot het stoppen van andere producten, diensten of manieren van werken?

	niet	ad hoc	beperkt op structurele wijze	sterk op structurele wijze
Huidig				
Gewenst				

8. In welke mate maakt uw organisatie gebruik van de intern beschikbare capaciteiten (bv. technologie, -kennis of distributiemogelijkheden) die ingezet kunnen worden voor eHealth toepassingen?

	niet	ad hoc	beperkt op structurele wijze	sterk op structurele wijze
Huidig				

Gewenst				

9. In welke mate maakt uw organisatie gebruik van de extern beschikbare capaciteiten (bv. technologie, -kennis of distributiemogelijkheden) die andere organisaties kunnen bieden voor het gebruik van eHealth?

	niet	ad hoc	beperkt op structurele wijze	sterk op structurele wijze
Huidig				
Gewenst				

10. In hoeverre houdt uw organisatie tijdens implementatie van eHealth veranderende omstandigheden buiten het ziekenhuis (bv. verandering in behoefte van de patiënt, gedrag van andere ziekenhuizen, technologische ontwikkeling) in de gaten die invloed kunnen hebben op het succesvol introduceren van de nieuwe toepassing?

	niet	ad hoc	beperkt op structurele wijze	sterk op structurele wijze
Huidig				
Gewenst				

Ervaringen met eHealth

11. Als u nu alle aspecten van innovatie zoals hierboven besproken in ogenschouw neemt, op welk niveau van volwassenheid functioneert uw organisatie naar uw mening op het gebied van eHealth?

	Huidig	Gewenst
eHealth zoekende: We willen wel graag eHealth gaan gebruiken, maar weten niet goed hoe. We zijn ons aan het oriënteren op eHealth.		
eHealth nieuwkomer: We maken recent gebruik van eHealth.		
eHealth ervaringsdeskundige: We hebben veel ervaring met eHealth. We zijn er actief mee bezig en proberen vernieuwend te zijn. We horen bij de koplopers binnen de Nederlandse zorgsector met betrekking tot eHealth.		

Tot slot

12. Wat is uw functie?

- Medisch specialist
- Staf / ondersteuning ICT
- Verplegend / verzorgend

13. Hoe lang werkt u al bij de organisatie?

- Korter dan 1 jaar
- 1-5 jaar
- 6-10 jaar
- Langer dan 10 jaar

Afsluiting

U heeft alle vragen beantwoord. Hartelijk dank voor uw deelname.

Zodra u alle onderdelen naar tevredenheid hebt ingevuld, kunt u op klaar drukken en daarmee de enquête verzenden.

Appendix IV: Additional empirical findings

eHealth use in H1

H1 is situated in the utilization stage. This hospital is involved in a broad range of eHealth projects, including projects with regard to COPD and HF. New and follow-up projects are executed in e-diagnosis, e-therapy, and mainly in e-care.

E-diagnosis is for example used by providing online questionnaires to HF patients through the patient portal, which helps healthcare providers to have better insight in HF patients' characteristics and it prepares them for consulting HF patients (I#2). H1 has used the patient portal since 2009. The hospital experienced that HF patients found it difficult to log on with their personal DigiD code. Therefore, H1 improved its patient portal into a new version which is now being executed in a pilot among four medical specialists. The new version sends an email to the HF patient which provides access to the online questionnaire consisting of 58 questions. The information provided by the HF patient enables the medical specialist to zoom in on specific topics during the consult. "Normally it is impossible to ask all those 58 questions to your patient" stated R#2. This improves the quality of a consult and makes it much more efficient compared to the conventional way.

H1 recently finished a project on HF patients using iPads in the waiting-room. When waiting for their appointment, HF patients answer healthcare and disease related questions on the iPad. According to R#2, questions are for example "do you understand how to take your medication?" and "do you take your medicines correctly?". This type of e-therapy helps the healthcare provider to evaluate the effectiveness of information given during previous consults and therapy. "If patients do not understand why they must take their medicines and thus do not take their medicines, then you [as a medical specialist] have a problem because then your therapy is unsatisfactory" mentioned R#2. Another e-therapy example H1 is involved in, is a study on smartphones assisting asthma patients in taking their medication, which showed positive impact of eHealth coaching on asthma patients compared to patients that did not receive eHealth coaching. Asthma patients received a notification on their smartphone when the software noticed that the patient needed to take his medication (I#1).

H1 mainly applies eHealth in the field of e-care, including telemonitoring and telecare. Especially H1's Cardiology department is focused on self-measurement by patients at home (I#1, I#2). One of the oldest projects, since 2008, involves implantable cardioverter-defibrillators (ICDs) (I#2). ICDs are able to correct cardiac arrhythmias by delivering shocks. Besides, these devices can feature wireless capacity to automatically connect with a home transmitter that sends medical data, like monitoring of arrhythmias, to the hospital (Burri and Senouf, 2009). Since the physician is able to monitor the patient through the ICD at a distance, the patient has to visit the hospital less often (I#2).

H1 also has carried out a telecare project since one year, which focuses on patients suffering from severe heart failure (HF) (I#2). This specific group of patients was already in close contact with H1's healthcare providers. Nurses for example weekly called or visited these patients, among others, to check their weight and to record the activity of their heart. Subsequently, back at the hospital these recordings need to be analysed, which "is an enormously intensive process" according to R#2. Severe HF patients are therefore equipped with devices to measure their own weight and blood pressure, and record the activity of the heart themselves with a do it yourself electrocardiography (ECG) device. Medical data provided by e-monitoring is then integrated in the EHR and ready to use for analyses at the hospital (I#2).

Another telecare project regarding HF is launched recently by H1 (I#1, I#2, I#3). Twenty patients who had an acute heart attack are equipped with a wireless blood pressure monitoring device, a wireless scale, a do it yourself ECG device connected with the patient's own smartphone, and a pedometer (I#1, I#2, I#3). All devices are connected with a patient portal and medical data is also integrated into the hospital's EHR, which enables both patient and physician to monitor the patient's progress (I#1). "We utilize the patient's own expertise … since patients measure themselves and are monitored while being at home. Patients will visit the hospital less for emergencies because of the devices and portal" explained R#18. The telecare project has its own dedicated researcher and specialised nurses are particularly trained and educated to carry out the project (I#2, I#3). Part of the project is carrying out video consults (I#2, I#3). Patients can make an appointment for a video consult and can communicate with nurses and medical specialists through a professional video system installed on their mobile device. However, not all acute heart attack patients are suitable to be included in the pilot, for instance older patients with high co-morbidity require physical examination in real life. Therefore, younger patients are included in the pilot. "We regard below 50 years old as young patients", stated R#19. The project reflects blended care and substitutes two out of four regular consults by implementation of video consult. Instead of the regular healthcare process with regard to heart attacks "a patient visits the hospital for the first consult one month after the heart attack and the second conventional consult is six months after the heart attack", explained R#20. In addition, R#2 mentioned: "With this project we actually substitute the clinical pathway. We really try to break through the conventional way".

Besides, e-monitoring helps patients to gain more insight in their own disease and progress which improves involvement in their own disease-management (I#1, I#3). Another improvement caused by the telecare project is the greater amount of medical data and information about the patient that is available compared to the conventional clinical pathway. R#19 explained that "normally you only saw a patient four times a year, each consult only 15 minutes, and most of the time you don't know the patient's blood pressure or weight".

eHealth use in H2

Although H2 mainly uses eHealth at its HF clinic, it is an experienced eHealth hospital which applies e-care tools to a large group of HF patients (I#15, I#16). H2 initiated and conducted a study on the use of an e-care platform, including e-monitoring, among a large population of HF patients. Approximately 90 of H2's HF patients participated in the study. This study resulted in positive results: reduction in the

amount of hospitalisations and improving quality of HF patients' life (I#15, I#16). The e-care platform substituted many of the conventional consults. The goal of H2's HF clinic is to use the e-care platform in order to reduce the amount of hospitalisations of patients as much as possible (I#15, I#16). The e-care platform enables to prevent severe exacerbations, and thus hospitalisation, by monitoring patients and advising them on medication at a distance (I#15, I#16). "We haven't seen some people for one year", tells R#9. Since HF patients visit the hospital less, they are educated through the system to manage their own disease (I#15). Furthermore, the e-monitoring system provides more reliable data compared to the conventional clinical pathway (I#15). The system measures weight, blood pressure, and pulse. "A patient doesn't fill out a form about his weight himself, but the scale accurately measures his weight and provides us (the nurses) reliable medical data", mentioned (R#9). R#15 mentions that the e-monitoring system could be improved by adding a do it yourself ECG for self-measurement of the activity of the heart. "If someone's heartbeat normally is 80 and suddenly rises to 140, then I want to know what is going. What kind of cardiac arrhythmias is it?", explains R#15. The e-care platform could also be extended with telecare (I#15, I#16). Currently, HF patients are called when an outlying value is monitored. H2 wants to improve this by adding video consults to the system.

eHealth use in H3

H3 is situated in the utilization stage. This hospital is involved in a broad range of new and follow-up eHealth projects in disease areas like nephrology, neurology, and asthma and COPD. Since some eHealth projects are further developed than others, individual disease specific departments differ in their experience with eHealth use (I#18, I#19).

The pulmonology department uses both e-diagnosis and e-monitoring tools. An online clinical screening instrument is used for advanced diagnosis of COPD patients. Patients receive an email for filling out the online questionnaire at the start of the clinical pathway and also after six months. The e-diagnosis tool extends the conventional diagnosis as it provides supplementary information on quality of life and wellbeing, in addition to medical data on the somatic domains (I#18; I#19). Furthermore, the department tracks the physical activity of asthma and COPD patients by using a move-monitor (I#18; I#19). Patients wear this device for one week because "scientific studies found that solely carrying out an anamnesis or questionnaire don't lead to reliable results", explains R#8. The pulmonology department also executed a feasibility study with another e-monitoring wearable (I#18; I#19). Ten COPD patients included in the pilot received a tablet which was connected with the wearable in order to monitor their own progression. However, it turned out that the wearable did not work well: "the activity of four out of ten patients was not monitored and registered at all" (R#14). Therefore, the pilot has come to an end and the external developer is thinking about how to improve the wearable. E-monitoring is expected to improve diagnosis. These tools simply track and show for instance breathing patterns which can be used for objective diagnosis, while some specific things, for example irregularities during sleep, can only be found if a patient tells about it during a consult (I#19). eHealth add-ons are also expected to support and stimulate COPD patients in self-management of their disease (I#17; I#19). Moreover, R#14 thinks it is likely that e-care tools will substitute some parts of the current clinical pathway regarding COPD: "there is a lot of one-to-one D2P contact in COPD. It is conceivable that these physical contacts will be partially substituted by eHealth, like in mental healthcare. Then, patients can be

educated online about their disease. If a patient doesn't understand the online information, then he can ask questions afterwards during a shorter consult". Another e-monitoring platform is currently evaluated for possible implementation (I#17; I#19). However, this process seems to take quite some time. "Possibly because it is not clear who has to pay for it and who owns the innovation. Does the hospital has to pay for it? Or the pulmonology department?", explains R#14.

H3 collaborated with other organisations on an eHealth platform. It is H3's biggest eHealth initiative for monitoring and self-management. The platform also improves D2P consults as more data is available to the physician compared to a conventional consult (I#17; Annual Report H3, 2014). A pilot on the eHealth platform is currently carried out. It is expected that the platform will be fully implemented at some of H3's departments in 2016 (I#17).

H3 also developed its own e-care tool for secured video consults between patients and doctors a few years ago (I#17; Annual Report H3, 2014). This initiative is further improved in collaboration with an external developer.

eHealth use in H4

H4 uses only three eHealth tools for diagnosis, therapy, and care among a few HF patients and a few COPD patients. eHealth is not used that much at H4 (I#12; I#13; I#14). H4 is therefore situated in the initiation stage. "Despite we have been using eHealth for quite some time, I think we are a newcomer because we don't work a lot with it", says R#7.

H4 was involved in study on an e-care platform a couple of years ago (I#12; I#13). As many as HF patients possible were included in the study (I#13). Approximately 15 of H4's HF patients participated in the study and used an eHealth platform for monitoring their weight, blood pressure, and pulse. HF patients received a wireless scale and blood pressure monitoring device which were connected to an online platform (I#13). This platform also provided patients instructions through videos and questionnaires about HF (I#13). The platform resulted in less hospitalisation as it enabled, among others, to control medication at a distance (I#12). However, it was not experienced that the e-care platform caused less work. R#7 says that "many patients still needed to be checked, while they turned out to be fairly stable". Another pitfall was that the e-care platform resulted in a false sense of security among the HF patients who have been using the eHealth tool for a long period. R#5 explains that these patients had the feeling that they were constantly monitored, which was not really the case.

H4 therefore changed its usage of the e-care platform. Instead of monitoring as many as HF patients as possible, the platform is currently used for monitoring new onset HF patients and adjusting their medication (I#12; I#13). Medication needs to be specifically adjusted per patient for optimal result as new onset HF patients differ in severity of the disease. "It is beneficial for correctly dosing the patient's medication, when he can be daily monitored while being at home", explains R#5. After medication is correctly dosed, HF patients are able to self-manage their disease without using the e-care platform (I#12). The eHealth tool is thus both used for more accurately e-care in the beginning and for e-therapy later on based on the e-monitoring outcome. It is not believed that the e-care platform will fully

substitute the current way of providing healthcare. It is more seen as an additional way to improve diagnosis, therapy, and care (I#12; I#13; Patient Brochure H4, 2015). R#7 mentions that e-monitoring could be improved by extending the platform with a do it yourself ECG for self-measurement of the activity of the heart: "then you can monitor their heartbeat at distance, while they currently have to return to the hospital for an ECG" (R#7, I#13).

H4's cardiology department also has used an implantable cardiac monitoring system (ICMS) since early 2015 (I#13). An ICMS monitors heartbeat and features wireless capacity to automatically connect with a home transmitter that sends medical data on cardiac arrhythmias to the hospital (I#12; I#13). The cardiology department has implanted an ICMS in three HF patients so far (I#12; I#13). ICMS is also used as e-diagnosis tool for additional diagnostic inquiries (I#12; I#13). If previous inquiries, like a 24 hrs Holter analysis, do not provide clear conclusions on the type of heart failure, then an ICMS can be implanted to monitor and analyse arrhythmias for a couple of weeks or months (I#12; I#13). When the ICMS sends a red alert to H4, the patient is called by the hospital to make an appointment to visit H4 for further analysis of the registered data (I#12; I#13). Since patients need to return to H4 for in depth analysis of their arrhythmias, it does not seem to substitute previous routines according to R#7.

H4 also uses an eHealth platform for COPD and asthma patients (I#14), which is implemented in 2010. In 2011, 43 COPD patients participated in the platform. The online COPD platform consists of an eConsult application through which patients can ask questions to their medical specialist or nurse by email. The eHealth platform also contains an application for self-monitoring. "It is like an online diary where patients write down their self-monitoring results", explains R#6. Based on these results of monitoring the doctor can adjust medication at distance (I#14), which shows a combination of eHealth in e-care and e-therapy. The eHealth platform will be further implemented, but this currently remains in plans and complexities need to be overcome (I#14).

eHealth use in H5

H5 is a newcomer which experimented with eHealth for HF patients and is currently considering a follow-up pilot involving its HF population. "We are in the beginning of eHealth. Some things are already arranged, some things aren't … we don't include additional patients in the pilot until we have agreed on the next steps with the health insurer", explains R#16. This hospital has mainly focused on e-care so far.

The first pilot carried out by H5 regards an e-care app which is installed on the patient's tablet (I#10; I#11). In case the patient did not have a tablet, he received a tablet from the collaborating care organisation (I#10; I#11). This will only be the case in the short-term as "of course it costs a lot of money; the app must be compatible to consumer electronics in the future, but this can be a limiting factor at the moment", explains R#12. As mentioned before, H5 collaborates with a care organisation in this eHealth project for HF patients which provides 24/7 support in monitoring, communicating with and visiting patients, and refer them to the adequate healthcare provider. This care organisation is situated between the general practitioner and H5's HF clinic. It thus connects primary and secondary care (I#10; I#11).

The e-care app with regard to the first pilot features several functionalities. Firstly, HF patients are equipped with a wireless scale and blood pressure monitor device for daily self-measurement and e-monitoring of weight and blood pressure (I#10; I#11; Annual Report H5, 2014). As long as the patient remains within the boundaries with regard to weight and blood pressure, which have been determined by the GP or medical specialist, then nothing happens (I#10; I#11). “Then it is just self-management by the patient and there won’t be any medical specialist involved”, adds R#16. Secondly, a digital questionnaire is used for weekly e-monitoring (I#11). This questionnaire includes questions on the patient’s habits “and it creates a record on how developments in the patient’s lifestyle”, explains R#16. The e-care app also features a video consult tool which provides access to 24/7 contact with the care organisation (I#10; I#11). Furthermore, the e-care app contains an educational functionality for broadening the patient’s knowledge on HF and improvements in lifestyle (I#11; Annual Report H5, 2014).

The first e-care app pilot included twenty patients and started early 2015 (I#11). H5 has recently evaluated this pilot. Recommendations for improvements are made based on the outcome of the evaluation and these developments will be further undertaken in 2016 (I#11). The goal of H5’s e-care app is to earlier recognize exacerbations and react sooner with adequate therapy, in order to reduce hospitalisation of HF patients (I#10; I#11; Annual Report H5, 2014). “The e-care app focuses on prevention and it prevents that I won’t suffer from a heart attack”, says R#11, and “it will correct you in time”, adds R#12. Besides, the patient’s monitored medical data is used in case he does get hospitalised, in order to provide the best cure (I#10; I#11). However, “it is still a pilot so it is too soon for eHealth to really substitute the conventional clinical pathway. The e-care app eventually will replace conventional consults at the hospital and there will be one yearly consult, instead of two consults per year”, explains R#16.

H5 is also looking into other eHealth possibilities for improving its support in chronic diseases (I#10; I#11). The hospital has collaborated with other hospitals in order to test another e-care platform as well (I#10; I#11). H5 has recently started with this e-care platform, carrying out a very limited test with two HF patients included in the platform (I#10; I#11). The hospital wants to include approximately 50 HF patients in the future (I#10). On the one hand, there are similarities between the first and the second e-care platform. Both platforms feature devices for daily self-measurement weight and blood pressure which are connected to the app on the patient’s tablet, in order to monitor HF patients (I#10). Also digital questionnaires are used for monitoring and patients and healthcare providers are connected 24/7 (I#10). On the other hand, both e-care platforms differ in their systematics. Instead of collaborating with an external care organisation which controls all incoming monitored data, the second system does not rely on such a care organisation (I#10; I#11). “The advantage is that you’re not dependent on a call-center or care organisation where all monitored data is sent to”, says R#12. According to R#16: “hospitals have the lead and control in the new platform, while the care organisation is strongly involved in the other system. That’s a big difference.” Furthermore, the role of healthcare providers is less active in the second system compared to the first one. The second e-care platform is based on a large database including medical data on HF and the platform is therefore capable of coaching patients based on their monitored data (I#10). “Patients can find a solution themselves in the platform’s educative functionality,

when an outlying value is monitored", explains R#12. If the system registers that the patient does not act upon coaching provided by the system, then H5 will be alerted (I#10). "HF patients are thus capable of managing their own disease, and healthcare providers only receive an alert when the patient's system keeps monitoring outlying values", explains R#12.

eHealth use in H6

H6 is situated in the initiation stage. This hospital is involved in an eHealth pilot with regard to neurology and experimented with e-care for HF patients. H6 is currently considering a follow-up pilot involving its HF population.

H6 has used its first e-care platform for approximately two years, but quit about three years ago (I#5). Approximately seven HF patients were included in the pilot at the most busiest moments (I#5). H6's first e-care platform consisted of self-monitoring of weight, blood pressure, and pulse (I#4; I#5). The platform also featured videos about educational background regarding HF, which is perceived as a useful addition to the conventional clinical pathway (I#4; I#5). "We offer patients brochures about HF and an information programme on HF twice a year. The good thing about the e-care platform is that it enables patients to learn more about their disease at home when they want to", says R#13.

The hospital quit the first eHealth pilot as it did not lead to increased safety or advantages with regard to patients (I#4; I#5). E-monitoring resulted in a false sense of security among the HF patients who have been using the eHealth tool (I#4; I#5). These patients felt safe because they had the feeling that they were constantly monitored by the hospital. "It felt as an extra safety measure to them, the thought that they were monitored", tells R#20. R#13 adds that "one patient told me that she had to adopt the platform because of her daughter. Her daughter has said: you should do it, because then at least someone is always watching you". However, "it was a false sense of security according to us since only blood pressure and weight were measured, which solely don't say that much, but patients thought that they were really safe because of these values monitored by the hospital", explains R#10. H6 also dropped the pilot because employees experienced that the e-care platform resulted in additional workload (I#4; I#5). According to R#20 "It wasn't instead of: the usual contacts and consults with patients remained. Patients were still willing to see their doctor through ordinary human contact". Moreover, the e-care platform did not seem to decrease hospitalisation (I#4, I#5). "It's a pity that the eHealth platform didn't result in less work, creating room for taking care of more HF patients", says R#13.

Therefore, H6 currently collaborates with other hospitals to develop a new e-care platform including 24/7 e-monitoring. This platform aims to e-monitor HF patients and to educate them in managing their own disease (I#4, I#5). In this e-care platform, patients are equipped to monitor their weight with a wireless scale, blood pressure by using a wireless blood pressure monitoring device, and heartbeat with a do it yourself ECG device (I#4). "We want to monitor the activity and movement of patients as well, and are currently orienting what devices are available", says R#10. It is believed that eHealth tools can help HF patients in improving management of their own disease, and support doctors in decisionmaking as well (I#4). "You can be completely wrong in your observation, me too. Sometimes, for example, you

don't notice someone's fluid retention of 5L. Then he will be hospitalised again within one week. I believe that technology will help us making better decisions. eHealth can provide much more information," explains R#10. The new platform also features an eHealth tool for P2D video consults (I#4; I#5). "Video consults will be demand-driven: we don't approach the patient, but the patient will contact us", tells R#10. It is expected that the new e-care platform will go live in 2016 (I#4). However, it is not clear yet how tasks will be divided among the collaborating organisations and some financial issues need to be resolved (R#13, R#21).

Furthermore, ICDs are used that feature wireless capacity to automatically connect with a home transmitter and send medical data to the hospital (I#4, I#5).

eHealth use in H7

H7 is an orienting hospital which experimented with eHealth for COPD patients. This hospital quit the COPD pilot some time ago and it is currently not planning on continuing the project (I#7). Therefore, H7 has returned to the consideration stage. This hospital was actively involved in a pilot project regarding an e-care platform for monitoring and educating COPD patients by providing them several questionnaires. The platform was taken to 20-40 COPD patients. "The patients were quite satisfied with the platform … I liked to work with it myself as well because the platform enabled me to get more involved with the patient and I thus was able to provide better more patient-focused healthcare", tells R#22. Despite the positive thoughts on the COPD platform by H7's CRDs department, attrition of the pilot took place because there were other developments at stake. A new EHR was implemented instead (I#7).

H7 is currently considering possible applications and options that the new EHR offers for e-diagnosis, e-therapy, and e-care (I#6; I#7). Some departments for example would like to use a video consult application (I#6; I#7). "I think that video consult constitutes an advantage actually for the doctor because it helps to get better insight in the patient's situation at a distance", tells R#22. Despite the broad range of possible eHealth options of the new EHR, however, e-care tools like e-monitoring and video consult have not been implemented so far (I#6; I#7).

eHealth use in H8

H8 is an orienting hospital which has not performed any eHealth pilots yet, but is considering to go live with eHealth within the near future. A shift from an old towards implementation of a new EHR is currently the case at H8. The hospital is currently considering possible applications and options that the new EHR offers for e-diagnosis, e-therapy, and e-monitoring. Some of these options, like providing access for patients to their own portal, are included when the EHR will go live in the fourth quarter of 2016 (I#8; Annual Report H8, 2014). According to R#3, "e-monitoring of patients at home could also be an interesting option".

eHealth use in H9

H9 is an orienting hospital which has performed no eHealth pilots yet, but is considering to go live with eHealth within the near future. H9 is mainly focused on creating a suitable infrastructure in its organisation, which will be the base for eHealth initiatives to come. "A new EHR for example that enables patients to access their medical data as well, are required to run the desired eHealth applications", explains R#17. H9 is looking for various systems and innovations involving telemonitoring to improve its clinical pathway regarding HF (Hart & Vaatgroep, 2014). H9 recently started with

implantable cardiac arrhythmia monitors that feature wireless capacity to automatically connect with a home transmitter and enable digital P2D communication of medical data (Patient brochure H9, 2015). Ideas with regard to eHealth are emerging, but it is not clear yet how to amplify and operate eHealth tools (I#9). According to R#17 "the hospital lacks a model that supports accurate decision-making on which eHealth initiatives we want to implement and carry out".

Appendix V: Additional findings with regard to the regime analysis

This appendix presents coded data on the remaining dimensions of the healthcare regime.

Industry (eHealth suppliers) – (potential) barriers

Users are insufficiently involved by developers:

- R2: Buiten partijen zoals philips en EZIS en chipsoft en al die dingen, wat mij opvalt is dat die relatief weinig zicht hebben op de specifieke problemen die [binnen het ziekenhuis] opgelost moeten worden. Daar zit volgens mij meteen in waarom het heel vaak fout gaat … vandaar mijn adagium dat het bottom up moet in ieder geval wat betreft het vaststellen van problemen en de oplossingsrichting.
- R14: wat me altijd wel opvalt ook is de betrokkenheid van de eindgebruiker in het ontwikkeltraject. en de eindgebruiker is dan de patient. Dat de patienten daar vaak niet nauw bij betrokken zijn. dus het is sterk aanbodgericht.
- R3: heel veel ZIS zijn ontwikkeld vanuit de leverancier zelf. Die denkt: ik denk dat dit goed is voor de zorgverlener en het ziekenhuis en de patient. terwijl je het eigenlijk moet omdraaien. Je moet veel meer luisteren naar je patienten en de zorgverlener en op basis daarvan moet je een ZIS ontwikkelen. Dat gebeurt nu wel wat beter. We hebben het over de afgelopen periode van twintig jaar. Het gaat steeds beter. Dat is ook een belangrijk punt. Luisteren naar je gebruiker, naar je klant, naar je patient. Wat wil die?

General notes:

- R3: in hoeverre gebeurt dit allemaal veilig? Wat voor soort verbindingen worden er allemaal gebruikt om deze informatie in het epd te krijgen? en daar zie je dat leveranciers nog wel eens wat steekjes laten vallen die dat gewoon via het openbare internet versturen. we weten allemaal dat patienteninformatie gewoon gemaild wordt in onveilig mailverkeer

Industry (eHealth suppliers) – (potential) drivers

Sense of urgency

- R16: de googles en de apples die slaan gewoon de zorginstellingen over die gaan gewoon rechstreeks naar de consument en de consument die staat vervolgens in de spreekkamer dokter wilt u even mijn dossier downloaden, plat gezegd, en de dokter zegt wat moet ik ermee want mijn systeem is er niet op aangesloten. je wordt gewoon ingehaald.
- R10: Aan de ene kant is het niet te stoppen. Dat is makkelijk. Want apple en facebook en google gaan gewoon door. die zetten hun eigen epds op. we hebben dat maar te volgen.
- R22: Met de huidige technologieen kan er zomaar een buitenstaander opstaan en zeggen: hier krijgt u kwalitatief hogere zorg en beslist u zelf mee. Als dat gebeurt, wat doen we dan? Als dat nu zou gebeuren houden we dat niet vol. Daar kan het ziekenhuis niet op inspelen.

General notes

- R6: [supplier X of EHRs] dat is een beetje de mc donalds of coca cola onder de epds in de zin van dat zij heel veel doen aan het opbouwen van een imago en een merk. hun marketing is heel erg

goed. wat zij doen is natuurlijk niet via een directie of een ict afdeling zeggen tegen de dokters zeggen “wat is ons epd goed”. nee die nodigen een aantal dokters uit voor een dienstreis naar amerika. kom naar ons epd kijken en wij betalen de vliegtickets en het verblijf in hotels. en men krijgt daar een show te zien en je ziet die dokters gewoon denken wauw dit is geweldig en dit willen wij ook. dan komen de dokters weer terug in nederland en dan gaan ze roepen wij willen [EHR X]! en [supplier X of EHRs] is niet de enige hoor. maar van hen weet ik het van een aantal specialisten bij naam dat ze op zo’n manier uitgenodigd zijn … [supplier X of EHRs] doet het op een andere manier, want die blijft gewoon in nederland. maar [supplier X of EHRs] … die organiseert reisjes naar Ierland.

- H2 + H3: intensive collaboration with industry.
- H6 approached by industry to get involved in e-care project on HF
- H7 formerly intensive collaboration with industry on e-care platform COPD

Infrastructure – (potential) barrier

Connectivity EHRs

- R12: je moet aansluiten op de consumentenelectronica want daar moet het gewoon op geinstalleerd kunnen worden. Ook een beperking. Want ict systemen: welk systeem heb je, past het er wel op, is het beveiligd of niet? Dat is de grote schreeuw nationalisering van de ict.
- R6: het epd dat wij in nederland hebben daar kan ook nog wel het nodige aan verbeterd worden. ik zou zo een hele putnenlijst op kunnen noemen met verbeteringen. en op zijn minst de integratie met ehealth … de patient die dingen doet of dat nou monitoring is of andere dingen. die data moet ergens terecht komen.
- R10: wat je nu krijgt is wildgroei. mijn patienten hebben bijvoorbeeld niet alleen hartfalen maar ook copd en suikerziekte. en voor dat alle vier zouden ze een ehealht module moeten hebben. dat gaat niet werken. ik zie dat neit werken. met vier verschillende leveranciers in twee verschillende ziekenhuizen met 1 huisarts er nog achter die ook nog volgens een ander systeem werkt. Een complexe samenwerking. Maar we moeten wel door dat dal heen. … hoe zie je een mens weer als één met en suikerziekte en copd en hartfalen. hoe gaan we dat regelen zonder vier verschillende systemen? hoe het nu gaat met allemaal verschllende systemen dat werkt niet. we kunnen alleen beter behandelen als we meer het geheel beter kunnen overzien. Een meer geintegreerde zorg is nodig maar die is er nu niet.
- R23: Het EPD is voor ziekenhuizen en zeker voor artsen zo'n beetje de kern van de patientengerichte ict. Daar komen alle gegevens bij elkaar. En wat je typisch ziet bij artsen … is dat zij heel graag vanuit een zelfde omgeving werken. … stel dat een medisch specialist telemonitoring moet gaan uitvoeren en moet daar een pakket voor gaan gebruiken dat niet geïntegreerd is met zijn EPD, dan heeft ie een probleem. Want dan moet hij met 2 user interfaces en 2 pakketten in de weer waar die informatie in de 2 pakketten naast elkaar nodig heeft en dat vinden artsen dus heel lastig.
- r3: Als je bij de ziekenhuizen kijkt dan kun je die makkelijk indelen wat betreft hun ZIS leverancier. Er is niet zoveel aanbod op de nederlandse markt. En wij hebben gewoon een verouderd systeem. Nu is het aanbod epic en chipsoft en dan heb je het eigenlijk gehad. En kijk je naar de systemen die nu in gebruik zijn, dan zijn er een aantal die bijna in the end of life fase zitten. Dat is ook wat betreft ons systeem. … er zitten allerlei belangrijke informatie in zulke websites zoals diabetes, bij orthopedie, maar dat zit niet in het epd. Het zijn allemaal losse systemen. Dat is jammer. … komende jaren om alle informatie bij elkaar te krijgen. Te ontsluiten. Te delen met de patient. De informatiesystemen van de nederlandse ziekenhuizen zijn daar alleen nog niet altijd geschikt voor.

Sectoral policy & government – (potential) barrier

Lack of clarity on laws and regulations:

- R17: passende regelgeving is ook van belang. dat het duidelijk is wat er wel en niet mag binnen de zorg. de regelgeving in de zorg is erg belangrijk.
- R10: Ja, maar die zijn dan weer niet goedgekeurd voor medisch gebruik. Zoals de jawbone en fitbit.
- R3: Dan krijg je de politiek weer tegen die over allemaal privacy dingen klaagt en dan mag het opeens weer niet. Het beleid van samenwerking met anderen de uitdaging daarin is het delen van patienteninformatie en is dus een belemmering om tot een goede samenwerking te komen. En dus ook tot goede zorg
- R14: ja 80% aan de ehealth ofzo [doelstelling VWS]. echt heel hoog. Maar dat gaan we niet halen. Echt flauwekul. We laten dat mensen ook maar gewoon blaten. Dat gaan we natuurlijk never nooit niet halen als je kijkt waar we nu staan.
- R#23: onduidelijkheid over regelgeving.

Sectoral policy & government – (potential) driver

Priorities and goals of VWS:

- R16: agenda van de zorg die zich nu richt op het afschuiven naar de eerste lijn en vooral als het gaat om chronische zorg. Hoe kun je dan met o.a. ehealth toeapassingen en innovatie met elkaar dat proces goed vormgeven?
- R15: door de politiek is natuurlijk uitgelokt dat chronische zorg naar eerstelijn moet. daardoor lopen op sommige plekken in nederland projecten om te kijken hoe we hartfalen patienten moeten begeleiden bij de huisarts en wie gaat dat doen en hoe moet dat doen? dat zijn ook ontwikkelingen die lopen en dan ook weer met telemonitoring erbij.
- R23: het feit dat de minister [schippers] vorig jaar drie hele concrete doelstellingen heeft geuit op het gebied van ehealth. ze heeft gezegd mensen moeten inzage krijgen in hun gegevens, mensen moeten de gelegenheid hebben om thuis zelf metingen te doen aan gegevens en die gegevens ook door te geven aan de zorgverlener, en er moet meer mogelijkheid komen om gebruik te make van beeldschermzorg. het feit dat die 3 concrete doelstellingen gedaan zijn maakt weer dat er heel veel discussie komt over dat soort onderwerpen, en dat maakt weer dat de agenda's van individuele instellingen ook beïnvloed worden. Ik wil niet zeggen dat zij gelijk gaan hardlopen omdat de minister iets gezegd heeft, maar het heeft wel op het soort discussies dat gevoerd wordt.
- R4: we denken dat daar vanuit de minister op gestuurd wordt. Dus we proberen ook wel binnen de trajecten die we doen door te kijken hoe we dit zouden kunnen door ontwikkelen over een paar jaar.
- R13: als de overheid zegt alle patienten moeten aan de ehealth en wij betalen het, dan zegt het ziekenhuis weg die hartfalen poli we gaan allemaal aan de ehealth. … Maar als van Rijn [VWS] zegt het moet, dan moet het en dan houdt het op

General notes:

- R23: Een overheid moet denk ik vooral de randvoorwaarden regelen. De wetgeving die er bijvoorbeeld is rondom het uitwisselen van patientgegevens die heeft invloed op wat er op het gebied van ehealth gebeurd.

Technology – (potential) barrier

Connectivity of eHealth tools

- R12: koppelbaarheid. Hebben mensen devices? Is het gebruiksvriendelijk genoeg?
- R2: Elk merk heeft natuurlijk zijn eigen kastje. Dat is hartstikke lastig. De gegevens van de ICD worden via het kastje naar een website. Allemaal verschillend. Elk kastje heeft zijn eigen ecosysteem
- R3: Maar dan is de vraag is dat allemaal gestandaardiseerd, gekalibreerd? wat is de betrouwbaarheid? kun je de data ontsluiten? daar valt veel te winnen als het gaat om gebruik te maken van dit soort apparatuur.

Limitedly developed and/or proven:

- R5: ehealth staat echt nog in de kinderschoenen
- R12: Proven technology is er nog niet in hele ruime mate. Daar ontbreekt het heel vaak aan. En het is vaak bedacht door iemand anders dan de klant (klant is de zorgconsument in dit geval)
- R14: het is de clinical inertia. er zit gemiddeld tussen het ontwikkelen van innovaties in de zorg en het op brede schaal toepassen ervan tien jaar tijd. ontzettend lang. ehealth is nu nog in het begin

High costs:

- R13: als iets heel veel geld kost en je hebt ook je twijfels over de meerwaarde dan denk ik van ja waar zijn we dan mee bezig.
- R10: Patienten betaalden honderd euro per maand voor een elektronisch weegschaal en bloeddrukmeter. Ik vind dat heel veel geld.

Technology – (potential) driver

Availability of technologies and technological possibilities:

- R16: verder heb je een trigger nodig om dat te doen. de trigger was dat het in de markt kwam dat [care organisation X] het kon aanbieden en daar ook behoefte aan had aan een pilot.
- R16: omdat het een platform is dat … [je] op verschillende toepassingen kunt wegzetten. daarmee leek het op dit moment, want techniek verandert natuurlijk snel, de meeste kans van slagen te hebben voor een brede toepassing.
- R6: gebruik apple producten die zijn onder artsen veel meer gemeengoed geworden dan anderen. in het begin moesten de artsen niets hebben van dat soort dingen. tot dat ze op een gegeven moment met de iphone kwamen. daarvoor heb je geen les nodig je kunt dat intuitief doen. dan zie je opeens dat zich dat als een lopend vuurtje verspreid. dat was ook met de ipad. voor je het wist liepen alle artsen rond met een ipad en werd ik geconfronteerd met wij willen met ipad het epd zien
- R17: doordat ze (artsen en verpleegkundigen) thuis zelf met veel ict in aanraking komen en met hun tablets en telefoons ook gemakkelijk op hun werk willen kunnen werken.
- R3: Je kunt de apple store inlopen om een weegschaal of bloeddrukmeter te kopen.
- R1: Voor patient zijn er heel veel middelen mogelijk om het aantrekkelijk te maken. technologisch gezien is er ontzettend veel mogelijk
- “We’ve never asked for email, but email emerged and now we cannot imagine the world without emailing”, mentioned R#12.
- R23: Het feit dat technologie zich steeds sneller ontwikkeld en dat bijvoorbeeld de ontwikkeling van mobiele technologie heel snel gegaan is. We hadden 10 jaar geleden nog geen iphone, dus het feit dat we nu tablets hebben en iphones hebben en dat soort zaken maakt ook dat ziekenhuizen geconfronteerd worden met vragen op dat gebied. Op een gegeven moment komt

de medisch specialist terecht bij de ICT afdeling: wanneer gaan we nou eindelijk eens regelen dat ik mijn ipad hier kan gebruiken.

General notes:

- R11: de middelen worden steeds makkelijker. De devices. De informatie.
- R2: terwijl de technieken kunnen algemeen zijn en vaak is de techniek ook helemaal het probleem niet. Er is geen technische belemmering.
- R17: moet de technologie ver genoeg ontwikkeld zijn. aan data alleen heb je niets. de technologie moet in staat zijn om data om te kunnen zetten. er moet apparatuur of software zijn die alle verzamelde data kan omzetten in iets nuttigs.