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Development and Testing of an Analytical Model to Analyse Patient Perceptions of eHealth

To Aid the Diffusion of eHealth Solutions

A master's thesis in Quality and Operations Management

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Gothenburg, Sweden 2018

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Abstract

When the number of people in the world increases, so does the number of people which could be in need of care, which puts a large stress on current healthcare systems. To manage this challenges caregivers look towards new ways of providing care. Researchers believe that an answer to the problem could be the implementation of ICT in care, such as eHealth. Therefore, the diffusion of eHealth solutions was seen as of great importance. Analysing patient perceptions of eHealth was believed to aid the development of eHealth solutions that are more likely to be diffused successfully. To aid qualitative analysis of patient perceptions for eHealth, this thesis aimed to develop an analytical model, a coding scheme, to analyse patient perceptions of eHealth solutions.

This thesis consisted of two parallel streams of input information, namely a theoretically driven and an empirically driven track, from which information was collected simultaneously. The theoretical track consisted of a literature search that aimed to identify models and frameworks which could be used to analyse patient perceptions. From these models and frameworks, aspects, or dimensions, which patients may have perceptions on were derived. These dimensions constituted the basis of the codes that the coding scheme was build on. To facilitate the usage of the coding scheme an overlap analysis was made to ensure that several codes were not targeting the same perception aspects. The coding scheme was tested on patient perceptions collected in a separate research project, called the DECI project. In the DECI project an eHealth platform was developed and distributed to the participating patients. This eHealth platform was the subject of the patient perceptions which the coding scheme was tested on. The patients that were participating in the project were elderly diagniosed with cognitive deficits, such as cognitive decline, mild cognitive impairment or mild dementia.

From the application of the coding scheme on patient perceptions, it could be concluded that it could increase the understanding of acceptance and satisfaction, and identify some indications of future. It was also concluded that the results were highly dependent on the quality of the input data, and thus, the analytical model needs be tested in a richer setting before any final conclusions can be made.

Keywords: Patient Perceptions, eHealth, Innovation Diffusion, Service Quality, Quality Assessment

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We would also like to thank our colleagues and classmates for their suggestions and assistance, and for kindly listening to our struggles and cheering us on. Lastly, we would like to thank our families and friends, for all their support, and for encouraging us both to pursue an education in science and persevere through its challenges!

Emma Gram & Linn Rönkkö, Gothenburg, June 2018

Abbreviations

eHealth	Care solutions developed by applying ICT in healthcare settings.
DECI	DECI refers to the Digital Environment for Cognitive Inclusion (DECI) project, an EU funded research project. In the project an eHealth platform was developed and tested on patients with MCI or MD in four participating countries.
EU	European Union
ICT	Information and Communication Technology
MCI	Mild Cognitive Impairment
MD	Mild Dementia
mHealth	An abbreviation of mobile health which is a sub-segment in eHealth where mobile devices, such as mobile phones, tablets, and wearable devices, are used in healthcare.
NVivo	A computer aided tool for qualitative analysis of data, developed by QSR International
SERVQUAL	A model used for assessing service quality developed by Parasuraman, Zeithaml, & Berry (1988).
TAM	Technology Acceptance Model developed by Davis (1989).
Telemedicine	The use of ICT to deliver care from a distance.
WHO	World Health Organisation

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1
Introduction

The introductory chapter of this thesis presents the societal challenge of providing healthcare to growing and ageing populations. eHealth solutions are predicted to help overcome this challenge, but there is a need for better ways of qualitatively asses the effectiveness of such solutions to enable them to become an integrated part of healthcare. To aid in the diffusion of eHealth solutions this thesis focused on investigating how patient perceptions could be evaluated through an analytical model. Based on this focus two research questions were formulated, concerning the development and testing of an anlytical model.

1.1 Background

To meet the upcoming challenges in providing high quality care to an increasing numbers of patients due to ageing populations, high expectations are set on introducing Information and Communication Technology, ICT, in care. ICT solutions are believed to create opportunities for economically sustainable care models which are better suited at handling the future increased demands of high quality care. Care solutions that are enabled by the use of ICT are among others; electronic health records, support systems for clinical decision processes, and virtual healthcare. Before ICT based care systems are introduced, thorough multidimensional evaluations on their suitability have to be made. The new care systems will be used by professional healthcare provides, patients, and the patients' families. To diffuse an innovative care solution successfully, the solution has to reach some degree of acceptance among these groups. Therefore, gaining acceptance from patients can be seen as a complex task, critical for the successful diffusion of eHealth solutions.

The application of ICT in healthcare is not a new concept, however it is yet to be widely introduced. Thus, a large part of care receivers are unaware, and/or unaccustomed to such care. Patients must rethink their previous conceptions of what care is, and build a new frame of reference for eHealth solutions. In this process the patients develop perceptions of the new care provision, and these can be a useful source of information for care providers. There is great value in capturing perceptions, as it enables tailored care to be developed to fit the patients needs and abilities.

What is causing the lagging implementation of ICT in care might relate to the difficulty in proving its effectiveness. Introducing an innovation in a market is related to great uncertainty (Rogers 2003). Lowering the uncertainty regarding the innovation

makes implementation decisions less complicated, which is why perceptions are so important.

1.1.1 Definition of Patient Perceptions

Before a model to aid the diffusion of eHealth solutions could be developed, there was a need to define what perceptions are, why they are important, and how they previously have been used to qualitatively assess innovations in eHealth.

Perception can be described as an individual's ability to register and make sense of new impressions. A dictionary definition of perception is 'a belief or opinion, often held by many people and based on how things seem' (Cambridge Business English Dictionary, 2018). It was found in literature that perceptions sometimes are replaced by or combined with other terms, such as satisfaction or opinions. Below are some examples on how the term have been used in literature.

- Akter et al. (2013) discuss perceived quality, in the context of the application of mobile devices in care settings, called mHealth, as 'the users' impression of overall excellence or superiority'.
- Kidholm et al. (2010) explain that patient perspectives are related to perceptions and satisfaction, and they argue that acceptance in many cases can be used synonymous to satisfaction.
- A general definition of satisfaction is the fulfilment of expectations or perceived needs (Kidholm et al. 2010)
- Dagger et al. (2007) explains perceptions on service quality as follows; 'Service quality perceptions are generally defined as a consumer's judgment of, or impression about, an entity's overall excellence or superiority.'

Due to the inconsistencies in definitions of perceptions, a clarification of the definition used in this thesis was needed. Henceforth, perception will be referred to as a patients opinions. These opinions are influenced by a patients ability to capture and process sensory information, perspectives, and satisfaction.

1.1.2 Definition of eHealth

eHealth is a concept where ICT is broadly applied in health related settings. Several attempts have been made to define eHealth, but a universally accepted definition has yet to be established. eHealth as a care construct has been defined in a variety of ways, Oh et al. (2005) found as many as 51 different definitions of eHealth in a systematic literature review. The potential of incorporating ICT in healthcare has since been increasingly recognised, and more research has been devoted to the concept (Shaw et al. 2017). This section aimed to aggregate a definition which was used in this thesis and to explain the relationships of eHealth to neighbouring fields of research.

The most cited definition of eHealth is according to Shaw et al. (2017) is provided by Eysenbach (2001):

> 'e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology'. (Eysenbach 2001.)

More recent definitions of eHealth are presented by Li et al. (2013) and the World health Organization, WHO. Li et. al. (2013) states that:

> 'e-Health is an application of ICT across the whole range of fractions that affect health. The benefits of e-health eg. improvement of health care operational efficiency and quality of patient care'. (Li et. al. 2013)

According to WHO, eHealth is defined as follows:

> 'eHealth is the use of information and communication technologies (ICT) for health. The eHealth unit works with partners at the global, regional and country level to promote and strengthen the use of ICT in health development, from applications in the field to global governance'. (WHO 2018)

In this study, the definition of eHealth provided by Eysenbach (2001) was used, due to its extensive use in academia. By adopting this definition the complex integration of devices, service elements, and systems, was viewed as an entity. There are fields of science that are closely related to or overlapping with eHealth, such as mHealth, and fields that are applicable for a single element of eHealth, such as product and service quality, some fluidity in the definition of eHealth was applied.

1.2 Problem Formulation

Qualitative assessments are central when gathering information in a complex setting such as the care environment, where objective measures are common but are generally considered to be insufficient in capturing relevant user information. Some efforts have been made to develop tools to evaluate healthcare service quality in different settings that take the patients perceptions into consideration, such as a tool for evaluating mHealth by Akter et al. (2013). In a literature search generic models for analysing product and service quality (Garvin 1987; Parasuraman, Zeithaml, & Berry 1988), user acceptance (Davis 1989), and diffusion of innovations (Rogers 2003) were been identified. However, no qualitative assessment model for eHealth focusing on the patients' perceptions could be found.

1.3 Purpose

The objective of this thesis was to aid the implementation decision process by suggesting that care providers focus on the patient perceptions of eHealth solutions. By developing a tool that can be used to lower the uncertainty of implementing and offering eHealth solutions it was believed that alignments between care provisions and patients perceptions could increase. Thus, the purpose of this study was to investigate how patient perceptions of eHealth interventions could be evaluated through the use of an analytical model. Based on the purpose, this thesis aimed to aid in the diffusion of eHealth solutions through the use of the analysical model. To capture the patient perceptions a variety of analytical models could be used. In this thesis a coding scheme, on which patient perceptions could be coded and categorised, was chosen. By coding perceptions, the occurrence of perceptions for a specific code could be measured and the model could result in comparable measures. Thus, the perceptions of different demographics or patient groups, that use the same eHealth solution, could be compared quantitatively as well as qualitatively. The quantitative measures were also believed to aid in determining what is especially important for different patient groups, i.e. what codes that are the most prominent in the coding of the patient groups. Showing the effect of facilitating conditions for each group, which was found to be challenging to capture or measure in any other way. From the decision to develop a coding scheme the following research questions were formulate.

1.3.1 Research Questions

Based on the purpose of this thesis two research questions were formulated. The answers to these questions aimed to fill the gap that have been found in the literature.

> RQ-1: *What can be a coding scheme to analyse patient perceptions of eHealth?*

To understand what patients think about eHealth it first needed to be established what parts eHealth could entail and what dimensions patients may have perceptions of. Therefore, definitions of eHealth were investigated in literature and what parts of eHealth that overlap neighboring fields of science. When this was determined, frameworks and models that could be used to evaluate the different parts of eHealth needed to be investigated. Frameworks and models were reviewed to find relevant aspects or dimensions that could aid in interpreting patient perceptions. Possible overlaps and/or correlations between the aspects and dimensions were determined though an overlap analysis, after which the dimensions could be combined into a coding scheme.

When a coding scheme had been developed, it could be used to try to determine what perceptions patients have of eHealth. Thus, the following research question was formulated:

> RQ-2: *How well does the developed coding scheme capture patient per-*

ceptions of eHealth solutions?

The evaluation aimed to investigate whether the developed coding scheme could be used to capture the perceptions of patients offered eHealth solutions. More specifically, whether the developed coding scheme could be used to analyse whether patients perceive eHealth solutions as good at delivering care and if the coding scheme could be used to capture any indications of future use. To answer the second research question the coding scheme needed to be tested on patient perceptions. This was accomplished though the inclusion of empirical data from a research project called the DECI project, which is described in greater detail in Section 2.2.

1.4 Delimitations

When researching what perceptions patients have of eHealth solutions the analysis was based on the patients' perspectives. Thus, it was not included in this thesis to analyse the perceptions of eHealth by caregivers, neither formal or informal. Furthermore, no comprehensive analysis regarding what causes or influence patient perceptions was made. Similarly, no analysis of the clinical outcomes and their relation to patient perceptions was done. Therefore, any increase or decrease in the wellbeing of patients was not evaluated parallel to patients' perceptions.

The developed coding scheme was evaluated through the analysis of interview transcripts from participants in the DECI project, see Section 2.2. The authors of this thesis had no say in who or how many that were interviewed in the project, nor had they any contact with the patients which were interviewed. Thus, there was no possibility to ask clarifying or additional questions which limited the data set available for analysis. Continuing, the authors could not assure that the interviewees were not influenced by the interviewers during the interviews. The data collected during the interviews were transcribed by the physicians that were performing the interviews which generated a possibility that the information received had been filtered during the transcription.

2
Methods

Throughout this research there were two streams of input information, which are described below. One of the processes concerned the interview data which was gathered in the DECI project. The other information stream was the result of a literature search, which aimed to construct a coding scheme based on theory. Therefore, parallel processes were used to analyse data from each stream respectively, using an abductive research strategy. The two information streams were joined in an ongoing pattern matching process, which aimed to create and test a coding scheme.

2.1 Abductive Research Strategy

This research adopted an abductive research strategy to develop and test a deductive top-bottom model for qualitative assessment of eHealth solutions, which according to Peng et al. (2016) will be the primary tools used in the future. As suggested by Dubois & Gadde (2002) parallel processes, theoretical and observational, enables a comprehensive understanding of a field. The authors argue that; 'theory cannot be understood without empirical observations and vice versa', and that by 'going back and forth', between empirical data and theory, a researcher can increase his or her knowledge in both areas. In alignment with Dubois & Gadde (2002) suggested methodology, this thesis adopted a structure with an empirically driven track and a theory driven track and continuous matching activities between the two tracks.

2.2 Research Setting

The empirical data which was analysed in this thesis was collected as a part of a research project, called the DECI project. In the DECI project an eHealth solution was developed and tested on a specific patient group, elderly patients with cognitive deficits, in four national pilots, Israel, Italy, Spain, and Sweden. In the following sections the specifics of the research setting for the project is described.

2.2.1 The DECI Project

This thesis was performed concurrently with the Digital Environment for Cognitive Inclusion (DECI) project. DECI is a European Union, EU, funded project with a goal to 'design and demonstrate the value of feasible interventions on business models in elderly care, enabled by ICT, to be scaled across National Healthcare

Systems' (Fondazione Politecnico di Milano 2015). As DECI include three perspectives; organisational models and processes, digital technologies, and business plans and economic models, the project can be perceived of having a holistic approach.

In the DECI project an eHealth solution was developed, henceforth referred to as the DECI solution. The DECI solution included the following elements; a care coordinator, a integrated care platform, psychical training system, cognitive training system, and a wearable activity monitoring device. The care coordinator, also referred to as case manager, who acts as a coordinator for a specific patient and coordinates all the patient's dementia care related appointments, and handles information that is processed in a digital platform. The care platform is used as a communication tool and to provide patients with the training systems, which contains the cognitive and physical exercises for the patients' to do at home. The patients that received the care platform all received a tablet on which the platform was installed.

In addition, some patients were also provided with a wearable activity monitor devices, henceforth referred to as the activity band, that tracks their physical activity at home. The data from the activity band was made available for the physicians, so that they can track the patients activity patterns.

The patients in the DECI project were divided into four intervention groups; Control Group, Intervention Group 1, Intervention Group 2, and Intervention Group 2+. The intervention groups determined the extent of the DECI platform each patient received during their participation. The functions that were offered each respective intervention group can be seen in Table 2.1 below.

Table 2.1: Overview of the distribution of the DECI solution for each intervention group in the project.

Intervention Group	**Integrated care platform**	**Care coordinator**	**Physical training system**	**Cognitive training system**	**Wearable activity monitoring device**
Control Group	—	—	—	—	—
Intervention Group 1	Yes	Yes	—	—	—
Intervention Group 2	Yes	Yes	Yes	Yes	—
Intervention Group 2+	Yes	Yes	Yes	Yes	Yes

2.2.2 Operational Differences in the National Pilots

Patients from four different national healthcare systems partook in the DECI project; Israel, Italy, Spain, and Sweden. In each of these pilots the care provision was adapted to the local healthcare system. In Sweden a noticeable adaptation was required. The care provided by the national healthcare system in the pilot site Skaraborg hospital group, partly consisted of visits to the hospital and home visits. Once a clinical picture of the disease had been established, patients from Intervention Group 1, 2, and 2+ were referred to a mobile team that conducted treatments in the patients' homes.

The primary communication tool used by the Swedish professional caregivers were mobile phones, due to the time spent on the road. Therefore it was decided that the care coordination should continuously be done over the phone, rather than using the tablet application in the eHealth platform. Consequently, the Swedish patients in Intervention Group 1 did not receive tablets from the DECI project, and the patients in Intervention Group 2 and 2+ only used the tablets they received for the cognitive and physical exercises.

2.2.3 Mild Cognitive Impairment and Mild Dementia

The prevalence of Mild Cognitive Impairment (MCI) and Mild Dementia (MD) is very common among elderly (Knopman & Petersen 2014), and the conditions have been found to be closely correlated with increasing age (Alzheimer's disease international 2003). The literature predicts a rapid increase of people who will be living with either MCI or MD, and it is predicted that 131 million people will living with dementia worldwide in 2050 (Prince et al. 2016). The ageing population is creating new challenges for society in providing high quality care for an increasing number of patients.

People sickened with MCI or MD have to make a variety of life adjustments and may gradually loose independence, which can have major effects on patients wellbeing (Bisschop et al. 2004). Confusion and agitation are two issues that are common in the later stages of several dementia diseases, and when experiencing these symptoms patients are often at greater risk of harming themselves. (Welsh et al. 2003.) To ensure patients safety and wellbeing, support and monitoring is required in addition to the task of continually reevaluating the patients' cognitive condition. (Prince et al. 2016.)

Prince et al. (2016) states that the care delivery models for patients with dementia must be continuous, holistic, and integrated to suit their specific needs. Care organisations must also handle patients more efficiently, as the number of patients are increasing. The current routines for detecting, diagnosing, and treatments in dementia care are believed to be, and there are many shortcomings in current care models. (Prince 2016.) The combination of the expected increase of elderly, in particular the increasing number of patients with MCI and MD have motivated researchers to research the possibility to incorporate intelligent systems, ICT, and robots into

elderly care. (Heerink, 2006)

Suffering from MCI or MD may limit individuals capacity to register, process, and express information. When involving elderly with MCI and MD in research or pilot projects, the patients ability to evaluate their participation, and the aspects of the pilot project, could be affected which in turn could restrict the data that can be gathered for analysis.

2.3 Data collection

This study was conducted in two parallel tracks, a theory driven and an empirically driven. Below are the data collection methods for both tracks described.

2.3.1 Literature Search

The literature search aimed to find qualitative assessment models based on patient perceptions and applicable to eHealth solutions. As eHealth is not clearly defined in literature, and it is closely related to, or overlapping with, other fields of research, it was assumed that using eHealth as a strict inclusion criteria would restrict the outcome of the literature search. eHealth was determined to be constructed of various elements, including devices, services, and ICT. Therefore the literature search was conducted using an exploratory approach, with the following inclusion criteria as guidelines;

- The model is based on user, customer, consumer or patient perceptions, and applicable in a health setting.
- The suggested method is a qualitative assessment tool or model.

The broadness of the literature search created a need for filtering among the identified models. To aid this process, a number of filtering criteria were developed as follows:

- One criterion involved to identify how models were constructed, namely if they were modified versions of already existing models, original models, to fit a certain context, and/or if they were expansions of original models to overcome identified shortcomings to the original models.
- The next criterion was to evaluate whether overlaps of concepts between models cloud be found, by using a mapping of elements for each model.
- To construct a systematic deductive top down model, well supported models were sought after. Therefore, the last criterion involved a screening of the models on the support and validation they received in literature.

Based on the the three steps described above, the following criteria was applied; original models and expansions of models, with full or partially overlapping elements to the definition of eHealth, that were well supported (cited) in literature, were included in the data analysis step.

2.3.2 Collection of Patient Perceptions

The patient perceptions that were analysed in this thesis origins from patients in the DECI project. The patients that were included in the DECI project had to fulfil a number of criteria, such as the patient had to:

- be 60 years old or older
- have been diagnosed with either MCI or MD
- have moderate progression of the illness
- be living at home and not in a care facility
- not suffer from any other severe illnesses

In the DECI project a selection of patients were interviewed. The interviewes were semi-structured and conducted at the clinical sites in Israel, Italy, and Spain, and by phone in Sweden. The interviews were performed in the patients' native language by clinical partners under ethical agreements. The authors of this thesis were not involved in the interviews due to ethical restrictions typical to research studies such as DECI. In Israel, Italy and Spain, the transcription and translation of the interviews to English were done by the care professionals while the Swedish interviews were transcribed by the authors of this thesis. As the authors are both Swedish native speakers, the Swedish interviews were not translated to keep the original perceptions of the patients uninterpreted. To ensure that the data could be interpreted accurately, any issues that occurred due to the transcriptions and translations of the interviews were resolved through conversations with the partners in the DECI project.

The questions which the patients were asked varied depending on the intervention group of the patient. The questions, which the patients in each intervention group were asked, can be seen in Table 2.2. While the wearable activity monitoring device is referred to as the activity band in the description of the offerings that the patients received, when interviewing patients, the caregivers referred to the activity band as 'the watch', see Question 7 below.

Table 2.2: Interview questions for patients in the DECI project which were used to collect patient perceptions.

Question Nr.	Intervention Group	Question
Question 1	Control Group Intervention Group 1 Intervention Group 2 Intervention Group 2+	What did you like best in the care you received?
Question 2	Control Group Intervention Group 1 Intervention Group 2 Intervention Group 2+	What did you like less in the care you received?
Question 3	Intervention Group 1 Intervention Group 2 Intervention Group 2+	Did you need to learn new thing before you could start using the system?
Question 4	Intervention Group 1 Intervention Group 2 Intervention Group 2+	Would you like to use the DECI system in the future?
Question 5	Intervention Group 2 Intervention Group 2+	What do you think about the training with help of the system?
Question 6	Intervention Group 2 Intervention Group 2+	Have you tried mental exercises with the DECI system, what do you think about it?
Question 7	Intervention Group 2+	Have you tried the watch, what do you think about it?
Question 8	Intervention Group 2+	How do you feel about the fact that your activity is being monitored by professionals and family members?
Question +	Intervention group 2+	Is there anything within the watch you would like to change?

In total 55 interviews where held, eleven Israeli, fifteen Italian, two Spanish, thirteen Swedish. In Table 2.3 a more detailed presentation of the distribution of interviews can be seen.

Table 2.3: The number of interviews available for analysis for each nationality and intervention group.

Intervention Group	Total	Israeli	Italian	Spanish	Swedish
Control Group	19	1	10	1	7
Intervention Group 1	10	4	6	0	0
Intervention Group 2	12	5	4	0	3
Intervention Group 2+	14	1	9	1	3

2.4 Data Analysis

In this section the data analysis processes for the theory driven and the empirically driven tracks will be described. The collected data was partielly analysed through application of pattern matching logic. Pattern matching is used to evaluate and compare patterns from empirical data and theory. The intention of pattern matching is to investigate whether patterns support each other to the extent that they can be considered to match. If the patterns are not found to be matching, it could be concluded that the theory, which the pattern is based on, is inadequate to explain the empirical findings, or in need of further development. (Trochim 1989.)

There are three primary processes in pattern matching; the formulation of concepts, the arrangement of data, and the pattern matching analysis. In the formulation of concepts process theory is converged into concepts where clear patterns can be distinguished. Similarly, the aim of the arrangement of data process is to structure the available empirical data into distinct patterns. To facilitate the pattern matching process it may be necessary to structure the empirical data in a similar fashion as the theory to enable a match. The main procedures presented by Trochim (1989) is illustrated in Figure 2.1 below. (Trochim 1989.)

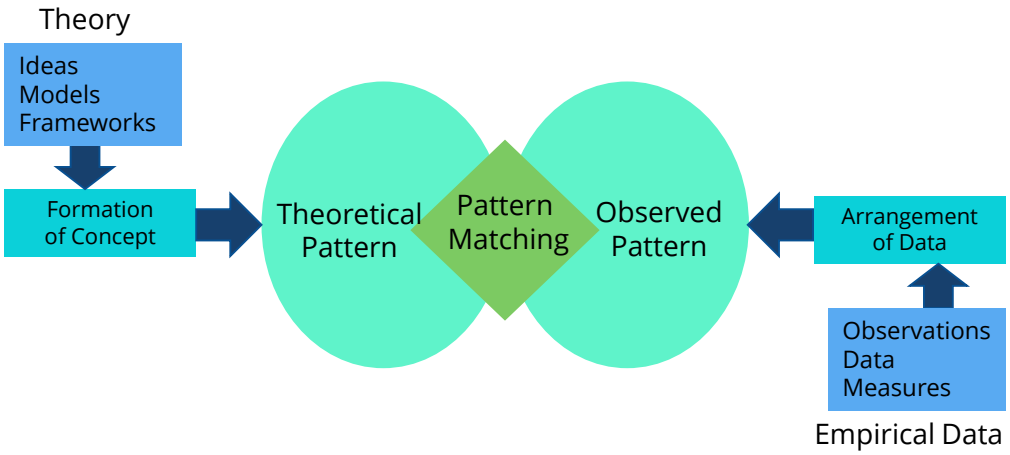


Figure 2.1: Figure illustrating the pattern matching logic used when comparing theory with empirical data.

2.4.1 Development of a Coding Scheme

The codes that form the coding scheme were derived from dimensions found in the models and frameworks that complied with the filtering criteria in the literature search, see Section 2.3.1. The dimensions were collected and interpretations of the dimensions possible usages for capturing patient perceptions were formulated. The interpretations were seen as potential codes and an overlap analysis was made to find

similarities and remove overlaps between the potential codes. The overlap analysis was based on pattern matching logic where theory was compared with theory, as can be seen in Figure 2.2.

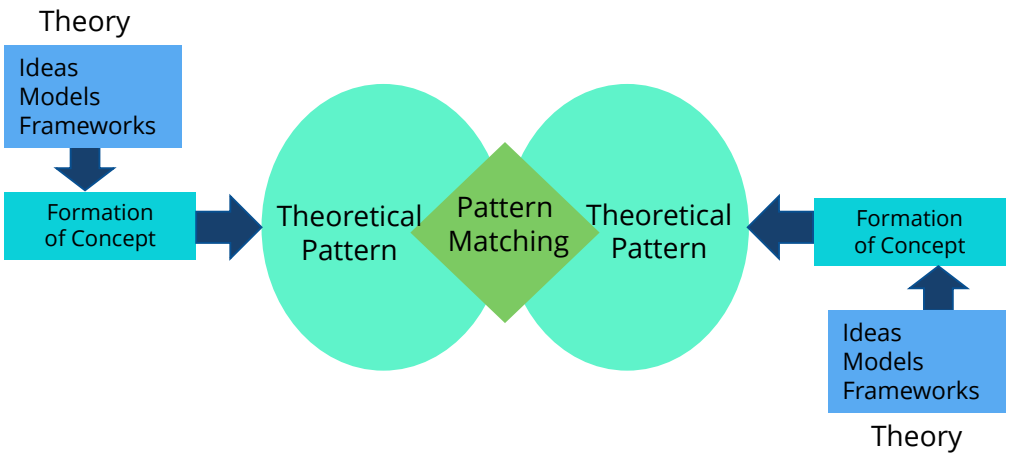


Figure 2.2: The figure aims to illustrate the pattern matching logic used when comparing patterns in theory with other theoretical patterns.

Two codes overlaped if similarities could be found in the codes potential usages. If a match was found, the intentional usage of the dimensions where compared. For the cases where a full overlap was identified, the codes were combined into one code. When codes partially matched the nature of the overlap was evaluated further. A partial match was identified when some aspects of the codes overlapped, for those cases the aspects that overlaped were removed from one of the codes, thus eliminating the overlap. If the partial overlap was due to that all aspects of one code was included in another code, in addition to other aspect, that code was eliminated. An overview of the different overlaps can be seen in Figure 2.3.

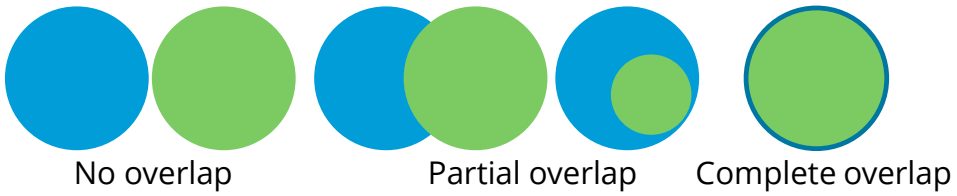


Figure 2.3: Figure illustrating the four different types of overlaps possible for the codes; no overlap, full overlap, and two types of partial overlaps.

After all overlaps had been resolved the remaining codes were collected into a list with the purpose to be used as a coding scheme, which can be found in Section 4.2, and in a more detailed presentation in Appendix A.

2.4.2 Analysis of Patient Perceptions

For the analysis of the patient perceptions available from the DECI project a computer aided deductive thematic analysis was applied. The computer program NVivo, developed by QSR International, was used. NVivo is designed to aid qualitative researchers to do analysis on large volumes of text-based data or multimedia information. The use of the computer program enabled the patient perceptions to be coded and filtered efficiently. The computer program was presumed to be frequently used when doing deductive thematic analysis and aid in the qualitative and quantitative analysis of the patient perceptions. When using the computer program, codes and and demographic information could be assigned to each perception, which facilitated the filtering and analysis process of the perceptions.

To enable a thematic analysis the collected data from the patient interviews needed to be organised so that all information, both perceptions and demographics, were coherent and patterns could be found. When the data was organised it was inserted in to NVivo. The data was coded by the use of the developed coding scheme. The coding was done through the identification of patterns in the patient perceptions that matched the use of the codes in the coding scheme. When the coding of the interviews were completed a review was done focusing on the information that had been collected under each code. The review also focused on what information that had not been coded, and if there were any ambiguity in the usage of the codes. The aim of the review was to create a notion of how well the developed codes captured the patient perceptions. The coding of the patient perceptions was done continuously as empirical data became available and the theoretical concepts were developed.

3

Result from a Literature Search

In this chapter the findings from the literature search are presented. eHealth interventions consist of several elements which form the offering delivered to patients. To explore what can be a coding scheme to analyse patient perceptions of eHealth interventions, the different areas that constitute eHealth needed to be determined, after which methods and frameworks to analyse patient perceptions for each area could be explored. In the first section of this chapter, the literature findings when applying the inclusion criteria are presented, followed by the outcome of the filtering strategy.

3.1 Presentation of Literature that Complied with the Inclusion Criteria

Qualitative assessment methods of service quality and healthcare have been stated to be missing in literature. Dagger et al. (2007) points out that healthcare in general has been slow to incorporate measures of quality in soft values, and that care quality has been measured using primarely objective measures. Grönroos (1984) argues that customer perceptions of service quality is what companies should base management decisions on and that success in a market place is determined by service quality. Thus, it is important to have a model to aid this. Akter et al. (2013) found in a literature review that the topic of how to measure service quality in mHealth was under-researched, which is why they developed and tested a scaling tool to be used in the mHealth context. Kidholm et al. (2010) stated that there were few studies of qualitative nature, and there were few studies that assessed patient satisfaction with validated tools. The results of the literature search arrived to a similar conclusions, namely that there are few approaches for qualitative assessment of patient perceptions in eHealth. The literature search also showed that there were approaches for qualiative assessment, for specific contexts. Peng et al. (2016) discussed the evaluation process of health applications. They suggested that a qualitative examinations of the user perceptions would aid app designers to develop more tailored provisions, the literature show however, that such efforts have been limited. When a qualitative approach has been identified, the method of choice for researchers to evaluate the perceptions have been a bottom up approach (Powell et al. 2017) rather than a top down, deductive approach.

The definition of eHealth in this study, is overlapping with other research fields, and various definitions are used within each field. Thus, wider inclusion criteria was applied in the initial stage of the literature search. Below is a table of models that fit the first inclusions criteria, see Table 3.1.

Table 3.1: Summary of identified models found in the literature search.

Author	**Year**	**Description**
Akter et al.	2013	Akter et al. (2013) propose a hierarchical measurement scale for assessing service quality in mHealth applications. The proposed assessment model consist of three primary quality dimensions, each with a set of sub-dimensions; – System Quality (system reliability, system efficiency, system privacy) – Interaction Quality (cooperation, confidence, care) – Information Quality (utilitarian benefits, hedonic benefits)
Dagger et al.	2007	Multidimensional hierarchical model to measure service quality in healthcare, and service satisfaction and behavioural intentions. The model consist of four primary dimensions, and nine sub-dimensions 'that were found to drive service quality perceptions' (Dagger et al. 2007). – Interpersonal Quality (Interaction, Relationship) – Technical Quality (Outcome, Expertise) – Environment Quality (Atmosphere, Tangibles) – Administrative Quality (Timeliness, Operation, Support)
Davis	1989	TAM (Technology Acceptance Model) Acceptance of a technology is highly relevant in the eHealth setting, why this model is a commonly cited in papers. The model suggests that user acceptance is primarily determined by Perceived Usefulness and Perceived Ease of Use. – Perceived Usefulness – Perceived Ease of Use

Continuation of Table 3.1

Author	Year	Description
Garvin	1987	Devices can be an element of eHealth, thus user perceptions of devices are a relevant area to include. According to Garvin (1987) quality of a product can be found in eight dimensions. Generally these are used as objective measures in development, but they can also be applied to users opinions: – Performance – Features – Reliability – Conformance – Durability – Serviceability – Aesthetics – Perceived Quality
Kidholm et al.	2010	MAST (Model for ASsessment of Telemedicine) A multidisciplinary, structured assessment framework used to evaluate effectiveness and contribution to quality care of telemedicine applications. It is intended to be used as a supporting tool for EU and European countries to design and/or choose among telemedicine solutions. Telemedicine solutions are defined as when using ICT to deliver care from a distance. The model is comprised of 7 domains; health problem and characteristics of the application, safety, clinical effectiveness, patient perceptions, economic aspects, organisational aspects, and socio-cultural, ethical and legal aspects. For which each domain are provided a checklist of aspects to consider. It is proposed that patient perceptions are assessed in the listed topics below: – Satisfaction and Acceptance – Understanding of information – Confidence in the treatment – Ability to use the application – Access – Empowerment, Self-efficacy

Continuation of Table 3.1

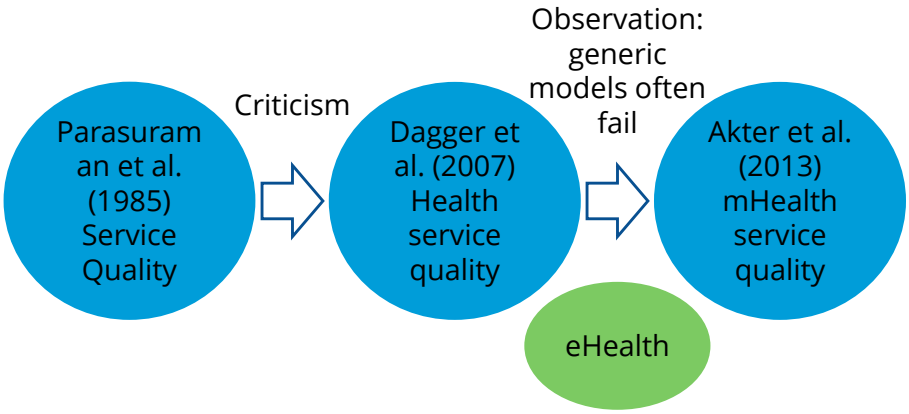
Author	**Year**	**Description**
Venkatesh et al.	2012	UTAUT (Unified Theory of Acceptance and Use of Technology) Venkatesh et al. (2012) set out to integrate a number of individual acceptance models, to build and validate a framework for technology acceptance. He found the following dimensions to be explanatory for acceptance: – Performance Expectancy – Effort Expectancy – Social Influence – Facilitating Conditions
Rogers	2003	Diffusion of Innovations Rogers (2003) proposes a model for rate of adoption of an innovation. Rate of adoption is a measurable factor that help explain innovation diffusion. Large variance in rate of adoption can be explained by potential adopters perceptions of five dimensions; – Relative Advantage – Compatibility – Complexity – Trialability – Observability
Parasuraman	1985	SERVQUAL is a tool used to assess perceptions on service quality. It is a generic model that aims to capture perceptions and expectations of quality in the listed dimensions. – Service Reliability – Tangibles – Responsiveness – Assurance (communication, credibility, security, competence) – Empathy (courtesy, understanding/knowing the customer, access)

Continuation of Table 3.1		
Author	**Year**	**Description**
Calvin & Karsh	2009	Personal Acceptance Factors A systematic review of factors that have been shown to affect personal acceptance for Consumer Health Information Technologies. Based on the review and an analysis of the results, Calvin and Karsh (2009) suggest the following dimensions as explanatory of patient acceptance of CHITs; – Prior Experience (with eHealth and/or technology) – Digital Literacy – Computer Anxiety – Personal Health Status

3.2 Presentation of Literature that Complied with the Filtering Criteria

Due to the broad inclusion criteria, various user centred models were included in 3.1. There was a need to organise the literature to apply the filtering criteria, described in 2.3.1. In the Table 3.1, there are several models that aim to provide measurement scales for service quality (Parasuraman 1985, Dagger et al. 2007; Akter et al. 2013). In the figure below the models are presented in relation each other, see Figure 3.1

Figure 3.1: Figure illustrating the service quality models developed by Parasuraman et al. (1985), Dagger et al. (2007), and Akter et al. (2013).



SERVQUAL is a generic model, that is applicable in a variety of settings. Dagger et al. (2007) provides a context specific extension of service quality in healthcare, to overcome criticism directed towards SERVQUAL. Akter et al. (2013) argues that models that have not been context specific have failed, which is why they developed

a tool to assess service quality in mHealth. The model by Akter et al. (2013) was deemed too focused for assessment of eHealth, since eHealth is a wider concept than mHealth, and mHealth can be considered to be an element of eHealth. Hence, no framework or model which focused on service quality assessment in an eHealth setting was identified in the literature search.

Dagger et al. (2007) made an updated version of an already existing model, called SERVQUAL, which aimed to overcome shortcomings that the original model presented. Many dimensions in the two frameworks were overlapping, and that additional dimensions to make the model more suitable to the context was provided. Similarities between the two models were observed, but due to the strong support for the SERVQUAL model in literature, and its continuous use, despite criticism, this model was chosen to represent assessment of service quality elements in eHealth.

Kindholm et al. (2010) provides guidelines on what topics to consider when assessing telemedicine solutions. Although being designed to provide support to EU in decision making focusing on telemedicine, the MAST manual has not gained much attention in literature, which is why it was excluded from furture analysis.

Innovation Diffusion by Rogers (2003) is a generic framework that investigates how innovations are diffused into a social construct. Innovation diffusion has roots in agriculture and is widely accepted and tested in various settings today. As it is generic it was presumed that it encompass the various elements of eHealth, and factors that drive diffusion, it was included in the following research steps.

Three acceptance models were included in the Table 3.1, TAM (Davis 1989), UTAUT (Venkatesh 2012), and Personal Acceptance Factors of CHITs (Calvin & Karsh 2009). TAM is partly based on innovation diffusion logic, but it emphasise a very central issue in eHealth, namely technology. In addition it is a widely accepted model that has remained relevant for decades. 'Davis' technology acceptance model has been one of the most influential theories for studying acceptance with diverse types of information technologies and population. (Calvin and Karsh 2009.) Therefore, TAM was included in the following research steps.

UTAUT (Venkatesh 2012) was developed through an evaluation of 8 acceptance models, one of which was TAM. Empirical testing of these frameworks helped develop UTAUT. Both models include expectancy and performance dimensions. UTAUT also includes social influences and facilitating conditions as dimensions. As the latter dimensions can be found in other included frameworks, and it is partially overlapping with TAM, it will be excluded from further analysis.

The model for Personal Acceptance of CHITs was excluded as it was found to be the results from a systematic review, rather than a validated perception model. Although the factors are aggregated from several fortified theories, some of which were included in Table 3.1, they were found yet to be tested independently and validated in practice. Which is why the model was excluded from further analysis.

Garvin (1987) focuses on the is included as the framework is widely accepted in academia, and it is not overlapping with the other models, thus it was included.

In the table below, Table 3.2, a summary of the models that complied with the inclusion and filtering criteria is presented. In the table a brief description of the models and frameworks are included, in addition to the frameworks names and developers. Each framework and model included in Table 3.2, will be described in greater detail in the following sections in this chapter.

Table 3.2: Summary of the chosen models that was used as a basis for the development of the analytical tool.

Name	Author	Year	Description
Product Quality	Garvin	1987	The framework consists of eight dimensions which can be used as a tool to analyse quality characteristics to aid product quality management. The dimensions are; Performance, Features, Reliability, Conformance, Durability, Serviceability, Aesthetics, and Perceived Quality.
Service Quality SERVQUAL	Parasuraman, Zeithaml, & Berry	1985	The SERVQUAL framework is a tool to capture customer perceptions, and expectations, of a service. The tool uses five dimensions to describe service quality; Reliability, Tangibles, Responsiveness, Assurance, and Empathy.
Technology Acceptance Model TAM	Davis	1989	TAM is a tool used to determine user acceptance of technology solutions. The model suggests that user acceptance, the possibility of a user deciding to use a technology, how, and why, is primarily determined by; Perceived Usefulness and Perceived Ease of Use.
Diffusion of Innovation	Rogers	2003	The model is used to improve understanding of the diffusion process of an innovation. The rate at which an innovation is diffused in a setting can to a large extent be explained by the Relative Advantage, Complexity, Compatibility,Trialability, and Observability.

3.3 Product Quality

Some eHealth interventions include the use of devices or products. To evaluate the patient perceptions of these devices a model for assessing product quality was needed. By reviewing product quality literature as a neighbouring field to eHealth, it was found that the eight dimensions of quality by Garvin (1987) were well supported in literature and not derived from any previous framework.

In quality literature there is a large focus on mechanistic quality of the physical aspects of products, such as reliability and durability. Customers however, have a different definition of quality and focuses on more subjective measures when evaluating quality. As this thesis focuses on patient perceptions, highly mechanical quality measures will not be incorporated in to the assessment of quality. Garvin (1987) believed that quality control efforts were primarily focused on defensive measures, such as, to eliminate defects. A new way of thinking about quality was believed to be required and the focus of quality needed to shift from protecting customers from faulty products to provide customers with products that pleased them. To achieve this vision Garvin (1987) argued that it was important to have a strategy for quality efforts.(Garvin 1987.)

3.3.1 Dimensions Used in the Product Quality Framework

The eight dimensions that were presented in the product quality framework were perceived as possible dimensions for analysing patient perceptions of product quality. In this section, the intentional use of the dimensions, as Garvin (1987) intended them, are described.

3.3.1.1 Performance

The performance dimension is explained to refer to a product's primary operating characteristics. The characteristics are often measurable attributes which means that they can be objectively compared between products, standards, and manufacturers. The performance ranking can also vary depending on the user. While it is possible to compare measurable attributes the overall performance ranking of a product depends on the needs and requirements of the user. Depending on what tasks a product intends to perform or what need to fulfil, a product might achieve a lower overall performance, despite superior performance in one or several characteristics.

3.3.1.2 Features

In addition to the primary operating characteristics and attributes a product also has additional characteristics that work as supplements to the primary functions, these characteristics are called features. Garvin (1987) explained features as "the bells and whistles of products and services", and states that the line between primary performance characteristics from secondary features, meaning the line between performance and features, is often hard to draw. What is critical to understand is that, similarly to performance, features involve both objective and measurable attributes, and individual needs affect how the user will interpret the quality of the features.

3.3.1.3 Reliability

Reliability is an aspect which reflects the probability of a product malfunctioning or failing within a specified time period. Reliability measures are often used to determine the life time of products, i.e. the time within users can expect a product to function without fault. To determine the reliability of a product measures, such as, mean time to failure, are often used. (Garvin 1987.)

3.3.1.4 Conformance

Conformance is described as 'the degree to which a product's design and operating characteristics meet established standards' (Garvin 1987, p. 105). When designed, a product's specifications are given targets and tolerances which the product is expected to be developed and perform within. The dimension is described to primarily be used during manufacturing, but when viewed from a user perception point of view, it could be used to collect information of how the product meet established market standards and target performance criteria by the users. It could be targets for the customer segment, or the alignment in performance compared to competitors. (Garvin 1987.)

3.3.1.5 Durability

Durability and reliability is closely linked. While reliability is the time before a failure, durability can be explained as the amount of use a user can get from a product or a device before it can no longer perform as intended, or it deteriorates. To determine both dimensions manufacturers rely heavily on calculations and tests, but ultimately it is the user perceptions of the durability that is of importance. (Garvin 1987.)

3.3.1.6 Serviceability

Serviceability is the dimension that entails the speed, courtesy, and competence, of the employees mending a product, and the ease of repair. Many users do not consider this dimension until a product breaks down or fails and the products serviceability is displayed. Within serviceability there are several aspects, such as the responsiveness, usually measurable as the mean time to repair, the competence of the repair personal, which is indicated by the number of service calls required to correct a failure. Serviceability also entails complaint handling from users and the users experience when complaining. (Garvin 1987.)

3.3.1.7 Aesthetics

The dimension reflects how the product looks, feels, sounds, or smells. This dimension is the most subjective of the eight Garvin (1987) presents as it is solemnly based on the users personal judgements and preferences.

3.3.1.8 Perceived Quality

This dimensions refers to factors that determine the customers quality expectations on a product rather than the experienced quality. The expectations could be affected by communication material, such as advertisement, branding, and image. The intentional use of this dimension is for organisations to develop a comprehensive image of the quality expectations users have on their products. (Garvin 1987.)

3.4 Service Quality

Perceived service quality is a comparison between customers' expectations of performance and the experienced performance. But as an offering, service differs from products or goods in primarily three ways. Firstly, services are most often intangible in the way that they are performance rather than objects. Secondly, services can be described as heterogeneous, as they vary depending on producer, customer, and the day they are delivered, which is especially prominent for services with high labour content. Lastly, many services are inseparable as service production and consumption occurs simultaneously. As a consequence, service quality is often created during the service delivery. Product quality can be both objective and subjective, while perceived quality of products are mostly subjective, and so is service quality. The characteristics of service quality makes it abstract and elusive, and to a large extend dependent on customers' perceptions. (Parasuraman, Zeithaml, & Berry, 1988.)

Care and eHealth solutions can incorporate service dlivery processed, it was therefore found highly relevant to evaluate the patient perceptions of service quality with a model specified for the task. The SERVQUAL model is intended to be used for assessing customer perceptions of service quality as was found to be appropriate to use in a healthcare setting. The model was developed to help organisations ensure that they were delivering sufficient quality to differentiate themselves, as outstanding quality was seen as a necessity for success. The tool is described to be most valuable when used periodically to track the changes in service quality over time. (Parasuraman, Zeithaml, & Berry,1988.)

In the SERVQUAL framework it was found that customers assess service quality through ten dimensions; Tangibles, Reliability, Responsiveness, Communication, Credibility, Security, Competence, Courtesy, Understanding/Knowing the customer, and Access. In the SERVQUAL framework these ten dimensions have been combined to result in five dimensions. Three dimensions which are as originally found; Tangibles, Reliability, and Responsiveness, whereas seven of the original ten dimensions were combined into two dimensions; Assurance and Empathy.

3.4.1 Dimensions Used in the Service Quality Framework

The SERVQUAL framework derived to five dimensions to evaluate customer perceptions of service quality. In this section the five dimensions and their intended use are presented.

3.4.1.1 Service Reliability

Service reliability represent the service providers ability to perform the promised service dependably and accurately (Parasuraman et al. 1988). To achieve reliability a service provider must perform the service right the first time and perform as promised.

3.4.1.2 Tangibles

When assessing service quality tangibles refers to the environment in which a service is provided, such as the physical facilities, the objects within, and physical representation of the service. The dimension also includes tools and equipment used to deliver the service, communication material provided by the service provider, and appearance of the personnel. (Parasuraman et al. 1988.)

3.4.1.3 Responsiveness

The willingness to help customers and to provide prompt service is referred to as responsiveness in the SERVQUAL framework. To achieve responsiveness the service must be delivered in a timely manner and employees must strive to give customers prompt service. (Parasuraman et al. 1988.)

3.4.1.4 Assurance

The first of the combined dimensions in the SERVQUAL framework was named assurance. This dimension represents the knowledge and courtesy of the employees and their ability to convey trust and confidence during service delivery (Parasuraman et al. 1988). To gain assurance service providers needs to possess the right competence, knowledge, and skills, to be able to perform the service accurately. The competence must be possessed by contact and operational personnel respectably. The organisation also needs the right competence to conduct research and development efforts of their offerings. (Parasuraman et al. 1985.)

The dimension also include the dimensions courtesy, communication, and credibility, from the ten original dimensions that were found to capture customer perceptions of service quality. Courtesy involves the providers ability to communicate politeness, respect, consideration, and friendliness to the customer. Communication involves the task of informing the customers in a language which they can understand, and listening to them. Companies need to acknowledge that each customer is different and that the language they use may need to vary depending on the customer they are serving. Both these aspects relate to the service providers ability to convey

credibility. The assurance aspect also entails the service providers ability to be portrayed as trustworthy and honest in the eyes of the customer, and to ensure that the customers believe that the company have their best interest in heart.(Parasuraman et al. 1985.)

3.4.1.5 Empathy

The dimension called empathy represents employees and service providers' ability to supply the service so that the customer feel that they receive individualised attention and provision of caring (Parasuraman et al. 1988). One way to provide the customer with a sense of individualised attention is to provide the customers with access to the service provider. This involves both approachability and the ease to which a customer can make contact with a service provider and employees. Accessibility could mean both access by phone or the waiting time which the customers need to endure in order to access the service. It could also be the convenience of opening hours or location of service facilities. (Parasuraman et al. 1985.) The individualised attention is closely linked with the aspect of understanding and knowing the customer, which entails the effort a service provider makes to understand customer needs and requirement. In addition, this aspect also emphasis on recognising the regular customers, and to show appreciation to them for their loyalty. Empathy also include a security aspect. Security is the customers perception that they are safe from danger and risks, both physically and financially. (Parasuraman et al. 1985.)

3.5 Technology Acceptance

When developing new technology solutions it is critical to gain customers acceptance to ensure the use of the new technology. The knowledge of how to ensure acceptance or prevent rejection can be beneficial for both developers in the design process of new technology solutions and for organisations to evaluate existing solutions. To understand what causes people to accept or reject information technology the Technology Acceptance Model, TAM, was developed. The purpose of TAM is to predict the use of technology. The focus of the model is to evaluate customer perceptions of perceived usefulness and ease of use, which is found to be the determinants of system use. (Davis 1989.)

3.5.1 Dimensions Used in the Technology Acceptance Model

There are many things that may influence why a person accepts or rejects a technology solution but there are two factors that have been found to be significant. As the acceptance of a technology solution is determined by the users the framework is based on the users judgements of the solution in question. Thus, it is the users perceptions of the technology that will be evaluated. Ultimately it is the usefulness that is most important for acceptance. While the acceptance of a technology may be hindered if users find it difficult to use, even it it is otherwise perceived as useful, lack of usefulness can not be overcome by any means of ease of use. (Davis 1989.)

3.5.1.1 Perceived Usefulness

One of the prominent factors of user acceptance is perceived usefulness which can be achieved if users perceive that they can use a solution advantageously. There are several factors that may determine if a person perceives a solution as useful or not. If a user feel that it would be difficult to perform a task without the technology solution or that the solution makes a task become easier the technology is perceived as useful. Usefulness could also be achieved by enhancing user effectiveness or productivity, namely enable the user to; save time by using the solution, to perform the task quicker, or allows the user to do more work than if the solution was not used. Improvement in performance by the use of a solution, or improvement in quality also referrers to the usefulness of a solution. (Davis 1989.)

3.5.1.2 Perceived Ease of Use

The second essential part of technology acceptance is the ease of use of solution. Even if a customer perceives a solution as useful it can be outweighed by the effort required to use the technology. Thus, the usage of a technology solution is influenced by the ease of use. Ease of use referrers to the user belief of required effort needed to use a particular technology. This dimension is closely linked to the complexity of the solution as complexity can make a technology difficult to understand. If a technology is difficult to understand then it is more likely that users will find it difficult to use as well. The complexity can be described as the mental effort needed to learn, understand, and use the technology, including how easy it is to remember how to use it. If users find that a solution confuses them, or that they frequently make errors, or other issues occur when using the system, a feeling of frustration may appear, this feeling of frustration can be linked to a negative indication of ease of use. This also include the effort or difficulty to recover from errors. To increase the users perception of ease of use the technology should be easy to control and behave as users might expect. To decrease the need of consultation, or aid from others, incorporated guidance can be a mean to ensure ease of use. (Davis 1989.)

3.6 Diffusion of Innovation

An eHealth solution may consist of many interacting elements, including technology, service, and products, and there can be variations to the environment in which an eHealth solution is introduced. Thus, there are many factors that must be taken into consideration when trying to grasp users perceptions of an eHealth solution. The perceptions expressed by users might be related to a specific element or feature of the received care, but it may also be an overall impression. To fully comprehend how users rate such eHealth solutions and interventions, there is a need for a comprehensive evaluation framework.

Diffusion is described as individuals, or other adopting units, acceptance of an idea or a specific item over time or 'the process in which an innovation is communicated through certain communication channels over time among the members of a social

system' (Rogers 2003, p. 5). Predicting the diffusion of an innovation can be a very uncertain task, some innovations are diffused relatively quickly while others fail to be diffused completely. Although an innovative platform may have great benefits, a successful introduction and a high rate of adoption cannot be assured. The underlying reason is that the perceptions of an innovation in a social system are subjective, and an individual's perceptions of an innovation is sensitive to external influences. (Rogers 2003.) Diffusion of innovation theory provides a means to explain some underlying reasons for diffusion patterns, and may be used to increase the chance of a smooth diffusion.

For over half a century the diffusion of innovation theory by Rogers (2003) has been the starting point for researchers and practitioners in creating consensus for the diffusion process. It is a well renowned and accepted framework that has been applied in many settings and types of innovations. The model has been proven to provide effective explanations for the variance in rate of adoption, i.e. the rate at which diffusion of an innovation occurs inside a social system (often measured as percentage of adopters over a set time in a social system). Rate of adoption is an indication of the efficiency and effectiveness of the diffusion process, and is explained in more detail below.

3.6.1 Dimensions Derived from Rate of Adoption

The innovation diffusion theory suggest that about half of the variance in rate of adoption may be explained based on potential adopters perception of five innovation attributes. Alongside these attribute perceptions, a set of external factor may also affect the rate of adoption.

The external factors are; the type of innovation decisions, the extent of the change agents' promotion efforts, the nature of the social system, and the nature of the communication channels diffusing the innovation at various stages in the innovation decision process. These factors all affect how the potential adopters will perceive the innovation. Hence, there is limited insight to these cause and effect relationships, why the external factors that influence diffusion cannot be thoroughly analysed.

Potential adopters perceptions on relative advantage, compatibility, complexity, trialability, and observability of an innovation, may be used to predict the diffusion of it. Hence, it is of interest to extract the perceptions on these five dimensions. These dimensions are conceptually different, however in practice it may be hard to separate them (Rogers 2003).

3.6.1.1 Relative advantage

Relative advantage is explained as how potential users perceives a innovation's attributes compared to other innovations' attributes available to them. It is a comparison of how well a new idea stands against the available solutions for any attribute. The attributes may be of financial nature such as economic profitability or initial

cost, but it might also be that one idea offers a larger decrease in discomfort than another. Other suggested attributes are an increase in social prestige, saving time and effort, or immediacy of reward. What characterised this dimension is the measurable difference between alternatives for a given attribute. It is suggested that some of the attributes are generally of higher importance than others to the users, but the framework does not provide any type of ranking of attributes, as the individuals' preferences highly influence the rankings. (Rogers 2003.)

3.6.1.2 Compatibility

Compatibility is built of three subdimensions; sociocultural values and beliefs, previously introduced ideas, and the need for a new idea. Compatibility must be achieved in all aspects in order to increase the rate of adoption of an innovation, and when compatability increases, the uncertainty regarding its impending diffusion decreases. (Rogers 2003.)

Firstly, the individuals inside a social system are accustomed to a way of living. The social system has a culture and a set of norms and values that individuals follow. For an innovation to be accepted within a group it must be aligned with the prevailing culture and values of that social system. An innovation that disputes the way that people are used to, or have chosen to, live their lives will not gain momentum. (Rogers 2003.)

Secondly, individuals are accustomed to a certain ways of thinking about technologies, products, and services. How much the new idea resembles other ideas that it supersedes may have a catalysing effect or a braking effect on the rate of adoption. All potential adopters have a frame of reference from previous experience, and it is by using this a new idea is comprehended. To facilitate a high rate of adoption it is necessary to portray an idea in a way that the individuals in a social system can understand. (Rogers 2003.)

Thirdly, if there is a need of an innovation, there is adoption potential. An idea must fulfil a purpose prior to a potential adoption. Potential adopters have needs and if an innovation is compatible with fulfilling the need it may have a positive effect on rate of adoption. (Rogers 2003.)

3.6.1.3 Complexity

A new idea might require the potential adopters to make an effort to understand and to use it. A common issue is that a new idea may not be understood using the same logic as for previous ideas and there may be a need to expand the users' knowledge before adoption. If there are other solutions available, that are perceived simpler to use, it is likely that the rate of adoption of the new idea will be affected negatively. (Rogers 2003.)

3.6.1.4 Trialability

It is more likely that an individual will adopt a new idea if given the opportunity to trying it before fully committing to adopting it. An opportunity to explore the innovation in a setting similar or close to where it will later be used can greatly improve the rate of adoption of a solution. (Rogers 2003.)

3.6.1.5 Observability

'Observability is the degree to which the results of an innovation are visible to others.' (Rogers 2003). If the positive effects of the innovation can be observed by potential adopters, the likelihood that an observer also will adopt it increases. (Rogers 2003.)

4

Development of a Coding Scheme

This chapter aims to answer the first research question, see Section 1.3.1. From the literature review several models and frameworks were found that could describe patient perceptions of various elements of eHealth. Each model and framework examined in the literature search consisted of several dimensions, on which patient perceptions could be captured. To create a coding scheme based on these dimensions two processes were used. Interpretations of the dimensions were constructed, focusing on patient perceptions rather than the customer, consumer or user. After which overlaps between different codes were identified and resolved. The research methodology for the development of the coding scheme can be found in Figure 4.1

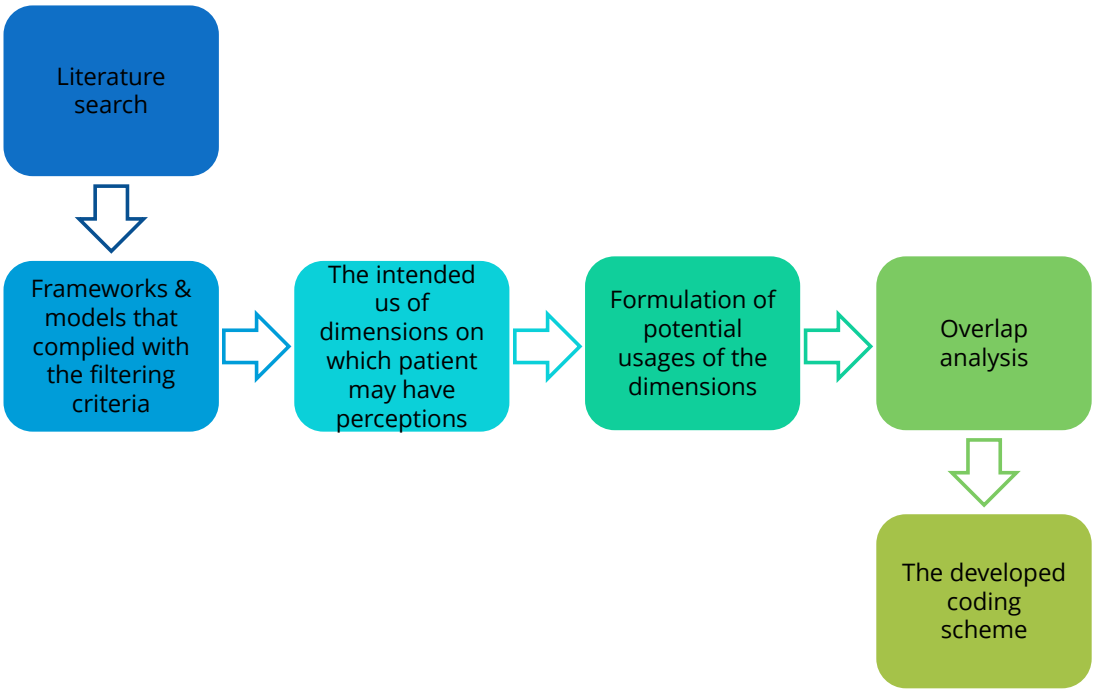


Figure 4.1: The development process of the coding scheme, from literature search, identification of dimensions, and formulation of potential codes, to overlap analysis.

4.1 Analysis of Overlaps

Before an analysis of potential overlaps could be made, the potential use of the dimensions found in the literature search needed to be defined. The dimensions intentional usage, from the models they were derived from, were evaluated and new potential codes were formulated with the intention to collect patient perceptions. To identify any similarities and correlations between the potential codes an overlap analysis was made through an adoption of pattern matching logic (Trochim 1989). The logic that was applied can be found in Section 2.4.1. After the overlap analysis the identified overlaps were resolved, after which the remaining codes were collected in a list which constituted the coding scheme.

4.1.1 Collection of Possible Codes Derived from the Dimensions found in the Literature Search

From the frameworks and models reviewed in the literature search 20 dimensions were found that could potentially be used as codes for analysing patient perceptions. In the following table the dimensions found in the literature search are listed, what model or framework they were derived from, and the interpretation of each code focusing on patient perceptions of eHealth, see Table 4.1.

Table 4.1: List over potential codes and how they could be used when coding patient perceptions of eHealth.

Code	Framework	Description of potential code
Performance	Product Quality	Performance intended to categorise information regarding patient perceptions of the devices used in their care intervention. Comments on the primary function and performance of the device could be collected under this code.
Features	Product Quality	When coded, Features could be used as a code to gather information of patient perceptions on aspects not directly related to the core function of devices but to the secondly and complementary functions.
Reliability	Product Quality	Reliability was interpreted as the patient perceptions of the reliability of the products or device. Perceptions gathered under this code could be comments on failures, breakage, and thoughts regarding the patient assumed reliability of devices.

Continuation of Table 4.1		
Code	**Framework**	**Description**
Conformance	Product Quality	Conformance could be used to gather information regarding patient perceptions that reflects whether a care offering is designed and developed to meet the standards of the patient, and other patients suffering similar illnesses.
Durability	Product Quality	When coded, Durability could be used to gather comments of the expected amount of use patients believe that they can attain of a product before it is no longer possible to use the device as intended or it no longer functions as intended or needed.
Servicability	Product Quality	Serviceability could be used to code patient perceptions focusing on the speed, courtesy, and competence of the people a patient interacts with during the care intervention. Aspects such as the responsiveness and the competence of the caregivers and other personal could also be categorised under this code.
Aesthetics	Product Quality	When used as a code, Aesthetics could be used to categorise all comments on how the devices used in a patients care intervention looks, feels, tastes, and sounds.
Perceived Quality	Product Quality	This code could be used to gather information on patient perceptions of the expected quality of an eHealth solution, before the patients have had a chance to try the solution.
Service Reliability	SERVQUAL	When coded Service Reliability could be used to collect perceptions on the care providers ability to provide service dependably and accurately.
Tangibles	SERVQUAL	Tangibles reflects the environment in which a care delivery takes place, and the tools and equipment used/needed to deliver the service.
Responsiveness	SERVQUAL	The care providers willingness to help patients and to provide prompt service could be represented by Responsiveness.
Assurance	SERVQUAL	Assurance represent the knowledge, courtesy, and trustworthiness of the care provider and employees.
Empathy	SERVQUAL	The patient's perception of receiving individualised attention, the ease of contact, and the provision of caring from the service provider is represented by Empathy.

Continuation of Table 4.1		
Code	**Framework**	**Description**
Perceived Ease of Use	TAM	The patient perceptions of the effort required to use the system. The ease of use could be determined by the complexity of the system and patients' previous knowledge and experience.
Perceived Usefulness	TAM	Perceived Usefulness could be used to collect perceptions on the usefulness of the technology used in a care intervention. If patients perceive a solution to be advantageous, aid or enable them to perform better in their work or everyday life, the technology is useful.
Relative Advantage	Innovation Diffusion	This code could be used to collect perceptions of the relative advantage of an eHealth solution and whether patients perceive that using the solution is advantageous compared to other offerings.
Compatibility	Innovation Diffusion	An eHealth solutions compatibility with the patients needs, values, and past experiences could be coded under Compatibility.
Complexity	Innovation Diffusion	The patient perceived complexity of a care intervention and eHealth solution could be coded under Complexity.
Trialability	Innovation Diffusion	Trialability could reflect patients ability to try the product or service before fully committing to adopt it.
Observability	Innovation Diffusion	Observability could be used to collect patient perceptions of their ability to observe the outcomes and results of others using the eHealth solution.

4.1.2 Presentation of Overlaps and Other Adjustments to the Potential Codes

When the potential codes had been defined an overlap analysis was made to find similarities and correlations between the potential codes. The usage of the potential codes were evaluated and compared with each other by application of pattern matching logic, see Section 2.4. When a potential match between codes was found the codes were analysed in greater detail, and the intentional use of the dimensions from which the codes had been derived from were compared, to determine the nature of the overlap. Four different types of overlaps were possible, no overlap, full overlap, and two types of partial overlaps, as can be seen in Figure 2.3. If some aspects of two codes correlated, or if one code included all the aspects of another code and more, a partial overlap was observed.

In Table 4.2 the overlap analysis can be found. When an overlap was observed the combination of codes received a *O*, and for the cases where no overlap could be found — was given. The black cells were given to combinations of codes where the two codes being compared were the same.

Table 4.2: Illustration of the overlap analysis of the potential codes derived from the literature search. The black cells indicates that no overlap was possible, O was given to a combination of codes where an overlap was found, and — illustrated that the codes compared did not overlap.

Potential Code	Performance	Features	Reliability	Conformance	Durability	Serviceability	Aesthetics	Perceived Quality	Service Reliability	Tangibles	Responsiveness	Assurance	Empathy	Perceived Ease of Use	Perceived Usefulness	Relative Advantage	Compatibility	Complexity	Trialability	Observability
Performance	■	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Features	–	■	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Reliability	–	–	■	–	O	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Conformance	–	–	–	■	–	–	–	–	–	–	–	–	–	–	–	–	O	–	–	–
Durability	–	–	O	–	■	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Servicability	–	–	–	–	–	■	–	–	–	–	O	O	O	–	–	–	–	–	–	–
Aesthetics	–	–	–	–	–	–	■	–	–	–	–	–	–	–	–	–	–	–	–	–
Perceived Quality	–	–	–	–	–	–	–	■	–	–	–	–	–	–	–	–	–	–	–	–
Service Reliability	–	–	–	–	–	–	–	–	■	–	–	–	–	–	–	–	–	–	–	–
Tangibles	–	–	–	–	–	–	–	–	–	■	–	–	–	–	–	–	–	–	–	–
Responsiveness	–	–	–	–	–	O	–	–	–	–	■	–	–	–	–	–	–	–	–	–
Assurance	–	–	–	–	–	O	–	–	–	–	–	■	–	–	–	–	–	–	–	–
Empathy	–	–	–	–	–	O	–	–	–	–	–	–	■	–	–	–	–	–	–	–
Perceived Ease of Use	–	–	–	–	–	–	–	–	–	–	–	–	–	■	–	–	O	O	–	–
Perceived Usefulness	–	–	–	–	–	–	–	–	–	–	–	–	–	–	■	–	–	–	–	–
Relative Advantage	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	■	–	–	–	–
Compatibility	–	–	–	O	–	–	–	–	–	–	–	–	–	O	–	–	■	–	–	–
Complexity	–	–	–	–	–	–	–	–	–	–	–	–	–	O	–	–	–	■	–	–
Trialability	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	■	–
Observability	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	■

From the overlap analysis five overlaps was found, one full overlaps and four partial overlaps. In addition to the overlaps, further adjustments to the codes were made. To better represent the new focus of the codes, and to not confuse the readers, four potential codes were renamed. The label "Perceived" for the two potential

codes derived from the Technology Acceptance Model, TAM, was removed and was renamed Ease of Use and Usefulness, the potential code Perceived Quality from the Product Quality model was renamed to Communicated Quality, and the potential code Tangibles from the SERVQUAL model was renamed to Delivery Environment.

4.1.2.1 Full Overlap between Reliability and Durability

By redefining the two codes to focus on perceived quality, both reliability and durability changes from being primarily objective measures to highly subjective when interpreted into codes. Reliability becomes the customer perception of the probability of a product malfunctioning and durability as a potential code becomes the amount of use patients believe they can attain before a failure. Thus, it was determined that the two codes were highly dependent of each other. Therefore, it was decided to combine the two codes in to one, and name it Product Reliability.

4.1.2.2 Partial Overlap Between Perceived Ease of Use and Compatibility

A partial overlap was identified between the potential code Perceived Ease of Use from TAM and Conformance from Innovation Diffusion. In the Perceived Ease of Use code, one aspect that determines a patient's perception of the effort required to use and to learn the system, are the patient's 'previous knowledge' of similar technology and care solutions. In the Conformance code one aspect, which overlaped with that of the Perceived Ease of Use, was 'past experiences'. In the Conformance code, an eHealth solution must be compatible with past experience to ensure compatibility. In this thesis, previous knowledge and past experiences were believed to be synonyms of each other, and could therefore not be included in multiple codes. When evaluating the importance of each aspect, when determining the patient perceptions of Perceived Ease of Use and Conformance, a patients previous knowledge was deemed of greater importance to the Perceived Ease of Use, than that of the Conformance. Hence, it was decided that the 'past experience' aspect in the Conformance code was redundant, and was removed.

4.1.2.3 Partial Overlap between Conformance and Compatibility

In the Product Quality model, conformance is used to describe the extent to which a products performance and characteristics meet established targets and tolerances. When evaluating patient perception, Conformance could be achieved based on the patient perceptions of the alignment of the product, service, or care, to the needs and requirements of markets and other patients. From the overlap presented above, see Section 4.1.2.2, Compatibility have been altered to no longer include the past experiences of patients. When viewed from a patient perspective, the remaining aspects of Conformance can be seen as the products compatibility with patient needs and ideas. It was therefore concluded that the usages of the two codes correlated to be a partial overlap, as the aspects of the code Compatibility could be identified in the code Conformance. As Compatibility already was altered due to another

overlap, it was decided to remove the overlapping aspects from that code, which lead to the Compatibility code to be eliminated.

4.1.2.4 Partial Overlap between Serviceability, Responsiveness, Assurance, and Empathy

Serviceability as an aspect of evaluation when determining product quality, is used to measure the customer interaction with the provider when a product is malfunctioning. The dimension from the Product Quality model reflects the courtesy and competence of the employees, and the speed in which the customers issues are handled. The characteristics of Serviceability was found to be in line with those in the Responsiveness, Assurance, and Empathy dimensions from the Service Quality framework, SERVQUAL. As mending or servicing a product can be seen as a service, and an overlap was found between the characteristics between Servicability and the codes from the Service Quality framework, it was decided that the Serviceability code was redundant. When coded the Responsiveness, Assurance, and Empathy codes were believed to capture all the information that the Serviceability code would have. It was decided to keep the three dimensions from the Service Quality framework instead of the Servicability code due to that the division of the aspects were believed to be presented more clearly if the aspects were presented individually in the three codes; Responsiveness, Assurance, and Empathy.

4.1.2.5 Partial Overlap between Perceived Ease of Use and Complexity

In the literature Perceived Ease of Use is described to be determined by two aspects, the mental and the physical effort required to use a technology solution. The mental effort could be influenced by a variety of factors such as users previous experience, their cognitive capabilities, and the complexity of the solution. In Innovation Diffusion literature complexity is similarly described as the effort required of a user to understand a product and the effort needed to use it. As both descriptions of complexity are consistent with each other and complexity is one aspect in the Perceived Ease of Use code, it was found unnecessary to have a separate code specifically for complexity. Therefore, the Complexity code was removed.

4.1.2.6 Changes to the Code Names Perceived Ease of Use and Perceived Usefulness

While both Perceived Ease of Use and Perceived Usefulness are referred to as 'Perceived' in TAM, the intention of the coding scheme was that all codes would be based on and evaluate patient perceptions. To refer to these two codes as 'Perceived', when that was the intention of all the codes was seen as inconsistent and could confuse readers regarding the use of the codes. Therefore, the codes were renamed Ease of Use and Usefulness.

4.1.2.7 Changes to the Code Name Perceived Quality

Based on the literature on Product Quality, Perceived Quality is a code that could be used to determine what perceptions patients have of the quality of a product or service before they use it. The name of this code was found to be ambiguous and it was believed that the name of the code could create confusion regarding the use of the code. Hence the code was renamed to Communicated Quality, which was believed to communicate the intended use of the code more clearly.

4.1.2.8 Changes to the Code Name Tangibles

The potential code Tangibles refers to the environment in which a care delivery takes place, and the tangible aspects in that environment. The code name Tangibles were believed to potentially confuse readers of the usage of the code. Therefore, the code was renamed to Delivery Environment which is believed to more clearly communicate the purpose and the usage of the code.

4.2 The Developed Coding Scheme

From the literature search 20 codes were derived and redefined to focus on patient perceptions. After the overlap analysis and the overlaps had been resolved, 16 potential codes remained. These formed the basis of the coding scheme which this thesis aimed to develop to answer the first research question, see Section 1.3.1. The collected list of codes which was intended to be used to analyse patient perceptions can be found in Table 4.3 below, in no chronological order.

Table 4.3: The coding scheme aimed to be developed to answer the first research question, which were developed of the codes that remained after the overlap analysis.

#	**Code**
1	Performance
2	Features
3	Aesthetics
4	Product Reliability
5	Ease of Use
6	Usefulness
7	Conformance
8	Responsiveness
9	Assurance
10	Empathy
11	Service Reliability
12	Delivery Environment
13	Trialability
14	Observability
15	Relative Advantage
16	Communicated Quality

A more comprehensive version of the coding scheme, which includes the names of the codes, from which frameworks they were derived from, and a more detailed description of the usages of the codes can be found in Appendix A

5

Patient Perceptions found in the DECI Project.

The second research question which this thesis aimed to answer concerned patient perceptions of eHealth, and can be found in Section 1.3.1. The aim of the research question was to investigate whether the created coding scheme could be used to capture and categorise patient perceptions. Specifically, the second research question aspired to explore if the coding scheme could be used to answer the following two questions:

Does patients perceive the eHealth solution to provide good care?
While an eHealth solution may have proven clinical benefits, it is important to take the patients opinions into consideration when developing care offerings. By ensuring that the users believe that a eHealth solution fulfil their care needs, while not experiencing an exhaustive effort needed to use the system, a greater rate of adoption may be achieved. By assessing patients' perceptions on the care that they are receiving, it was believed to answer whether the patients believe that their care needs were taken care of, and that they were satisfied with the eHealth solution.

Can any indications of future use be derived from the patient perceptions?
As for most innovations, when developing new offerings it could be of great use to evaluate potential users opinions on the offering, and their indications of using the product in the future, if it would become available to them. For care interventions and eHealth solutions it could be importance to investigate potential users intentions of use and whether they could consider adopting a solution into their lifestyle, as it could greatly impact the outcome of care interventions if patients are inclined to follow their care plans.

To test the coding scheme and to evaluate whether it could be used to answer the two questions above, it was used to evaluate the patient perceptions of patients in the DECI project, described in greater detail in Section 2.2.1. In the project, several interviews were made which constituted the basis of the test of the coding scheme. The interview transcripts were reviewed and the patients answers were evaluated based on the codes in the coding scheme, see Table 4.3.

For the specific case of the DECI project some considerations regarding the coding needed to be made as the case setting, see Section 2.2.1, made some of the codes inapplicable. DECI was a research project where the patients that are selected have

never experienced any similar care intervention for their cognitive condition. The codes #13 Trialability, #14 Observability, and #16 Perceived Quality were not used in the evaluation of the patient interviews as the isolated research setting did not allow the patients to either observe or try the eHealth solution before making a commitment to use it, nor were the patients able to create an opinion based on marketing efforts or other communication material before entering the project.

Another adjustment that was made was the exclusion of #2 Features. Based on the authors knowledge of the DECI project and its solutions, the distinction between primary and secondary functions was considered to fine and hard to determine when coding the patient perceptions. Therefore, the decision to exclude the code was made.

5.1 Patient Demographics

This analysis was made based on the entire data set, which consisted of 55 interviews. The following section contains a short presentation of the demographics of the patients, such as the nationality, gender, intervention group distribution, and average age in the pilot projects.

Of the 55 interviews the majority of the patients were Italian, 29 Italian patients partook in the interviews, 13 patients were Swedish, 11 patients were Israeli, and 2 were Spanish, see Figure 5.1 for graphical representation.

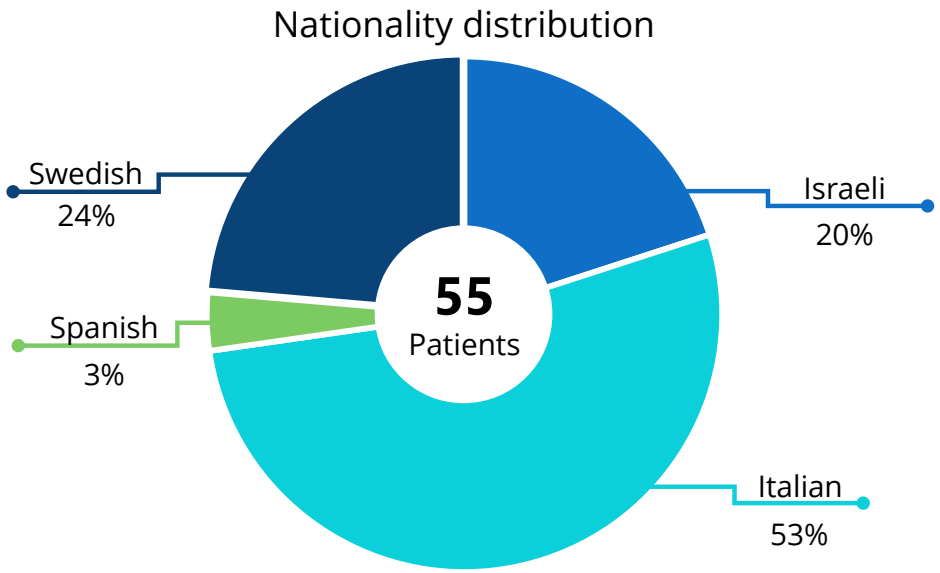


Figure 5.1: The nationality distribution of the patients interviewed in the DECI project.

Out of the 55 patients interviewed, 26 were male and 29 were female, see figure 5.2.

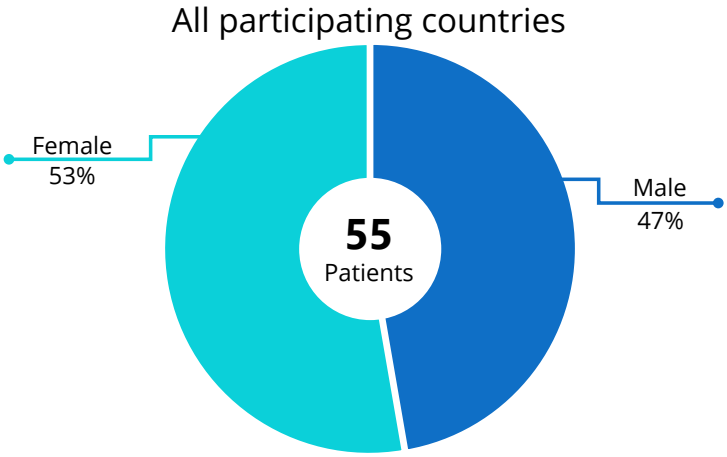


Figure 5.2: Gender distribution of all patients interviewed in the DECI project.

The gender distribution for each respective country can be seen below. The distribution of the Israeli patients were 4 males and 7 females, for the Italian patents, 13 male and 16 females, the distribution of Spanish patients were 1 male and 1 female, and lastly, of the Swedish patients 8 were males and 5 female, see Figure 5.3.

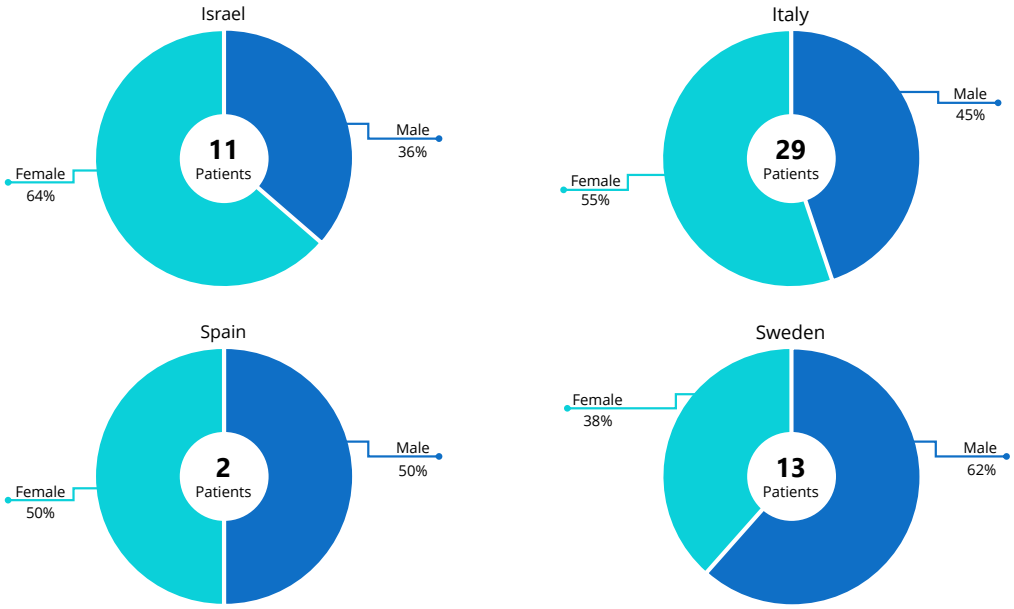


Figure 5.3: Gender distribution of the patients interviewed in the DECI project for all participating countries.

The combined average age of all patients that were interviewed was 77 years old. The average age for the male and female patients were 78 and 76 years old respectively. The following figure show the average age for the patients from each participating country, and of the male and female patients from each country, see Figure 5.4.

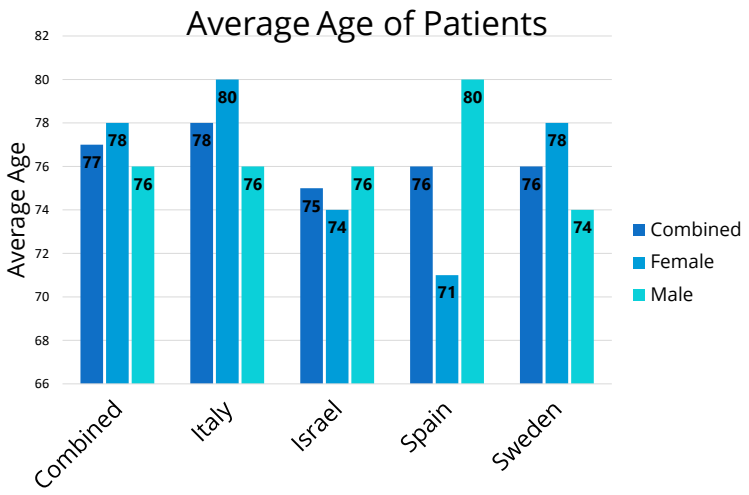


Figure 5.4: The average age of the participating patients divided over nationality and gender.

The patients in the DECI project were divided in to four different intervention groups; the Control Group, Intervention Group 1, Intervention Group 2, and Intervention Group 2+. The intervention group determined the extent of the patients care intervention and their access to the developed technology. For a greater description on the extent of the care in each intervention group, see Section 2.2.1.

The figure below shows the distribution of the patients in each intervention group for the entire group of patients, regardless of nationality, see Figure 5.5.

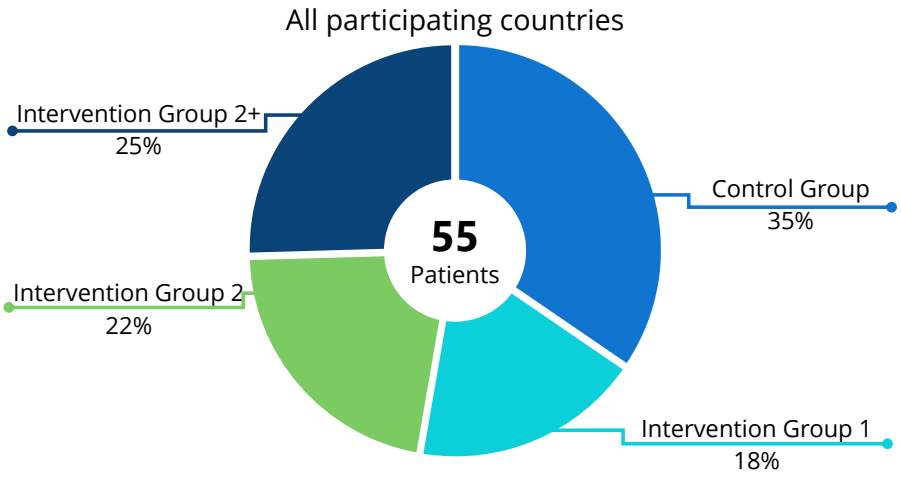


Figure 5.5: The patient distribution in the four different intervention groups in the DECI project.

The following figure shows the distribution of patients for each participating country respectively, see Figure 5.6:

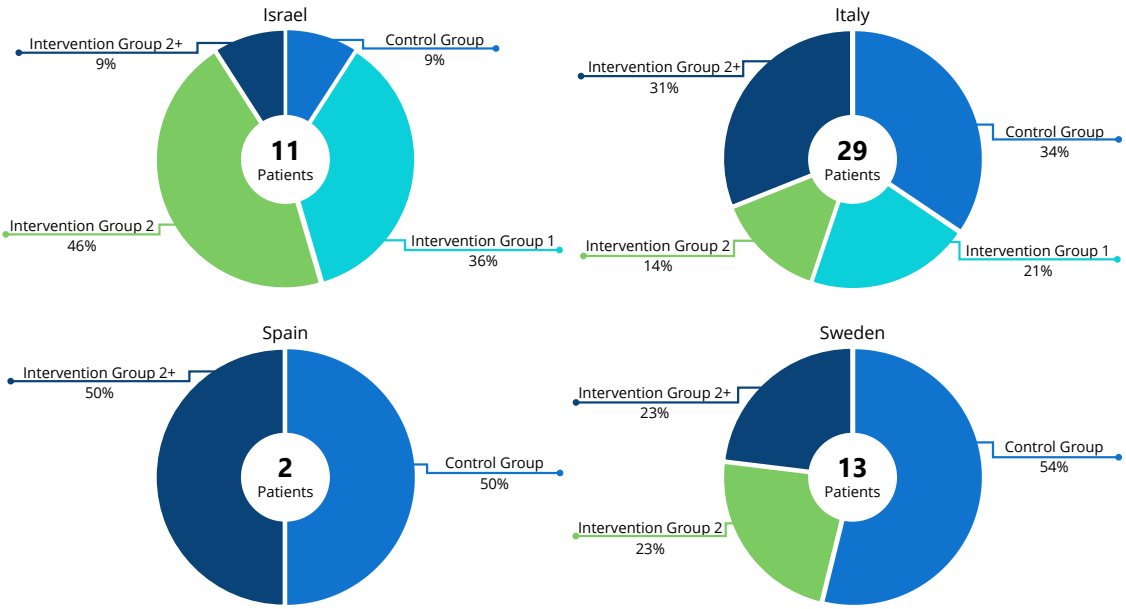


Figure 5.6: The patient distribution in the four intervention groups depending on the patients nationality.

5.2 Perceptions of eHealth by Elderly Patients in the DECI Project with MCI or MD

From the coded interviews some pattern and themes could be identified. As the offerings varied depending on the intervention group, so did topics on which the patients interviewed focused on, and in turn the answers that was received. In addition to the variety of offerings available to the patients depending on their selected intervention group, some national differences between the participating countries also existed.

The following section aims to present the patients perceptions on eHealth and the care they received in the DECI project which was found through the use of the coding scheme. The codes used to categorise perceptions is referred to as # *code number*, *code name*, i.e. #9 Assurance. In Appendix B, a collected list of the occurrence of each code depending on the intervention group and nationality of the patients can be found.

In general the patients interviewed in the DECI project perceived the professionals that they encountered in the project to be knowledgeable and professional and that the caregivers granted them individual attention. The perceptions on the part of the DECI solution that included cognitive and physical exercises were divided. Some patients preferred cognitive exercises before physical, and others the opposite, the patients did however generally perceives both exercise types as useful. Both exercises were carried out on a tablet. The perceptions of the tablet primarily targeted issues with its performance and the difficulty to use the tablet.

The tablet also contained a communication function which was hardly mentioned by any patient during the interviews. The activity band which was given to the patients in Intervention Group 2+ received a lot of comments which focused primarily on the size of the device. Several patients expressed that it was too large and one patient also perceived the watch as to youthful looking.

A collection of the occurrence of codes which were found in the analysis of the patient perceptions for each intervention group and nationality can be found in Table B.1, in Appendix B.

5.2.1 Perceptions of the Control Group

As the offerings varied depending on the nationality of the patient the themes which the different patients were discussing varied as well. The patients in the Control Group did not receive any technology from the DECI project, therefore the patients could not have any comments on the eHealth solutions. Thus, the perceptions presented below are not formulated based on the eHealth solutions developed in the DECI project, but the care specific to the patients country of origin and their cognitive health. In the following table, Table 5.1, the number of patients in the Control Group from each participating country is presented.

Table 5.1: The distribution of patients in the Control Group depending on the patients nationality.

Nationality	**Combined**	**Israeli**	**Italian**	**Spain**	**Swedish**
Number of patients	19	1	10	1	7

The control group put a large emphasis on the people they encountered during their time in the project. The patients commented on the professional caregivers knowledge and competence and that they believed that they were receiving good care, #9 Assurance. Patients also expressed an appreciation to the caregivers kindness and helpfulness, and perceived that the doctors showed an interest in the patients wellbeing. The patients also commented in the caregivers ability to adjust the care and communication to the patients, such as making the patients feel prioritised and to speak in a language the patients could understand, #2 Empathy.

When asked what the patients liked less in the project the patients generally felt that they had nothing to criticise in regards to the care they received. Although, Italian patients expressed a dislike towards the fact that they had to pay for their treatments, but did not specify whether it was specifically the treatments they received in relation to their cognitive condition or in general.The Italian patients also criticised the waiting times between a request for a care appointment and the visit.

In addition to the themes presented above Swedish patients the project focused on the fact that they did not have to go to the hospital to meat their professional caregivers, but due to the mobility of the care team, could receive care in their homes. This aspect of the care the Swedish patients in the control group put a large emphasis on. Patients expressed that the possibility to sit down at their own kitchen table made them calmer, and that the care they received from the mobile care professionals felt more relaxed.

In the Control Group there was only one patient from Israel and Spain. The Spanish patient was positive to the care that the patient had received and liked all aspects of it. In contrast, the patient from Israel expressed that: 'I did not receive any care'. Thus the perceptions expressed in this section can not be assumed to represent the care received in Israel or Spain for patients with MCI or MD to the same extent as it represents the care the patients in Italy and Sweden received.

The table presented below presents the number of perceptions coded, dependent on the nationality of the patients for the patients in the Control Group , see Table 5.2.

Table 5.2: The occurrence of codes in the analysis of the patient perceptions of the patients in the Control Group.

#	**Code**	**Combined**	**Israeli**	**Italian**	**Spain**	**Swedish**
6	Usefulness	1	0	0	0	1
7	Conformance	5	0	0	0	5
8	Responsiveness	3	0	3	0	0
9	Assurance	8	0	7	0	1
10	Empathy	10	0	7	0	3
11	Service Reliability	1	0	0	0	1
12	Delivery Environment	3	0	0	0	3

The patients were generally positive to the care they received but only one Italian patient expressed any indication of future use. The patient expressed that, when asked what the patient liked less in the care that he had received; 'It's a difficult answer because about health something you have to do necessarily'. From the quote it can be derived that care is not always something voluntary, but might be a necessity for continued wellbeing or survival. In the Control Group one patient expressed an improvement to the care that the patient had received. The patient felt that a time plan was missing for the care the patient received. The time plan, the patient explained, could be a mean to prepare for treatments and to get an overview of the care interventions that a patient would be experiencing during the year.

5.2.2 Perceptions of Intervention Group 1

Intervention Group 1 received a portion of the DECI solution, namely the integrated care platform and care coordination by a case manager. Thus, the perceptions presented in this section are focusing on those aspects of the DECI solution. The intervention group did not contain any patients from Spain or Sweden, the perceptions presented in this section should therefore be seen as exclusive to the Israeli and Italian patients. The number of patients in Intervention Group 1 from each participating country are presented in Table 5.3.

Table 5.3: The distribution of patients in Intervention Group 1 depending on the patients nationality.

Nationality	**Combined**	**Israeli**	**Italian**	**Spanish**	**Swedish**
Number of patients	10	4	6	0	0

Unlike the patients in the Control Group, the majority of the patients in Intervention Group 1 received a tablet, containing the integrated care platform. The patients in Intervention Group 1 did not have unified perceptions of the effort needed to use the tablet, #5 Ease of Use. One patient expressed that the difficulty in using the tablet led to that the patient 'gave up' and did not use it as directed. Some patients required the aid of a family member to use or to learn the system successfully. The Israeli patients were in general more positive towards the tablet, than Italian patients, of which several expressed a difficulty in using and learning the system. One Italian patient expressed that the difficulty in using the system, and the fear of making mistakes made the patient not wanting to use the system, during the pilot or in the future.

Regarding the DECI solutions the patients did not perceive the solutions they received as sufficient for them to choose to continue to use the DECI system in the future. The Israeli patients did however expressed a desire to continue with the system, if it would include cognitive exercises. In addition to the integrated care platform many of the Israeli patients used the tablet to play games, that they had found themselves, which they believed were to aid their cognitive health status. If the platform would include similar games, specifically games that would provided feedback and showed patients their progress, the Israeli patients could consider using the tablet.

Similarly to the patients in the Control Group, the patients in Intervention Group 1 put large emphasis on the kindness of the professional caregivers they encountered in the project, reflecting aspects in the code, #9 Assurance. However, this was only expressed by the Italian patients. Italian patients also expressed dislike towards the fact that they had to pay for their treatments, but did not specify whether this perception was exclusive the treatments they received in relation to the DECI project or in general.

Below is a table of the codes which was coded for the patients in the Control Group dependent on the nationality of the patients, see Table 5.4.

Table 5.4: The occurrence of codes found when analysing the patient perceptions of the participants in Intervention Group 1.

#	Code	Combined	Israeli	Italian	Spain	Swedish
5	Ease of Use	9	3	6	0	0
6	Usefulness	1	0	1	0	0
8	Responsiveness	1	0	1	0	0
9	Assurance	6	0	6	0	0
15	Relative Advantage	1	0	1	0	0

5.2.3 Perceptions of Intervention Group 2

The patients in the second intervention group received a larger section of the DECI solution than the two groups presented above. Thus, the patients had more perceptions on the technology than the previously described group. The perceptions in the following section are derived from interviews from three of the participating countries. A more detailed presentation of the distribution of the number of interviews analysed for each country can be found in Table 5.5 below. As can be seen in the table, there were no participants from Spain in this intervention group, consequentially no conclusions could be made regarding the perceptions of the Spanish patients in Intervention Group 1.

Table 5.5: The distribution of patients in Intervention Group 2 depending on the patients nationality

Nationality	Combined	Israeli	Italian	Spanish	Swedish
Number of patients	12	5	4	0	3

Similarly to Intervention Group 1 and the Control Group, the patients in Intervention Group 2 expressed their appreciation for the caregivers knowledge and expertise, and their ability to use a language when communicating with the patients that allowed them to understand without making them feel patronise,#9 Assurance and #10 Empathy. The aspect which dominated the perceptions of Intervention Group 2 however, were the exercises that the patients received.

In addition to the integrated care platform and case manager offered to the patients in Intervention Group 1, Intervention Group 2 also received cognitive and physical exercises to do by the use of the tablet distributed in in the project. Regarding the exercises patients had different experiences and opinions. Some preferred the cognitive exercises, while others found greater use of the physical. The patients that was positive towards the cognitive exercise perceived them as a tool which helped them to feel better and that their cognitive abilities increased though the use of the exercises, #6 Usefulness. The patients which were positive towards the physical exercises declared an improvement in both balance and agility, #6 Usefulness.

But some patients had feedback on the design of the exercises, such as a difficulty to understand how to perform some exercises and a lack of feedback on whether the patients are performing the physical exercises correctly or not, #5 Ease of Use.
The patients also expressed a frustration with the difficulty of the exercises, both physical and cognitive, and patients felt that they did not fit their cognitive of physical level. Some patients perceived the exercises to be too difficult while others felt they were too simple, #7 Conformance. Some patients felt that the the exercises were so easy that they did not feel a purpose of doing them, #6 Usefulness.

Patients from all the interviewed nations expressed issues with using the system because they could not access the platform and the different functions within, # 4 Product Reliability. Patients also expressed difficulties with the interface of the system and explained that they had to have aid in managing the system, even if they managed the cognitive exercises alone, # 5 Ease of Use. Both the Israeli and the Swedish patients expressed an issue with the buttons in the tablet, #1 Performance. According to the patients they did not function properly and were not sensitive enough. The Swedish patients put a large emphasis on the performance of the tablet. in addition to the issues with the buttons, other software issues that the patients commented on were the language used in the exercises. They also commented that the translation of certain words did not make sense in some exercises and made the comprehension of the exercise difficult.

In contrast to the Control Group and Intervention group 1, the patients in Intervention Group 2 commented on the relative advantage of the DECI solution. One Swedish patients commented on the advantage of using a tablet instead of written instructions when explaining an exercise, #15 Relative advantage. One Swedish patient also compared the DECI solution to other care they had previously received outside of the DECI project and explained that the process of having physician travelling to patients, which was exclusive only to the Swedish participants in the DECI project, was useful and appreciated, as that meant that patients did not have to go to a hospitals or care facilities themselves, #12 Delivery Environment. One Italian patients commented that the use of the tablet enabled him or her to save time as the patient did not have to interact with another human, #15 Relative Advantage.

In the table below the collective codes which was coded for the interviews of the patients in Intervention Group 2 based on the developed coding scheme, see Table 5.6

Table 5.6: The occurrence of codes found when analysing the patient perceptions of the participants in Intervention Group 2.

#	Code	Combined	Israeli	Italian	Spain	Swedish
1	Performance	9	1	1	0	7
4	Product Reliability	7	3	1	0	3
5	Ease of Use	20	4	4	0	12
6	Usefulness	17	2	7	0	8
7	Conformance	21	3	6	0	12
8	Responsiveness	1	0	1	0	0
9	Assurance	5	0	3	0	2
10	Empathy	9	0	5	0	4
12	Delivery Environment	3	0	0	0	3
15	Relative Advantage	4	0	2	0	2

5.2.4 Perceptions of Intervention Group 2+

The group that received the entire eHealth solution developed in the DECI project was Intervention group 2+. In addition to the technology offered to the patients in Intervention Group 2 and Intervention Group 1, this group also received an activity band to monitor and track the patients' daily activity in their homes. Consequentially, this group had a greater number of comments regarding product quality and functionality than the other groups. The distribution of patients in Intervention Group 2+ from each participating country is represented below in Table 5.7.

Table 5.7: The distribution of patients in Intervention Group 2+ depending on the patients nationality.

Nationality	Combined	Israeli	Italian	Spanish	Swedish
Number of patients	14	1	9	1	3

In the interviews with the patients in Intervention Group 2+ the technical aspects of the solution dominated the perceptions. The patients commented on the tablet and the software, which was not as easy to use as they preferred, #5 Ease of Use. Patients stated that the instructions were tricky to follow and that the touchscreen was not functioning as well as on other devices the patients had previously used, to the extent that patients became aggravated when the tabled did not respond to their instructions, #1 Performance. Several users also describe that they had to use the aid of family members to use the system, especially in the beginning of the project, #5 Ease of Use.

The cognitive and physical exercises did not receive as much focus in the interviews with the patients in Intervention Group 2+ as in Intervention Group 2. The patients did however share the conflicting perceptions of what exercises they preferred. While some preferred the cognitive, others preferred the physical exercises, and some patients did not find the exercises useful at all, often due that they did not find the

exercises challenging enough, #7 Conformance. Some patients expressed that the level on which the exercises were at were suited to patients which had more severe cognitive decline. Similarly to patients in Intervention Group 2 the patients in this intervention group stated that the mental exercises helped them stay focused and the physical exercises helped them feel better, #6 Usefulness. One patient commented that the cognitive exercises 'helped me in making connections and paying attention to details' and 'I started paying more attention to details'. Patients also commented positively on the diversity of the exercises.

A large focus of the interviews with the patients in Intervention Group 2+ related to the activity band they were given. The comments mainly concerned the aesthetics of the device, #3 Aesthetics. Although, patients from all nationalities commented on the aesthetics of the activity band, it Italian patients were the ones that emphasised the aesthetics the most. The majority of comments on the activity band were on the size of the device which was consistently perceived as to large, and bulky. Patients also commented on the compatibility of the device and its functionality. One patient expressed confusion regarding the description of the device as a 'watch'. Patients also had issues perceiving the device as a watch as it did not show any information to the wearer, #6 Usefulness.

Despite the perceived difficulties with operating the tablet and the size of the monitoring device, the majority of the patients expressed a desire to use the system in the future. Some patients highlighted an increased willingness if the issues were to be resolved, but generally they believed that the health benefits they obtained by using the system compensated for the systems shortcomings.

In Intervention Group 2+ there were few aspects that differentiated between the patients from the different countries that partook in the DECI project. As the patients in the other intervention groups however, the Swedish patients in Intervention Group 2+ commented on the mobile care team that provided the patients with care in their own homes and allowed them to receive care without needing to travel to a care facility. The patients was positive towards the change and stated that it was less stressful for them.

The patients in Intervention Group 2+ discussed similar themes as the patients in the other intervention groups. The Italian and the Swedish participants in Intervention Group 2+ expressed their perceptions of the professional caregivers, and their appreciation to the caregivers competence and skills, and the kindness they were shown during the project, #9 Assurance and #10 Empathy.
The codes used to analyse the patient perceptions of the patients in Intervention Group 2, and thier occurances, can be seen in Table 5.8.

Table 5.8: The occurrence of codes found when analysing the patient perceptions of the participants in Intervention Group 2+

#	Code	Combined	Israeli	Italian	Spain	Swedish
1	Performance	5	0	1	0	4
3	Aesthetics	17	0	12	2	3
4	Product Reliability	6	1	0	1	4
5	Ease of Use	19	3	9	1	6
6	Usefulness	24	2	16	0	6
7	Conformance	28	2	14	5	7
8	Responsiveness	2	0	2	0	0
9	Assurance	6	0	6	0	2
10	Empathy	6	0	5	0	1
12	Delivery Environment	1	0	1	0	0
15	Relative Advantage	2	0	1	1	0

5.3 Lessons Learned from Applying the Coding Scheme

From the application of the coding scheme on the patient perceptions collected in the DECI project, a number of learnings could be identified, these are shortly presented below. These learnings elaborate on whether the developed tool could be used to determine if an eHealth solution can be perceived to provide good care, and if any indications of future use can be identified. This section aims to answer the second research question, see Section 2.2.

By applying the analytical model to perceptions of an eHealth solution, comprised of several elements and with various intervention designs, it was seen that individuals had different perceptions depending on the extent of the received solution. The authors of this thesis, believed that it was not possible to draw any conclusions on the distribution of the used codes in the different intervention groups, for two reasons. If a device is provided as a part of a care provision, it may be the focus of the perceptions rather than other care elements. This, due to that it can be easier to talk about something tangible than something intangible, such as the interaction with caregivers. Thus, devices can be seen as distractions when evaluating intangible elements in care. The second aspect of the focus of perceptions on devices may be the dynamic nature of expectations. As new solutions are provided in care, the patients expectations evolve. According to the KANO model (Bergman & Klefsjö 2010), basic needs are not explicit. Thus, it may be assumed that the patients that have previously received more substantial interventions have evolved expectations of care, in contrast to patients that have received regular care.

In the process of applying the analytical model it was found that the research setting constituted a limitation which hindered the capability of the model to be fully tested. The quality of the information in the transcripts and recordings became a considerable limitation, as many answers were short or incomprehensible, and thus, unable to be assigned a code. On several occasions the patients expressed short statements of satisfaction with the eHealth solution, however the developed analytical model was unable to include short statements such as 'Yes, satisfied' in a successful way. Some patients stated that they did not like the activity band, and unless they stated why they disliked the activity band, the data could not be coded. To apply a qualitative assessment model qualitative data is required, but the empirical data collected in the research setting of the DECI project was often more quantitative in nature.

When empirically testing the analytical model there were several indications that the model helped identify the occurrences of themes that were related to if the tested eHealth solution were perceived as good at providing care and indications of future use.

Satisfaction and acceptance were considered to be closely intertwined with what the patients perceive as good care. A group or an individual's satisfaction or acceptance can be related to a variety of aspects of the received care, depending on how a patient perceive his or her needs. Thus it was difficult to single out codes that independently could explain what was perceived as good care. The main driver for acceptance has been discussed in literature. In TAM it is argued that an innovation that is perceived to be unnecessary, is unlikely to be accepted by potential users (Davis 1989). Similar reasoning is used in the Diffusion of innovation framework by Rogers (2003). In the testing of the analytical model, several care elements that were deemed unnecessary by patients, primarily coded under usefulness, were found. This implies that the developed analytical model can be used to determine indications that patients perceive that the care interventions are good care.

Acceptance and satisfaction alone were not presumed to predict the diffusion of an eHealth solution. Despite if patient perceptions regarding a solution are positive, other factors likewise affect the diffusion of the innovation, factors such as how easy the solution is to use. Ease of Use represents how much effort patients need to put in to using and learning how to use a system. Quality aspects of service or product elements may cause the innovation to be perceived as hard to use. In addition, personal aspects, see 3.1, were also believed to inhibit an individual's adoption of an innovation successfully. It was observed that in the developed model Ease of Use became a generic term for personal aspects. In the testing of the analyical model difficulties in using the eHealth solution were found to relate to both quality and personal aspects, which implied that the model could aid in predicting the future use of innovations.

The developed analytical model indicated potential in assessing patient perceptions for an eHealth solution, and the coding scheme managed to help assess how an eHealth innovation can be perceived by patients. However, due to insufficient empirical testing, there is a need for further testing and development of the model.

6

Ethical Aspects of the Conducted Research and the DECI Project

ICT in care offers great potential in solving the care related issues that are impending on our societies. However, from an ethical standpoint patients opinions should be accounted for in the development of the care provisions, to ensure that the care not only meets societal needs, but the needs of patients as well. Therefore it could be argued that understanding how patients perceive eHealth solutions is of great importance in the development process, to assure that the solutions are aligned with the users' values and perceived needs.

An ethical issue that was found to be widely discussed by practitioners in the eHealth research field, was that of data handling, as patient data that is collected in digital form could become accessible to a larger number of people. Monitoring adds another dimension to this issue, since the collected data could be of a more detailed nature. Extencive data collection and analysis of patient data could give a much more comprehensive insight into a persons health, but it could also be perceived as intruding on patients' privacy. Thus, it could be argued that there is a need to set up clear guidelines on how patient data should be collected and stored.

Since this research was conducted in parallel to the DECI project, and the empirical data was collected from patients with MD and MCI, some context specific ethical aspects of the research were contemplated. The ethical issues that have been revised in detail by DECI are informed consent and sensitive data protection. The participants in the DECI project were considered to have given informed consent, at the start of their pilot, as it was an inclusion criteria for the participating patients. It was recognised that a patient's illness could progress throughout the pilots, and the informed consent could be compromised. Therefore, an ethical board was enlisted to decide on continuance of participation for the patients which cognitive health became more severe during their participation in the project. To assure that the collected patient data was handled in a secure manner, DECI followed specific directives developed by the EU.

The DECI project was responsible for the welfare of their participants, and thus it was decided that the authors of this thesis would receive anonymous transcripts and recordings with demographic data attachments. It was also decided that the practitioners who conducted the interviews were able to avert an interview if it was in the patients best interest. Actions that were taken to ensure an ethically appropriate

handling of the patient data, included ensuring that data was not distorted, and the participants words were kept in its true context.

7
Discussion

In this section the developed analytic model will be discussed, elaborating on the benefits of applying it, as well as its shortcomings. What aspects of it that could be improved and further validated will also be suggested. Lastly, a discussion on how some methodological proceedings may have affected the results are presented.

7.1 What Benefits Could be Found of Applying of the Analytical Model

The result presented in Section 5.3 show indications that the coding scheme may be used to increase understanding of whether an eHealth solution can be perceived as providing good care. It has potential to aid the process of identifying what elements in a care provision that a patient group find especially important, and which aspects of the care that are perceived less important.

When developing the coding scheme, the authors chose to construct it based on well supported theory, only incorporating assessment tools and models that have been widely accepted and validated in literature. By using pattern matching logic, it was assumed that the codes in the developed coding scheme could utilise the support from the original models and tools, on which it was built. This was found to be successful to some extent in the setting the model was tested. The analytical model was found to provide insights in patients acceptance and satisfaction of the provided eHealth solution. Additionally, there are some factors in the analytical model which could be used to help predict future intentions of use. These factors stem from frameworks and models used to determine acceptance levels, which in itself was not presumed synonymous with intention of future use, but it was believed that it could be used as indication of the patients future use.

Perceptions that focused on the patients understanding of the purpose of the solution, and its usefulness for patients were coded under the code #6 Usefulness. In the analysis of the patient perceptions it was found that patients that did not understand the purpose of the provided care and eHealth solution were less keen to use it, or stopped using it during the pilots. This indicated that by ensuring that patients perceive a care provision as useful the likelihood that patients follow their assigned care plans can increase, which can ease the pressure on current care systems.

The importance of the effort needed to use and learn how to use a device have been extensively described in literature (Davis 1989; Rogers 2003). The code #5 Ease of Use was found to capture the perceptions of the effort needed by the patients to use the developed DECI solution. Based on the analysis of the patient perceptions it could be determined that patients that were unable to operate the provided technology were less keen to use the solution, or to adopt it in the future. Which are inline with the reasoning argued in literature.

Other codes that were found unambiguous and clear to be use, while capturing the patient perceptions successfully were the codes #3 Aesthetics, #9 Assurance, and #10 Empathy. All the codes mentioned in this section were believed to be sufficiently developed to capture the perceptions for which they were developed, and could be excluded in any future improvement processes.

7.2 Identified Shortcomings of the Analytical Model

The analytical model was developed to assess interview data, and thus its suitability for other types of qualitative data, such as observations, have not been tested. For an eHealth solution to be perceived to be used to successfully deliver good care the care needs of the patients which will use the solution, must be understood and met to an acceptable degree. As the care needs of patients are not solemnly explicit, care providers and caregivers may not be aware of some care needs which patients are expected to be fulfilled by a solution, until the patient express that these implicit needs are not fulfilled.

Due to the nature of the transcripts which were analysed when the analytical model was tested a substantial portion of data was uncoded. Short interview answers that did not comprehensively present the patient perceptions were not able to be coded. Which limited the conclusions which could be derived from the data sample.

The developed scheme provided limited insight of indications of future use. The included theories provided indications of perceived quality of various aspects of the eHelath solution, and it was concluded that the developed analytical model could provide a holistic view of the perceived quality of a solution. The model was also found to be able to be used to investigates how willing patients are to accept new technology and innovations. However, Rogers (2003) suggest that incentives may play a considerable part in adoption behaviour. The analysical model does not include any code which capture the incentives of the patients in to consideration. The incentives that patients could perceived could be that the provided eHelath solution could aid them in maintain their current wellbeing or slow the progression of their illnesses and deceases. Continuously, whether the incentives to use a solution would be enough to make patients adopt a solution can not be analysed by the use of the analytical model.

7.3 Suggestions to Improve the developed Analytical Model

Regardles of what improvements that are made to the analyticalmodel, it is critical that when an improvement to the coding scheme have been developed, the new coding scheme is tested in the specific context of eHealth.

By incorporating additional theory on consumer and user behaviour, the analytical tool could become more suitable to analyse patient perceptions and indications of future use. It could also be beneficial to incorporate theory on what drives the incentives of the patients to use a solution in the future.

As presented in the previous section, see Section 7.2, the interview transcripts, in which patient perceptions were gathered, were critical to the analysis as the data collected determined the success of the analysis. Thus, it is suggested that a clear framework on how to perform interviews to ensure the collection of sufficient amount data should be created.

7.4 Aspects in the Research Methodology that Affected the Developed Analytical Model

Although efforts were made to include a substantial part of the available research papers on acceptance of various eHealth applications, some may not have been identified due to selected search phrases.

Due to the chosen research strategy for the literature search, to overcome issues related to research field definitions, the findings may be biased to the interests of the authors of this thesis. It was assumed that a systematic approach in a research environment which were lacking a clear definitions would obstruct a broader perspective of intertwining research fields. A consequence of the unstructured literature search could be that acknowledged models in perception theory were missed.

It was decided to treat eHealth solutions as one entity, due to the integrated structure of the elements; for instance, ICT cannot be provided without a device. However, literature has directed criticism toward generic models, and a trend to move towards more context specific models could be identified. Due to lack of literary support of validated evaluation frameworks for eHealth, this thesis applied an approach to develop a model based on generic frameworks.

This thesis aimed to develop an assessment model for innovative eHealth solutions, to help decrease the uncertainty regarding patients acceptance and intentions of future use, of such solutions. This was done by combining various perception theories for customer, consumers, users, and patients. Literature suggested that a deductive top down approach would be an efficient method for evaluating eHealth solutions,

and by using an abductive approach, and pattern matching methodology, a coding scheme was developed.

As described in Section 5.3, the empirical data available for analysis greatly influence the conclusions that could be drawn regarding the patient perceptions. Thus, it could be argued that the interviewer and the process of collecting the patient perceptions are of great importance for the use of the coding scheme. Equivalently, the questions asked, and the manner in which they are asked, could determine what areas patients focus on when presenting their perceptions. If questions solemnly focus on one area of an eHealth solutions, patients will most likely focus on that area and the perceptions gathered will not be represent the entire solution.
IN addition the language used by interviewers are important as could be observed in the patient perceptions of the DECI project. Patients from Intervention Group 2+ had many complaints about the activity band, which was referred to as 'the watch' by both interviewers and interviewees. The referral to 'the watch' could have affected how the device was perceived by the users, as the basic functions and attributes of a watch may have been expected, but not received. This is further indicating that the data collection process influence the data, and that interviewers perceptions may have been conveyed into the interviewees' answers.

The developed coding scheme has been applied on a limited sample of patients suffering from MCI and MD, which may have limited the testing process. Patients with cognitive impairment sometimes presents limited capabilities in forming perceptions. It was observed that the patients in the semi-structured interviews tended to answer in very short sentences. The authors of this thesis can only speculate as to what underlying reasons that might have influenced the patients to answer in this manner. It could be that questions were poorly formulated, that the illness prohibited the interviewees to answer more elaborately, or that the interviewing conditions were restricting. The consequences of the poor empirical data sample is that the developed model could not be fully tested.

8

Conclusion

As expressed in the introduction, a major societal challenge that must be solved is how to provide care to a growing number of people. eHealth enables solutions that are perceived as effective and cost efficient. eHealth is not a new concept as it has been researched since 1990, but is yet to be widely used in care interventions, which implies that there are issues in the diffusion of eHealth solutions. It is suggested that the primary issue regarding adoption of eHealth solutions is that there are limited ways to effectively evaluate the effectiveness of eHealth solutions. Thus, this thesis set out to develop a deductive analytical model to be used to evaluate if patients perceived eHealth solutions to deliver good care and to identify indications of future use.

The analytical model that was developed and tested in this thesis provides a solution for healthcare providers to use when developing and evaluating eHealth solutions, to increase the likelihood for successful adoption of the solutions. In the model factors that account for satisfaction, acceptance, and facilitators of diffusion are included. However, the developed model is yet to be tested and validated in various settings. Due to the restrictions in the research setting in which the patient perceptions were collected, and in which the model was applied, it was difficult to draw any conclusions regarding its functionality without further testing. The analytical model was found insufficiently tested to be able to be used to make any validated predictions regarding patients' indications of future use and diffusion patterns. Nevertheless, some indications of the analytical model's usefulness could be concluded. The model was found to be used to perform quantitative analysis on qualitative data and was found to help increase understanding on patient perceptions of eHealth solutions.

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A

Description of the Developed Coding Scheme

In this chapter the developed coding scheme is presented in greater detail. After the overlap analysis, see Section 4.1, and all overlaps were resolved, all codes that remained did not overlap with any other code. These codes form the coding scheme that this thesis aimed at developing. In the table below, see Table A.1, the codes are presented. in addition to the code number and name, the frameworks from which the codes were derived are presented, in addition to a more detailed description of each code and its usage.

Table A.1: The collection of codes in the coding scheme which this thesis aimed to develop.

#	Code	Framework	Description
1	Performance	Product Quality	Performance intend to categorise information regarding patient perceptions of the devices, systems, and solutions used in their care intervention. Comments on the primary functions and the performance of devices used in the care intervention could be collected under this code.
2	Features	Product Quality	When coded, Features could be used as a code to gather information of patient perceptions on aspects not directly related to the core function of devices but to the secondly and complementary functions.
3	Aesthetics	Product Quality	When used as a code, Aesthetics could be used to categorise all comments on how the devices used in a patients care intervention looks, feels, tastes, and sounds.

Continuation of Table A.1

#	Code	Framework	Description
4	Product Reliability	Product Quality	Patients' perceptions of the reliability of a product or device used in care interventions or in eHealth solutions could be coded under Reliability. Perceptions gathered under this code could be comments on failures, breakage, and thoughts regarding whether a patient perceive that the usage that the patient was able to retrieve from a device aligned with the assumed usage.
5	Ease of Use	TAM Innovation Diffusion	The patient perceptions of the effort required to use an eHealth solution could be coded under Ease of Use. In addition comments on the complexity, the occurrence of errors, or the need for aid to use the care solution could be coded under Ease of Use. Aspects that are determined by users previous knowledge and experience could be coded under this code as well.
6	Usefulness	TAM	Perceived Usefulness could be used to collect perceptions on the patient perceptions of the usefulness of a care intervention or eHealth solution, and the devices used in it. If patients perceive a solution to be advantageous for them, aid or enable them to perform better in their work or everyday life, the technology is perceived as useful.
7	Conformance	Product Quality Innovation Diffusion	Conformance could be used to gather information regarding patient perceptions that reflects whether a product or device was designed and developed to meet the standards of the patient, and other patients suffering similar illnesses. It also includes an eHealth solutions compatibility with the patients needs and values.
8	Responsiveness	SERVQUAL	The care providers willingness to help customers and to provide prompt service is represented by Responsiveness. Any comments on waiting times could be coded under Responsivness.

Continuation of Table A.1

#	Code	Framework	Description
9	Assurance	SERVQUAL Product Quality	Assurance include the knowledge and competence, courtesy and friendliness, and trustworthiness and credibility of care providers and caregivers, in addition to if patients believe that they are well cared for.
10	Empathy	SERVQUAL Product Quality	Patients' perceptions of a care intervention in regards to if they perceive that they are receiving individualised attention, perceive the it is easy to gain contact with care providers, and the provision of caring from the care givers.
11	Service Reliability	SERVQUAL	When coded, Service Reliability could be used to collect perceptions on the care providers and eHealth solutions ability to provide care dependably and in a way that the patients believe to be accurate.
12	Delivery Environment	SERVQUAL	This code reflects the environment in which a care delivery takes place, and the tools and equipment used/needed to deliver the care or use an eHealth solution.
13	Trialability	Innovation Diffusion	Trialability reflects patients ability to try a care intervention or an eHealth solution before fully committing to adopt it.
14	Observability	Innovation Diffusion	Observability could be used to collect patient perceptions of their ability to observe the outcomes and results of others using eHealth solution.
15	Relative Advantage	Innovation Diffusion	This code could be used to collect perceptions of the relative advantage of an eHealth solution and whether patients perceive that using the solution is advantageous compared to other offerings.
16	Communicated Quality	Product Quality	This code could be used to gather information on patient perceptions of their expected quality of an eHealth solution or care intervention before the patients have had a chance to try the solution.

B

The Code Occurrence when Coding the Patient Perceptions of the DECI Solution.

The occurrence of codes in the different intervention groups in the DECI project varied depending on the care package each intervention group received. The following table, see Table B.1, shows the occurrence of codes in the different intervention group and combined for all patients. In addition to the twelve codes used in the analysis of the patient perceptions on the DECI solution, the table also contains the two additional columns. Future Use represent the number of indications for each intervention group, while Improvement Suggestions represent the number of improvement suggestions the patients expressed during interviews.

Table B.1: The occurrence of codes found when analysing the patient perceptions of the interviewed participants in the DECI project.

Nationality	Intervention Group	#1 Performance	#3 Aesthetics	#4 Product Reliability	#5 Ease of Use	#6 Usefulness	#7 Conformance	#8 Responsiveness	#9 Assurance	#10 Empathy	#11 Service Reliability	#12 Tangibles	#15 Realtive Advantage	Future Use	Improvement Suggestions
Israel	All Intervention Groups	1	0	4	10	4	5	0	0	0	0	0	0	1	1
	Control Group	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Intervention Group 1	0	0	0	3	0	0	0	0	0	0	0	0	0	1
	Intervention Group 2	1	0	3	4	2	3	0	0	0	0	0	0	0	0
	Intervention Group 2+	0	0	1	3	2	2	0	0	0	0	0	0	1	0

Continuation of Table B.1

Nationality	Intervention Group	#1 Performance	#3 Aesthetics	#4 Product Reliability	#5 Ease of Use	#6 Usefulness	#7 Conformance	#8 Responsiveness	#9 Assurance	#10 Empathy	#11 Service Reliability	#12 Tangibles	#15 Realtive Advantage	Future Use	Improvement Suggestions
Italy	All Intervention Groups	2	13	1	19	24	20	7	20	17	0	1	4	3	6
	Control Group	0	0	0	0	0	0	3	7	7	0	0	0	1	0
	Intervention Group 1	0	0	0	6	1	0	1	6	0	0	0	1	1	0
	Intervention Group 2	1	0	1	4	7	6	1	3	5	0	0	2	0	1
	Intervention Group 2+	1	12	0	9	16	14	2	4	5	0	1	1	1	4
Spain	All Intervention Groups	0	2	1	1	0	5	0	0	0	0	0	1	0	0
	Control Group	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Intervention Group 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Intervention Group 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Intervention Group 2+	0	2	1	1	0	5	0	0	0	0	0	1	0	0
Sweden	All Intervention Groups	11	3	7	18	15	24	0	5	8	1	6	2	6	6
	Control Group	0	0	0	0	1	5	0	1	3	1	3	0	0	1
	Intervention Group 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Intervention Group 2	7	0	3	12	8	12	0	2	4	0	3	2	4	1
	Intervention Group 2+	4	3	4	6	6	7	0	2	1	0	0	0	2	4