MESG
MESTRADO EM ENGENHARIA DE SERVIÇOS E GESTÃO

Understanding the health care experience: the supportive role of technology in the elderly care sector

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Master Thesis

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UNIVERSIDADE DO PORTO

2016-07-01

Aos meus avós.

Abstract

Health care has revealed itself a key service sector in society as it affects everyone's life (Berry and Bedampudy 2007). Understanding customer experience is complex, however is fundamental to increase the related knowledge, in the sense that it can represent organizations new competitive advantage. Towards an aging world population (WHO 2014), there is a need to enhance the levels of quality of life and well-being (Ostrom *et. al.* 2015), namely by offering alternative services, as ones enabled by information technology. Thus, focus on the elderly segment health care experience and how technology can support it is of high pertinence (Mochis, 2012, Ostrom *et. al.* 2015).

The perspective of the customer as a mere recipient of the service is outdated (McColl-Kennedy *et. al.* 2012). For service-dominant logic the customer is being seen has playing an active role in the provision of service and in the realization of its benefit: value co-creation (Vargo and Lusch 2004, 2008). Therefore, it is fundamental to understand the customer value co-creation activities and interactions, in order to perceive what influences health care experience, as the "customer role readiness" (personal resources) or "availability of help from other customers" (Support Figure/Network) (Verleye 2015).

Furthermore, the co-creation experience also depends on customer characteristics, such as "expected co-creation benefits" and on characteristics of the environment, such as "*technologization*" (Verleye 2015). Hence, research about the benefits customers find in technology as supporter of their experience gains prominent importance, mostly for more vulnerable customers. Technology is viewed has having the potential of enhancing the elderly experience and consequently their well-being (Miskeli 2001; Berry and Bendapudi 2007; Bujnowska-Fedak and Pirogowicz 2013; Gil and Amaro 2015; Ostrom *et. al.* 2015), but at the same time, they are victims of misconceptions regarding their behaviour towards its use and adoption (Bujnowska-Fedak and Pirogowicz 2013, WHO 2015).

This research uses a qualitative methodology approach based on semi-structured interviews with elderly individuals. Data analysis, revealed considerable differences in the sample thus analysis was structured around two groups: elderly (more than 74 years old), and older adults (more than 60 years old). A set of health care value co-creation activities (McColl-Kennedy *et. al.* 2012) were found and its level of compliance related to the individuals quality of life, context and personal resources, influencing the health care experience. Health experience value co-creation is then perceived as multidimensional, showing the need for a holistic approach to its study and interpretation (Vargo and Lucsh 2008, Verleye 2015). Furthermore, health care experience interactions and its attributes (factors that could enhance or deteriorate one's experience) arose from data analysis. These attributes were mentioned as interactions requirements that enhance health care experience, hence influence well-being.

Finally, addressing the supportive role of technology on the elderly health care experience, its benefits and impediments for use and adoption by the elderly are described, as the emotions each one taunt and its impact on the individual well-being enhancement or depreciation, as they revealed to be either positive or negative.

Acknowledgments

A huge Thank You to my supervisor Professor Gabriela Beirão for the opportunity of doing this dissertation and the reliance. Thank you for all the many hours of discussion, for all the support and guidance given during the thesis development and the patience for listening to my problems and doubts.

To Professor Lia Patrício, who introduced me to the world of Costumer Experience, during the Master Course in Service Engineering I want to thank for the wisdom and enthusiasm that contaminated me about this subject.

I would like to thank the Venerável Ordem Terceira de São Francisco de Vila do Conde for actively collaborate in the research process giving access to its residents making the interviews possible in such a caring way.

My gratitude to all the volunteers who participated in this thesis: family, friends and friends of friends, their valuable time is much appreciated.

To all my master degree colleagues who accompanied me in this wonderful and challenging journey.

A special thanks to all my friends who helped and encouraged me to proceed.

To my boyfriend for being my cornerstone.

Last, but definitely not least, to my Family, my parents who gave me the gift of life and from whom I have inhered most of who I am, without whom nothing would be possible.

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List of abbreviations

CCT- Consumer Culture Theory

CVA – Cerebral Vascular Accident

ICT – Information and Communication Technology

IT – Information Technology

MSD - Multilevel Service Design

OECD - Organization for Economic Co-operation and Development

POCD – Pulmonary Obstructive Chronic Disease

S-D - Service-Dominant

SMS - Short Message Service

SSME - Service Science, Management, and Engineering

VCA – Value Co-creation Activities

WHO – World Health Organization

1   Introduction

This section frames the dissertation subject, which intends to better understand the health care experience, more specifically to explore the supportive role of technology in elder health care. The project was developed at the Faculty of Engineering of the University of Porto.

1.1   Project Background

Services now represent the dominant economic activity in developed countries; they are transforming economies on a substantial scale (OECD 2014). Many product companies are looking to services solutions for survival to compete both locally and globally; *servitization*[1] is nowadays a trend. This rising trend is expected to endure, or even accelerate, due to the increasing prominence of knowledge-based and service-oriented activities (OECD 2000; Bujnowska-Fedak and Pirogowicz 2013). Thus, according to Ostrom *et. al.* (2015), the significance of service research and the need of knowledge related to services field is increasing.

Services happen over time, they are by large intangible, making the act of supplying the service very difficult to separate from its consumption. Services are "deeds, processes and performances" (Zeithaml, Bitner and Gremler 2010, p. 1), they are also a sequence of activities in which the costumer takes part to achieve a certain result (the desirable is that it fits the service value proposition) (Sweeney *et. al.* 2015). These iterations are touchpoints – the people, information, products and spaces that are encountered when "using" a service (Patrício *et. al.* 2011).

Services are now focusing on the development of offerings where the experience lived by the customer makes the difference, which is perceived as the core concept for service success. The focus on service value creation through favorable customer experiences is nowadays gaining strength (Patrício *et. al.* 2011).

Health care is a key service sector in society as it affects everyone's life, both individual's quality of daily life and economies worldwide (Berry and Bendapudi 2007). Health care systems have a significant role in the quality of life and social welfare in modern society. Thus, research on health and well-being is encouraged by service researchers, with emphasis in the impact of service on well-being (Ostrom *et. al.* in 2010).

The world is entering a profound 'age wave', the new Portuguese demographic reality presents us an aged country, where social isolation situations of the elderly are a reality. Population aging is not only a Portuguese phenomenon, it has worldwide proportions, which is explained by the improvement of health care and consequently the increase in the average life expectancy (WHO 2014). This issue is increasingly gaining more prominence for developed economies, placing a heavy strain on health care networks, challenging society to overcome all the related issues, leading to increased demand for health care service and alternative living arrangements for those in need of assistance (Bujnowska-Fedak and Pirogowicz 2013).

Towards this new reality, there is a need to enhance the levels of quality of life and well-being, namely by offering services such as health care services. Therefore, according to Mochis (2012)

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[1] "(…) recognized as the process of creating value by adding services to products" (Vandermerwe and Rada, cit. by Gao *et. al.* 2009).

it is, nowadays, essential to understand the older consumers market, given that there isn´t enough knowledge about their behavior; until recently this segment was taken as a homogeneous segment of the population, not taking into account the existing varieties among them due to the variance in aging processes.

Technological advances, mainly internet, enable the emergence of new services. Furthermore technology has narrowed the differences between services and the other economic activities, it has allowed people to participate, in real or deferred time, in several services activities, without having to be present (OECD 2000). Information technology (IT) plays a major role in the growing importance of services, enabling new services, changing the way they are provided, and changing the relationship and interaction between service providers and consumers (Accenture 2015).

Also, the context in which service is delivered and experienced has profoundly changed. IT innovation, is "leading to a proliferation of revolutionary services and changing how customers serve themselves before, during, and after purchase" (Ostrom *et. al.* 2015, p. 127)

Within health care sector, technology developments as electronic health records (EHR), remote treatment, and the ability to share data online, granted modern societies with an array of new health care solutions available, even in low-income settings. The use of mobile technologies to collect and distribute information is helping significantly in the prevention and treatment of diseases. Hence, technology may provide a valuable addition to support the elderly in health care service (WHO 2015). Also within health care sector, there is the acknowledgement that the successful management of diseases, is also related to the collaborative interactions between the individual and their health providers and the individual active involvement thus the value co-creation (McColl-Kennedy *et. al.* 2012).

It is increasingly important for the health care sector, to understand customers' behaviours, needs and feelings, as well as, understand how the new emerging technology can help in proving better services (Ostrom *et. al.* 2015). Customer experience may be defined as "the cognitive and affective outcome of the customers' exposure to, or interaction with, a company's people, processes, technologies, products, services or other outputs" (Buttle 2009 p.183). This author also emphasizes the customer's intangible feelings and perceptions. Importantly the creation of customer's experiences should be considered from both rational and emotional perspectives (Frow and Payne 2007). It is known that health care is as a high emotion service, as it often involves intense feelings even before the service commences (Berry, Davis and Wilmet 2015).

Therefore, it is important to investigate the determinants involved in health care customer experience, and how may technology facilitate it. Furthermore the role customers play in the value co-creation process is critical for a good customer experience (Frow and Payne 2007, Akaka *et. al.* 2015). For instance, patients' successful management of diseases implies collaborative interactions between the individual and their health providers, as well as the individual active involvement (Holman and Lorig 2000). Thus, only an in-depth and holistic understanding of customers and their environment can create offerings that provide meaningful value and make a real difference on the bottom line (Meyer and Schewager 2007).

1.2 Problem Description

The delivery of compelling customer experiences requires a deep knowledge of customer needs, however there's still a huge gap in perceptions between companies and their customers regarding the best service experience (Frow and Payne 2007; Bujnowska-Fedak and Pirogowicz 2013). According to Shostack (1987 p. 133), services have an increase propensity to failure, among other reasons due to the fact of "the lack of systematic method for design and control". For instance a survey done to customers of 362 companies shown that merely 8 per cent of them termed their experience as "superior", but on the other hand 80 per cent of the companies considered that the experience they have provided was "superior" (Meyer and Schwager 2007). As such, service quality and customer satisfaction may be decreasing because what customers often receive falls below their expectations (Frow and Payne 2007; IFM and IBM 2008), thus research is fundamental to "deconstruct customers overall experiences, resulting customer satisfaction into its component experiences" (Meyer and Schwager 2007),

As in any other services, within health care it is important to understand customers' needs and wants learn about the opinions, perspectives and concerns (Ghulam *et. al.* 2006; Bujnowska-Fedak and Pirogowicz 2013). It is possible that the elderly may exhibit less technology readiness, posing a barrier to a positive experience. However, the use of technology may provide independence and personal autonomy to the elderly (Miskelly 2001). As such, is important to understand the role of technology, it acceptance by users and potential impact on well-being (Ostrom *et. al.* 2015).

This study aims to extend the present knowledge on elderly patients' health care experience and the role of technology and people in improving it to improve well-being. This study intends to address one of the eight key research priorities on the service area: the role of technology-enabled services in improving the well-being for vulnerable customers, such as the elderly (Ostrom *et. al.* 2015). Also, the project focuses on a better understanding of how technology may support the service experience and the role of emotions of the actors involved in the experience (Jaakkola *et. al.* 2015).

1.3 Research Questions

The purpose of this dissertation is threefold:

1. To explore what influences elderly customers health care value co-creation experience for better well-being;

2. To investigate how technology may contribute to improve the elderly well-being;

3. To understand what is the role of emotions on the health care experience as perceived by the elderly and the role technology play.

1.4 Report outline

The thesis is organized in 6 chapters as follows.

The first section – Introduction, introduces the dissertation context, its problem description as the research questions and the outline

The theoretical background is discussed in section 2 - Literature Review. In order to introduce

the most relevant topics, associated to the specificity of health care sector, regarding the customer experience and the role of technology in the context of elderly health care providing, it is discussed the relevant research fields and works in which this research was based and presents the basic premises that guided it. Following, literature review gaps are presented.

Then, section 4 describes the research design undertaken, starting by the overall research approaches and their main advantages and disadvantages to the selected methodology. It also describes in detail the data collection and analysis procedures.

Section 5 – Results details, presents the data collected and explains its analysis.

Section 6 – Conclusion and future research, sums up the main results and conclusions in order to clarify the contributions of the thesis and it also enumerates a number of prospects for future works to be developed.

2   Literature Review

The section provides a literature review relevant to address the research questions, focusing on customer experience and value co-creation, mainly within the health care sector, subject with an increasing magnitude as a dominant research issue in a variety of themes that are also addressed hereafter, such as its potential for individuals' well-being improvement and how its services should be shifted to costumer centered in order to deliver a quality experience. Afterwards, the role of emotions on health care experience is pointed, as a contextualization about the elderly segment importance and broad characteristics with health care impact, such as, illiteracy. To finish, technology relevance to current and future health care service delivery enhancement and its particular influence on the elderly segment support is reviewed.

2.1   Customer experience

Commodities are fungible, goods tangible, services intangible, and experiences memorable.
(Pine and Gilmore 1999)

Customer experience as a source of competitive advantage is a factor to take into account in the design and development of services, as several authors consider it as the most sustainable competitive advantage for a company and core of the service offering and service design (Zomerdijk and Vos 2010; Helkkula 2010).

The term customer experience is becoming broadly used by organisations in every sector (Frow and Payne 2007), and it has been applied as synonym for service experience. Although, according to Jaakkola *et. al.* (2015) the two concepts can have different meanings, within this dissertation they will be referred as meaning the same.

The concept of experience has been characterized in different ways, it "can be "real" and physical, or "virtual" and observed, or perhaps a holistic phenomenon that combines both "real" and "virtual" elements, an experience can be either a single event or several events (Helkkula 2011). For Pine and Gilmore (1999, p.12) "experiences are events that engage individuals in a personal way and derive from the individual's prior state of mind". Meyer and Schwager (2007) state that it encompasses every aspect of a company's offering, the quality of customer care and also the advertising, packaging, product and service features, ease of use, and service reliability. As such, customer experience should be considered when designing services as is the most sustainable competitive advantage of a company and is the core of the service offering (Zomerdijk and Vos 2010; Helkkula 2011).

While there is widespread contemporary agreement on the importance of the concept of service experience, this concept is not viewed by all researchers in the same way, there are different perspectives about how the concept of service experience should be characterized. Helkkula (2010) provides a three-fold typology of characterizations of the concept of "service experience", which are then related to other key concepts in the research literature on service marketing and management (see Table 1). These three types of service experience are deeply related with the different Service Design or Service Science research perspectives.

Table 1 Characterizations of the concept of service experience (Helkkula 2011)

Research perspective	Description	Service research perspectives
Phenomenological service experience	"Relates to the value discussion in service-dominant logic and interpretative consumer research"	S-D logic and interpretative consumer research
Process-based service experience	"Relates to understanding service as a sequential process"	Service marketing that understands service as a process
Outcome-based service experience	"Relates to understanding service experience as one element in models of service linking a number of variables or attributes to various outcomes"	Understanding service experience as part of a causal model in which either the outcomes and/or antecedents of experience are measured or in which experience is posited as a moderating variable

Holbrook and Hirschman's, were the pioneers on the characterization of service experience as experiential and phenomenological (Holbrook and Hirschman's 1982; Frow and Payne 2007). The authors (1982, p. 132) described such service experiences as a: "(...) primarily subjective state of consciousness with a variety of symbolic meanings, hedonic responses and aesthetic criteria". According to Meyer and Schwager (2007 p. 118-19), within a phenomenological perspective customer experience is defined as "the internal and subjective response customers have to any direct or indirect contact with a company (...) [including] unplanned encounters with representatives of a company's products, services, or brands (...) word-of-mouth recommendations or criticism, advertising, news reports, reviews, and so forth".

Although all the discussion about the "specific to an individual and situation" or the "interpersonal interaction" (Helkkula 2010 p. 371) around the phenomenological approach of service experience, the true is that it was the interest in hedonic service experiences that originally placed the notion of customer service experience under attention.

This concept was further developed by Vargo and Lusch (2008) and it turned into one of the key concepts in the emerging paradigm of S-D (Service Dominant) logic, which they adopted in relation to value co-creation in the foundational premises of S-D logic and which will be developed further. Nowadays to consider a dynamic interaction and the nature of the context of value creation is fundamental to better understand and enhance market-related experiences (Akaka, Vargo and Schau 2015).

2.2 Value co-creation

Co-creation: the joint creation of offerings or value (…).

Hoyer et al. 2010

The traditional economic meanings of value, which exists since Aristoteles Theory of Value, have changed. Once value was seen as "value-in-exchange" or "value-in-use" (McColl-Kennedy *et. al.* 2012), nowadays the "value-in-context", according to Vargo *et. al.* (2008) concept needs to be considered. This proposition considers the context of the customer, it has a phenomenological perspective, rather than just a value for exchange or value for integration and use, respectively. On the first hand, the phenomenological approach to service experience was essentially individual, but increasingly the focus has assumed the preponderant role of the aspects of the context.

Holbrook and Hirschmann (1982) emphasize that emotions and contextual, symbolic and non-utilitarian aspects are core for experiential perspective, because value resides not in the object of consumption but in the experience of it. The importance of experience has been enhanced by S-D logic, by emphasizing the experiential nature of value (Vargo and Lusch, 2004, 2008). This phenomenological approach to service experience has shifted the focus of services, from the outcomes of production to how those outcomes are contextually experienced. S-D logic emphasizes individually perceived experience that is subjective, case-specific, and context-specific. This paradigm acknowledges that this takes place in co-creation with other people in social-experience networks, where all individuals are experiencing subjects (Helkkula 2010). Value co-creation is critical in S-D logic and can be defined as "benefit realized from integration of resources through activities and interactions with collaborators in the customer's service network" (McColl-Kennedy *et. al.* 2012).

This perspective has grown from a focus on the internal and hedonic experiences of consumer as an individual to a co-created phenomenon, highlighting the experience as a collective phenomenon (Helkkula *et. al.* 2012). Currently, the interaction processes are increasingly occurring, not only in a dyadic interactions (provider-customer), but also between networks of actors, where multiple interactions happen. Customers share and co-create experiences collectively in communities and providers collaborate with their suppliers, contributing to customers' experiences (Hakanen and Jaakkola 2012, Tax *et. al.* 2013). According to this perspective, services experiences are requiring "reciprocal contributions from all parties" (Jaakkola *et. al.* 2015, p. 183). In order to briefly frame the existing service research perspectives and to contextualize them within each paradigm, an excerpt and adaptation of Helkkula (2011, p.191) matrix is presented in Table 2.

The growing stream of research that focus on collaborative created value that is having deep insights in this research is the S-D logic (Vargo and Lusch, 2004, 2008), shedding light on the experiential aspects of value and the dynamic contexts through which it is created. This perspective focuses on the integration and application of a variety (tangible and intangible) of resources within dynamic networks of actors, which underscores the social or relational nature of context (Edvardsson *et. al.* 2011). S-D logic has broadened the scope of the experience concept from customer perceptions of the immediate, isolated service or product encounter to encompass past and future as well as lived and imaginary dimensions (Helkkula *et. al.* 2012). Although generating better customer experiences is a key rationale for firms to opt for co-creation (Payne *et al.,* 2008; Pine and Gilmore, 1999), studies shown that co-creation is much more viewed, from a firm perspective, as a way of effectiveness gains for firms, such as a closer fit with customer needs (Fang *et. al.* 2008) and better market reach and acceptance. The recognition of the importance of engaging customers in the creation of new products and services through co-creation has, thus increased (Payne *et. al.* 2008; Prahalad and Ramaswamy 2003; Vargo and Lusch 2008), and online tools and communities, for instance, have facilitated this.

According to Verleye (2015, p. 322) the co-creation experience depends on customer characteristics, such as "expected co-creation benefits" and "customer role readiness". The author also believe that these experiences depend on characteristics of the environment, such as "*technologization*" and the "availability of help from other customers".

Table 2 Excerpt and adaptation of "Central research perspectives on service experience co-creation" (Helkkula 2011)

Research perspective	*Authors*	*Focus of research on experience; why experience is important*	*Perspective on service experience co-creation*
Service-dominant logic and service logic	Vargo and Lusch (2008), Helkkula *et al.* (2012), Edvardsson *et al.* (2011)	*Experience as subjective, context-specific and phenomenologically defined;* *Value emerges through experiences*	*Co-creation takes place in interaction between two or multiple actors who integrate resources*
Consumer culture theory	Arnould and Price (1993), Firat and Venkatesh (1995), Schau and Gilly (2003), Arnould and Thompson(2005), Cova and Dalli (2009)	*Experiential, sociological and cultural aspects of consumption;* *Experience is the main object of consumption*	*Even most private consumption is collaborative in nature;* *Focus on customer-to customer interaction within customer communities*
Service management	Verhoef et al. (2009), Grewal *et al.* (2009), Kwortnik and Thompson (2009), Klaus and Maklan (2012), Kandampully (2014)	*Superior experience as a precursor of perceived customer value and competitive advantage for the firm*	*Service experience is co-created within the service relationship between the employee and the customer, sometimes also involving other customers*
Service Innovation and design	Edvardsson et al. (2005), Zomerdijk and Voss (2010), Patrício *et al.* (2011), Teixeira *et al.* (2012)	*Developing products/services that create better experiences for users; Experience is a key source of differentiation*	*Users co-create experiences through interactions with the service provider across multiple touchpoints; Collaboration with customers is needed to understand their experiences*

Based on literature review Verleye (2015) presented a theoretical framework (see Figure 1), containing the individual and environmental determinants for a costumer experience co-creation, highlighting that customer motives to co-create value confirm that they expect different benefits as "profit".

Füller (2010) argues that combinations of intrinsic benefits (hedonic benefits), extrinsic benefits (pragmatic and economic benefits), and internalized extrinsic benefits (cognitive, social and personal benefits) drive customer engagement in co-creation, but these combinations differ among customers and aren't the only determinants. Customer motivation, role, clarity and ability, help customers to constructively participate in service creation therefore, customer role readiness also affects the co-creation experience dimensions (Verleye 2015).
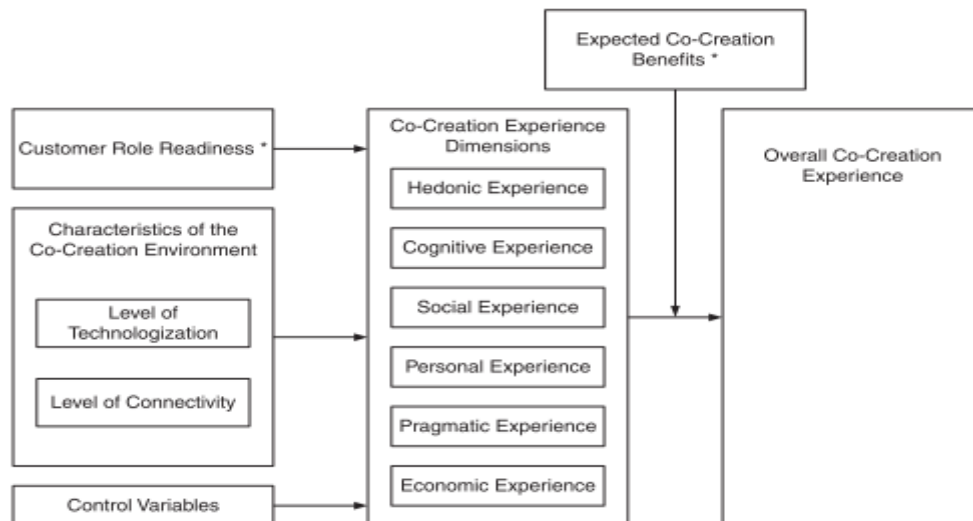
Figure 1 Theoretical framework customer experience co-creation (Verleye 2015)

2.3 **The growing importance of health care services**

The world is entering a profound *age wave*, explained by the improvement of life quality and consequently the increase in the average life expectancy, for which countries were not well prepared (WHO 2014). This is an issue increasingly gaining more prominence, for developed economies, placing a heavy strain on health care networks, challenging society to overcome all the related issues, leading to increased demand for health care service and alternative living arrangements for those in need of assistance (Bujnowska-Fedak and Pirogowicz 2013).

Achievements in health worldwide in the twentieth century and especially during the past few decades are impressive. The increase in life expectancy throughout the world have never been greater. Life expectancy is almost 25 years longer today than at similar income levels in 1900 (Preker A. *et. al* 2000). These gains in health and quality of life are mainly the result of achievement and development of medical care industry, producing and delivering in broader parts of population a complex of services.

Health and health care, are becoming a dominant economic and political issue in most countries, with increasing magnitude and importance of the health care sector. Health care significantly affects economies worldwide, as it costs billions and as well it affects individuals' quality of daily life (Berry and Bendapudi 2007). Also, by 2020, the number of adults with chronic diseases will increase by around 40%, with relatively more of the conditions affecting those in the older age groups and also, ageing is associated with an increased risk of experiencing more than one chronic condition at the same time (known as multimorbidity) (WHO 2014, 2015).

For this remarkable increase in health care expenditure, the following factors are distinguish by OCDE (2010) as direct reasons:

- Rising relative costs. There is a tendency for the relative costs of the health services to rise faster than the average, so that a higher level of spending is required year by year just to maintain standards;

- Changes in population structure, particularly the age structure. The rapid aging creates new pressure for the health care system;

- New and improved services and also extension in the coverage;

- Growing social needs due to changing socioeconomic conditions.

In the current context, it is important to improve quality of health services looking to the health value network from the citizens' perspective fostering value co-creation among multiple actors, thus resulting in beneficial outcomes (Pinho 2015). While identifying the benefits of health care services is important, it is also important to investigate the factors affecting the health care experience. It is increasingly important for the health care sector, to understand customer's behaviours, needs and feelings, as well as, understand how new technologies may improve service offerings, for both patients and firms, in order to achieve the desire outcome, improved well-being and quality of life.

Thus, health care is seen as an important context for a variety of research priorities (Ostrom *et. al.* 2010) and a fertile field for service research (Berry and Bendapudi 2007) as it is a critical service sector in every society and a rich case of service complexity.

2.4   Health care customer experience and value co-creation

The benefit realized from integration of resources through activities and interactions with collaborators in the customer's service network.

McColl-Kennedy et al. (2012, p. 375)

As in any other service, until recently, also in health care, customers were seen as mere recipients of what the firms do (McColl-Kennedy *et. al.* 2012). But following service research trends, as S-D logic, the customer is being seen has playing an active role in the provision of service and in the realization of its benefit (co-creation of value) (Prahalad and Ramaswamy 2000; Vargo and Lusch 2004).

Within health care sector, there is the acknowledgement that the successful management of diseases is also related to the collaborative interactions between the individual and their health providers and the individual active involvement (Holman and Lorig 2000). According to McColl-Kennedy *et al.* (2012) within health care, the notion that the treatment plans and health care related activities can also be extended beyond interactions with the "firm" (medical staff), to include further aspects of the individual's life such as lifestyle and beliefs.

Therefore the dyadic aspect of customer relation with a service is fading, giving place to a notion of network involvement in health care customer experience, where patients interact with different actors such as health professionals, alternative therapists, family, and others. Hence, value co-creation extend beyond the boundaries of the health care service (Prahalad and Ramaswamy's 2003).

Value derives from resource integration behaviors that may occur at the point of service or spatially or temporally distant from the service organization (Sweeney *et. al.* 2015). Indeed, customers are involved in a cognitive process given that "past, present or imagined future experiences are valuable for them" (Frow and Payne 2007, p.90). This involves viewing customer experience from a perspective of both normal day-to-day routinized actions, as well as more emotional experiences (Holbrook and Hirschmann 1982).

In line with previous studies, McColl-Kennedy *et. al.* (2012, p. 380) say that, although, in health care there's in fact a customer involvement in value co-creation, this co-creation can be done

in many different ways depending on the individual and context characteristics. These authors conducted a study with chronic patients and found a relationship between customer value co-creation practice styles and patients' quality of life. According to the study individuals displaying ''partnering'' or ''team management'' practice styles have relatively higher quality of life than ''passive compliance'' and ''insular controlling''. Thus it is expected that individuals who engage in activities further than basic compliance will have higher quality of life and higher customer participation has also shown to lead to enhanced psychological well-being. As such, managing health care, and chronic disease particularly, depends largely on the active involvement of customers (Michie, Miles, and Weinman 2003).

2.4.1 Health care service influence on well-being and quality of life

Good health adds life to years.

WHO (2015)

Quality of life is a broad-ranging concept that captures people's physical health, psychological state, levels of independence, and relationships with salient features of the environment (WHO 2015).

The definition of quality of life as ''subjective well-being'' by Cohen *et. al.* (1996, p. 1421), is used usually in health care and, according to (McColl-Kennedy *et. al.* 2012, p. 377) comprises four domains as follows:

- Psychological – "concerns feelings regarding being depressed, nervous or worried, sadness, and fear of the future";

- Existential – "concerns an individual's belief about their life, including the belief that life is meaningful and worthwhile, and that goals are achievable, how they feel about themselves, and whether they have a sense of control over life";

- Support - "concerns about feeling supported and cared for";

- Physical – "concerns the individual's most problematic physical symptoms, such as fatigue, pain, and weakness."

Regarding well-being, it is about feeling good and functioning well and comprises an individual's experience of their life, and a comparison of life circumstances with social norms and values. According to the United Kingdom Department of Health (2014) it is considered as existing in two dimensions, as follows:

- Subjective - is what the one think and feel about his own well-being, and includes aspects such as life satisfaction (evaluation), positive emotions (hedonic), and whether their life is meaningful (eudemonic);

- Objective - is based on assumptions about basic human needs and rights, including aspects such as adequate food, physical health, education, safety, among others. Objective well-being can be measured through self-report, or through more objective measures (e.g., mortality rates and life expectancy).

Well-being is deeply associated with positive health behaviours in adults. Patients' experience of care is an important factor on their health and well-being. People are concerned with their health but they also care about their experience of illness and the services they receive (Raleigh *et. al.* 2009).

How patients experience care can be an important factor alongside the actual medical treatment they receive. Although it is a subjective, individual, experiential concept (Dagger, Sweeney, and Johnson 2007), based on experiences in a variety of domains.

Consideration of patient choices and their care environment (e.g., flowers, pictures in hospitals or care homes) can have a positive impact on how quickly someone recovers and can impact on their longevity (Thin 2012). Medical experts and service marketers have argued that health-related quality of life is a vital indicator of health care service performance (Yao, Zheng and Fan 2015).

Consideration of health and well-being requires a shift in focus from what can go wrong in people's lives, to focusing on what makes their lives go well, thus effective health and well-being improvement calls for new ways of working (WHO 2014, 2015).

The interest in understanding how services can be more valuable to society has substantially increased. Examining the relationship between service and well-being, for instance, was ranked as a priority in research networks. Ostrom *et al.* (2015, p. 140) emphasized the effect of service on improving well-being "through transformative service".

This transformative service[2] research is predominantly relevant in health care, due to the fact that both the firm and customer can contribute to the individual as well as to the society well-being (Sweeney *et. al.* 2015). Health is the top thing people say matters to their well-being (WHO 2014). Customer value co-creation, as the enhancement of customer benefit from the integration of resources (both internal and external), has the potential to affect quality of life perceptions, turning this into continues cycle.

As other research paradigms mentioned earlier on, also the transformative service research framework considers the health care experience broader than the focal firm-customer dyad (Sweeney *et. al.* 2015). For this research paradigm, it is a set of several interactions, between entities such as the medical staff and the ecosystem, and individuals, that create customer well-being (Anderson *et. al.* 2013), inextricably linked to the customer's lifestyle and social world.

Service management scholars have much to offer to a critically important, intellectually challenging, but deeply troubled health care service sector on its impact on social well-being and quality of life, mainly through a transformative service research perspective (Ostrom *et. al.* 2015).

2.5 Experience quality

For some authors service quality can be viewed as the most important issue in achieving service sector competitive advantage (Berry and Parasuraman 1991). According to Lemke *et al.* (2011) customer experience quality is a perceived judgement about it excellence or superiority.

As it has been stated along this theoretical approach, the experience is context-specific and phenomenologically defined (Vargo and Luch 2008), though the experience quality concept is also assumed to be a context-dependent construct, because the ways in which customers judge their experiences in different environments vary (Zomerdijk and Voss 2010; Grewal *et al.* 2009; Verhoef *et. al.* 2009).

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[2] Service research that aims to ''create uplifting changes and improvements'' in the well-being of individuals (as consumers and as employees), collectives (e.g., families and communities), and ecosystems (Anderson 2010, p. 9)

It has been argued that due to the nature of services (e.g. perishability, utilization of customer contact) a significant utilization of quality management is and should be used (Witt and Clark, 1990). Some service quality models have been applied to health care services in order to perceive and measure customer experience, such as SERVQUAL (Ponsignon *et. al.* 2015), though they have been criticized for measuring the customer experience narrowly in terms of responses to a single interaction (Voss *et. al.* 2008) and not over other aspects of the experience (Lemke *et. al.* 2011), that has an holistic dimension as identified previously. Sampson (2012) states that a customer experience involves either a direct interaction between staff and customer, an indirect interaction or an independent activity that is independent of the dyadic interaction. Customer experience quality is reflected by the customer's perception of their interactions with both employees and the environment (Ponsignon *et. al.* 2015).

In health care, beneficiaries are likely to pay particular attention to the process of service delivery, emphasizing the intangible aspects of service provision, which makes of this sector a relevant context for studying experience quality, since, for instance, the quality of the staff attitudes and behaviours towards the patient are more difficult to assess (Ponsignon *et. al.* 2015). The lack of methods or framework to evaluate health care experience leads to acknowledgement among researchers that a concerted effort to understand, measure and enhance the patient experience is necessary (Ponsignon *et. al.* 2015). They encourage studies to examine how patients perceive and evaluate health services, enhancing the understanding of how customers perceive their experiences in specific service contexts (Berry and Bendapudi 2007; Ostrom *et. al.* 2010; Helkkula 2011).

This provides a strong rationale for the exploration of this concept in the specific context of health care for the elderly.

2.5.1 Customer-centric perspective for experience quality in health care

Experience centric–services are an orchestration of events that happen over time and in different interactions within the service. A service doesn't have a certain "beginning" or an "end", or more properly the service elements that can affect the customer perception about it can even happen after de service "delivery" (Zomerdijk and Voss 2009).

Organisations focus is shifting towards a customer experience management, which pretends to enhance relationships with customers and build customer loyalty. Organisations are paving the way to deliver what Voss, Roth and Chase (2008, p.248) identified as "experience-centric services" services in which firms craft the customer experience proactively to create distinctive product and service offerings. Organizations are struggling to involve patients and learn from their experience, as the quality of the patient experience influences clinical outcomes, such as patient safety and clinical effectiveness (Doyle *et. al.* 2013).

Health care providers are increasingly seeking to improve quality by refocusing organizational policy and care delivery around the patient, due to evidence that to achieve beneficial clinical outcomes their care should be: patient-centered (Ponsignon *et al.* 2015). Patient needs have had limited attention in the structure of the delivery of care (Ponsignon *et al.* 2015), but to focus on patient needs and preferences is a useful way to define patient-centered care. Literature suggests that there's a disparity between patients' expectations and providers' priorities in health care services. Organisations often concentrate on the tangible aspects of the experience while patients give much more significance to intangible aspects such as reliability, responsiveness

and medical staff empathy (O'Connor *et. al.* 2000; Fottler *et. al.* 2006; Ponsignon *et. al.* 2015). In order to develop a valid classification framework for experience quality in health care, with dimensions that extend beyond the existing health service quality models, Ponsignon *et al.* (2015), conducted a study to explore how cancer patients and their careers perceive and evaluate the health care experience. This study findings provide a categorization of direct, indirect and independent interactions (see Appendix D).

2.6 Emotions impact on health care experience

Emotions: a strong feeling deriving from one's circumstances, mood, or relationships with others. An instinctive or intuitive feeling that is distinguished from reasoning or knowledge.

Oxford Dictionary (2014)

Inquiry regarding the nature of emotions is not new. In fact, examples of such forms of inquiry have been documented since Socrates. Researchers and practioners in psychology, sociology and education understand the complex nature of emotions, as well as the importance of defining them. Emotions are an integral part of the experiences of events and circumstances over the life course that define the stages of psychological development, the person's responses to stressful events and transitions into and out of roles (Mochis 2012).

Patient's experience of illness is not separate from the rest of their lives and can affect their quality of life, relationships with others as well as their emotions (Mochis 2012). There are reports of consumers' aversive emotional experiences related to a major diseases (Mochis 2012, Tettegah and Garcia 2016). According to Kraus *et. al.* (2000) the concept of quality of life should not only be related to the individuals comfort and social relations, it should also take into account their emotions. The American Psychiatric Association (2013) suggests that there are eight primary types of emotions and an adapted description is presented in the following table (see Table 3).

Table 3 Primary emotions (Adapted from the American Psychiatric Association 2013)

Emotions	*Description*
Fear	Feeling afraid/shock or phobia
Anger	Feeling angry/rage
Sadness	Feeling sad/sorrow/grief (e.g. when someone has died) or depression
Joy	Feeling happy/gladness
Disgust	Felling that something or someone is wrong or dirty
Trust	Positive emotion/admiration/acceptance
Anticipation	Looking forward positively to something that is going to happen
Anxiety	Apprehension

Emotions are complex and personal traits, anxiety and depression, for instance are common emotional states associated with patients experiencing illness, to interpret them and respond to them is a fundamental part of health care mainly through the interaction between medical staff and patients, but never forgetting the ecosystem where the experience takes place (Tettegah and Garcia 2016). Medical staff must be aware of patient's emotions, due to the fact that these are

extremely important conditionings of patient's quality of life, especially for the ones with long-term conditions (Mochis 2012). During any patient health care experience, the communication, both verbal and nonverbal of medical staff (within the ecosystem) towards the patient, is a vital aspect for its quality and success. Stewart in 1995 stated that strong communication skills between medical staff and patients were connected to greater benefits in terms of health and quality of life.

From the patient's perspective, also self-efficacy can be associated with emotions. Self-efficacy as the individual beliefs on his own abilities, based on feelings of control and assurance (Tettegah and Garcia 2016). Often considered as the determinants for one's motivation and behaviour, that could determine better health outcomes. Individuals who believe to have higher control over their own health and in equal communications with medical staff are more likely to engage in healthy behaviours and therefore better health outcomes (Tettegah and Garcia 2016). Patients may experience different emotions in the need for stimulus, recognition, structure, belonging and control (Tettegah and Garcia 2016). When these factors are taken into consideration in patient contact, patients are more likely to have positive experiences of self-efficacy, confidence, motivation, which can be related to one of Ostrom *et. al. (2015, p. 139)* Service Research Priorities: "Identifying customer attributes associated with a positive service experience".

From a review on literature on health and older adults/elderly customer behaviour an observation emerged, there are not much studies grounded in theories of emotions when compared to other subjects as cost-effectiveness of health care service or its quality assurance (Mochis 2012; Tettegah and Garcia 2016), but more prominent, since we are living the *technologization* era (Verleye 2015, p. 322), is the lack of information that relates patients emotions and technology, mainly in health care.

2.7 Importance of the elderly customers

The world is entering a profound 'age wave', according to WHO (2015) by 2050 more than 1 in 5 people will be 60 years old (see Figure 2). Population aging is not only a Portuguese phenomenon, it has worldwide proportions, which is explained by the improvement of life quality and consequently the increase in the average life expectancy, for which countries were not well prepared (Demiris 2004; United Nations 2013; Bujnowska-Fedak and Pirogowicz 2013; WHO 2015). The aging of the Earth's population has been affecting governments, individuals, and corporations globally.
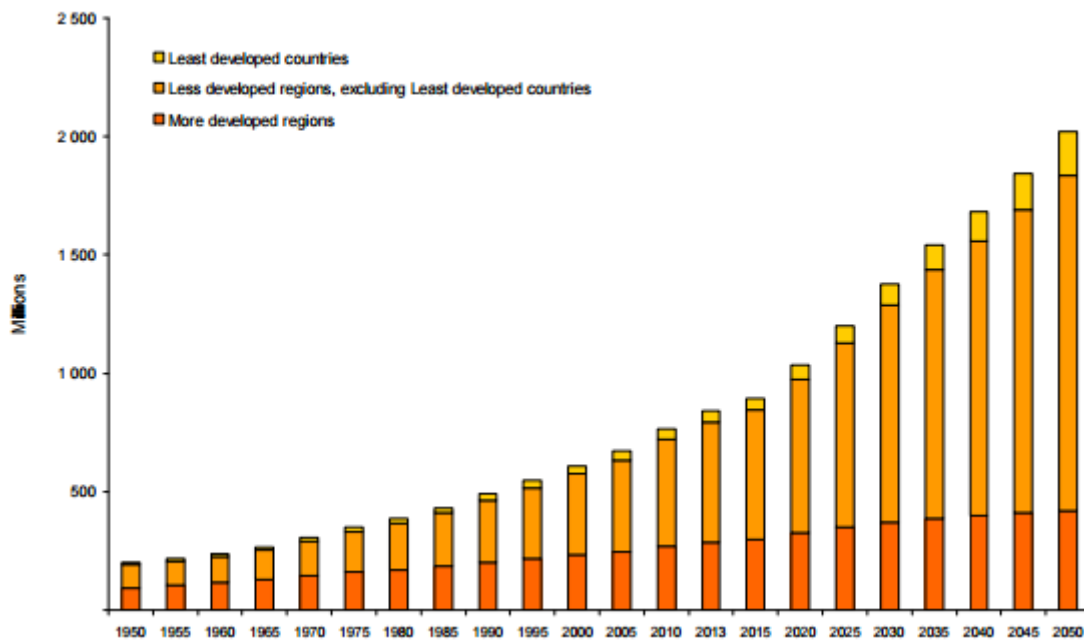
Figure 2 Population aged 60 years or over by development region, 1950-2050 (United Nations 2013, p. 12)

Nevertheless older people can make contributions to society in surprising ways. Elderly expenditures can be seen as a "cost", but we can also look at them as an important part of our society with much left to offer, such as the education of next generations or that the investment made in the elderly quality of life improvement may mean that women[3] will be able to spend more years in the workforce instead of an early retiring to look after their older relatives. Figure 3 shows the perspective of considering the elderly expenditures as investments that enable an overall society cohesion and well-being WHO (2015, p. 17).

Social change is ongoing and it is somehow unpredictable, hence strengthening the ability of older people to thrive in this challenging environment, fostering major shifts in how ageing and health is perceived, and inspiring the development of transformative approaches should be considered (Sweeney *et. al.* 2015; WHO 2015).

Following the huge demographic transformation, subjects such as the marketing's role in addressing the needs of older adults assumed greater significance. Longer life expectancies have been causing greater diversities among aging consumers due to a greater variability in aging processes and environmental changes (e.g. technological) (Mochis 2012; WHO 2015).

The diversities among the older adults/elderly, create an even greater need for understanding the new emerging segments that are likely to define the older consumer market. Ostrom *et. al.* (2015) also highlighted the need for "Designing services for vulnerable consumers (e.g., poor and aging)" as one of the priorities for service research in the coming years, they argued that in the pursue of an enhanced social well-being through services it will require, shifting efforts to focus on different segments of society, as the older adults/elderly.

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[3] Most older persons with long-term care needs—65%—rely exclusively on family and friends to provide assistance. An estimated 66% of caregivers are female. [The National Alliance for Caregiving and AARP, (2015) *Caregiving in the U.S. National Alliance for Caregiving. Washington, D.C.*]
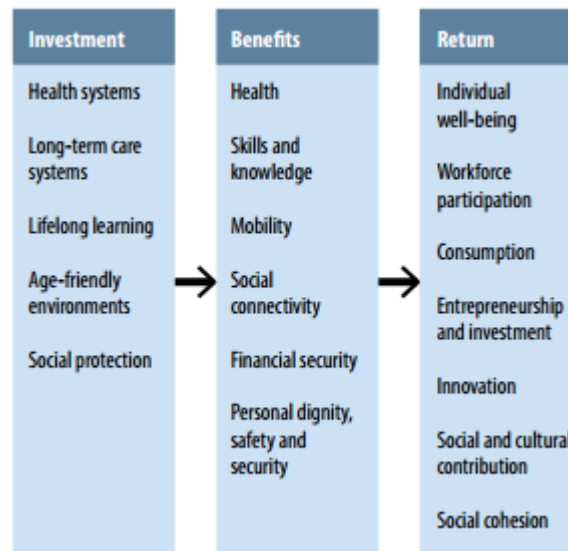
Figure 3 Investment in and return on investment in ageing populations (WHO 2015, p. 17)

2.7.1 Elderly customer behaviour

According to the reviewed studies about older consumers it is assumed that there's not a single conditioning explanation for their behaviour but a complex integration of a set of conditionings such as aging, life events, and circumstances affecting an older person's psychological states, which in turn affect his or her consumer behaviours (Mochis 2012, WHO 2015). People age as biological beings, social beings, psychological beings and even spiritual beings (Mochis 2012, WHO 2015).

Often people use chronological age to explain the biological aging but this conditioning alone is not a total explanatory value of behaviour or market trends, the same goes to the psychological aging paradigms or social aging (related to the different roles people assume according to their age and the new self-concepts allied to this), among others (Mochis 2012, WHO 2015).

There are many models applied in researches conducted with the aim of understanding the elderly customer behaviour, one is the Multitheoretical Model of Cognition (Mochis 2012), which for instance tends to ignore the role of emotions as a key factor of human behaviour. Other is the Dialectic Framework published by Riegel in 1975 (Mochis 2012). But none of these as scored the importance of a life-course approach, as The Life-Course Paradigm (Mochis 2012), more recent than the others, its defenders believe that there is no "typical" older person, that we cannot associate the typical loss of abilities to the individual chronological age, but as root of events throughout the life course that have to be connected to a complex interaction of conditionings (Mochis 2012; WHO 2015). The life-course paradigm suggests that changing life conditions in the form of life-event experiences create physical, social, and emotional demands and circumstances to which the person must adapt (Mochis 2012).

As said, there isn't a "receipt" or a "model" to understand the older consumer, there behaviour will be constrained by a multicity of factors that happen trough each one life course. Although, according to the literature there are some characteristics that can be pointed as being generally possessed by the elderly (Mochis 2012, WHO 2015):

- Generally older adults often delegate difficult decisions to others whom they apparently perceive as more competent than themselves, which make of them a social being as opposed to an isolated one;
- For most of the older people, the maintenance functional ability has the highest importance;
- Older age frequently involves significant changes, including shifts in roles and social positions, and the need to deal with the loss of close relationships. In response, older adults tend to select fewer and more meaningful goals and activities, optimize their existing abilities through practice and the use of new technologies, and compensate for the losses of some abilities by finding other ways to accomplish tasks;
- Goals, motivational priorities and preferences also appear to change, with some suggesting that older age may even be the stimulus for a shift from materialistic perspectives to more transcendent ones. Although some of these changes may be driven by adaptations to loss, others reflect ongoing psychological development in older age. These psychosocial changes may explain why in many settings older age can be a period of heightened subjective well-being;
- Generally older adults show a decline in the ability to make optimal decisions and increased vulnerability with age, due to increased use of no compensatory decision rules, as well as less elaboration prior to decision making.

Emotions have not received adequate attention also in studies of older adult's behaviour (Mochis 2012; WHO 2015; Tettegah and Garcia 2016). Recent research suggests their importance in understanding consumer behavior in later life and that emotions can be studied as integral parts of the life-course paradigm, due to its inclusive view on several life course perspectives. According to Mochis (2012) the emotional states brought about by psychosocial crises that characterize development in later life, can for instance result in decreased interest in material possessions.

Literature suggests that efforts to do well in one domain of life, such as maintaining competencies in making choices, compete for resource investment in other domains of life, with fewer chances for failures and, therefore, adverse effects on an aging person's self-esteem. With less time prospective the elderly may be more inclined to use emotion-focused strategies, because the outcome of their decisions may have negative consequences on their self-esteem, or it can explain that and they use compensatory strategies, such as delegating decision making to others (they may delegate health treatment decisions), as a coping strategy (Mochis 2012).

2.8 Illiteracy and its impacts on health care experience

Illiteracy, as madness, has the definition that society gives to it, within a particular period.

Jean-Paul Hautecoeur

The 2011 Portuguese census done by the National Statistics Institute (NSI) shown that almost 500 thousand Portuguese don't know how to read or write. The Portuguese illiteracy rate is one of the highest among the European countries.

OECD (2014) defines illiteracy as the capability of using and understanding written information within everyday activities, at home, at work, in society, the ability to develop knowledge and accomplish goals and according to its studies, between four and three quarters of its adult

population has not achieved the third level of literacy, which is considered by the experts as the minimum to meet the challenges of a modern society.

Within health care scope this has severe consequences, for instance, in the comprehension of therapeutic indications to be followed after a treatment. It is the source of many drugs misunderstandings and treatment abandonment (Maria João Gomes *at. al.* 1999*)*. Patients with poor reading ability have important problems accessing the health care system, understanding recommended treatments, and following the instructions of providers (Baker *et. al.* 1996). In 1999, Maria João Gomes *et. al.*, a group of medical doctors, have conducted a study to understand the level of illiteracy among the patients of a given hospital service, the results, according to age and social context are as follows (see Tables 4 and 5).

Table 4 Relationship between age and literacy within a Portuguese medical ward (Maria João Gomes *et. al.* 1999, p. 319)

	<65 year	*≥65*	
Literacy	88	51	139
Illiteracy	12	49	61
	100	100	

Table 5 Relationship between social context and literacy within a Portuguese medical ward (Maria João Gomes *et. al.* 1999, p. 320)

	Urban	*Non-Urban*	
Literacy	96	41	137
Illiteracy	10	50	60
	106	91	

According to this results, the major illiteracy problems, as it was expected, are within the older segments of the population, getting worst if they live in less "privileged" locations.

A research conducted by Baker *et al.* (1996) to understand this phenomena, has revealed some important facts regarding this subject. The collected and analyzed stories showed the negative effect of people reading difficulties on their ability to interact with the health care, giving a glimpse into the profound effect low literacy has on their daily life and self-esteem (Baker *et. al.*1996). There isn't much information about the "why" but it is known that low literacy is in fact associated with worse health care system (Weiss *et. al.* 1992*;* Baker *et. al.*1996).

A dominant theme occurring throughout all of the stories of Baker *et. al.* (1996) research, was the tremendous shame patients with low literacy felt about their reading difficulties, which is reinforced by hospital staff who become frustrated or angry when someone cannot accomplish a given task.

Seeking medical care is intimidating for patients with low literacy because they cannot understand signs and registration forms. Many patients recounted serious medication errors

resulting from their inability to read labels. The lack of information, for instance, can result in negative emotions for the patients (and their careers), such as depression and anxiety, and this will affect their quality of life, as they have not only psychological but also physical manifestations, deteriorating patient's health status (Baker *et. al.* 1996).

When clear information is provided to the patient, studies show that psychological distress is reduced, alongside with enhanced physical symptoms as blood pressure reduction (Roter *et. al.* 1995). The ability of medical staff to better communicate with patients is directly connected to patient's easiness in understanding medical information (Tettegah and Garcia 2016). Although, despite the importance that an empathic, effective and somehow "customized" communication, has in health care service providing, researches show that this medical staff attribute declines through time, which means that perhaps patient experience could be much better supported than it is (Neumann *et. al.* 2011). Evidence shows that currently, to cope with these problems, these patients rely on their support network, as friends and family, in this specific case appealing to them as their "surrogate readers" (Baker *et. al.* 1996, p.332).

2.9 Technology

Etymologically the word technology comes from the Greek words tekhne which means "art" or "craft" and logos meaning "knowledge" or "science" – The "treated on an art".

Pupo, Muñoz and Andalia (2005)

With respect to technology, it is important to place terms and tools within a historical context, give that in today's society when speaking to a person who is a "Millenial" (born between 1980's and 2000), they may tell us that technology is internet and smartphones, although to other segments of the population it can mean microwaves, airplanes, ATM's, among others. Hence technology in the twenty-first century can mean many things. For example it can mean software applications, hardware, and mobile technology, just to name a few.

Humans have used tools since the begin of times, although the experience in dealing with tools is not linear and the most important aspect of it is, how we use and interact with it, mainly the emotion responses one's experience during the interaction (Tettegah and Garcia 2016). The major role played by technology can be observed by how human became excited, frustrated or relieved when interacting with new technologies that assist us within our daily activities. According to Tettegah and Garcia (2016) to the diversity of emotions played by humans with and through technology include joy, anger, love, lust, empathy, compassion, jealousy, motivation and frustration.

Although the different experience each one can experience when dealing with technology its importance in our daily lives is undeniable, in today's dynamic world, life without technology is meaningless (Bujnowska-Fedak and Pirogowicz 2013). Communication across the globe is now much easier than not many years ago. This is due to the invention and use of internet which have lead the world into a globalization phenomenon. People hailing from different geographical regions can virtually communicate through video calls, e-mails as well as many social media platforms available.

One of the areas that technology has been of great use is the health industry. Modern electronic equipment's have been discovered which have improved the quality of treatment people receive at the health institutions as well as increasing their survival chances. Another notable benefit of technology is that it have enabled doctors to discover most health problems while they are still

developing and have treated them before they can develop into severe stages (White and Cocci 2014).

Given the significance of technology in the lives of consumers, the technology-enabled services role in affecting well-being is being highlighted among researchers (Ostrom *et. al.* 2015; WHO 2015). Information and Communication Technology (ICT) can be used to enhance the efficiency of current services provided, and it offers possibilities for totally new types of services also. According to Ostrom *et. al.* (2015, p.141) important questions around this subject are being made, such as "How can technology advances in e-medicine, remote health monitoring, and smart devices that track and analyse health information positively affect well-being? And, under what conditions might use of these technology-based services reduce well-being?"

2.9.1 Technology role in health care services

Technology has been the primary vehicle for health care innovation for more than 50 years, its improvement has been a driver to shift health care service delivery (Tettegah and Garcia 2016).

Technological changes in the health care market will allow more customers to bid farewell to some of the most frustrating parts of a troubled health care system (White and Cocci 2014). Waiting hours to see the physician, carrying hand-written medicines to the pharmacy, pursuing medical records are all problems that a customer faces in his daily sick life. Here comes the importance of technology in health care which will make health care superior for customers.

Health care technology appears to be incrementally moving beyond the place where it was, considered nowadays the way to conquer two of the biggest barriers to health care (Bujnowska-Fedak and Pirogowicz 2013; Tettegah and Garcia 2016):

1. Access, especially to those underserved populations who live in rural areas with limited access to services, lack transportation or that do not seek, usually for care;
2. High-cost of health care services providing.

Although the traditional patient could be somewhat passive as a recipient of health care services, the modern patient is more willing and able to assume a more proactive role in health-seeking behaviour by virtue of the ubiquitous Internet and mobile electronic devices (Bujnowska-Fedak and Pirogowicz 2013).

E-Health defined as the use of ICT, especially the Internet, supports the delivery and management of health care services providing a new method for using health resources (Gil and Amaro 2015; Tse, Choi and Leung 2008).

To meet the growing expectations of patients, numerous web platforms provide their users with medical information. Increasingly, medical centers/hospitals now offer remote electronic services such as access to a patient's electronic health record and personal health record, online health services such as e- registration (e.g. Portuguese Citizen Portal sponsored by the Portuguese Ministry of Health Shared Services) or short message service (SMS) reminders for appointments.

Mobile health, for instance is a promising and exploding, it allows customers to track their activity and other measurements that assist perk up wellness. This wellness technology is as well, turning out to be embedded in homes and smartphones (Demiris 2004). While more technology goes home with sick people, more can correspond with health suppliers remotely.

Distant access also enables more patients to get the required care where and when it is convenient for them. Clinical applications such as teleconsultation/diagnosis as well as self-monitoring are being introduced among literature and technology industry as a significant technological innovation that has the potential to bring about a paradigmatic shift in health care (Grönvall and Verdezoto 2013; Gil and Amaro 2015).

In Portugal, in 2013 the health governmental entities advocate through dispatch that the National Health System should promote and ensure the provision of telemedicine services to its users (Diário da Républica 2013). Within this scope a pilot project is underway that aims to follow-up fifteen patients with Chronic Obstructive Pulmonary Disease (COPD) in their residence, through daily assessment of various parameters that are sent through wireless enabled monitoring devices, to the hospital/medical center for the medical staff to analyze. The aim is to raise the quality of services provided to citizens optimizing also organizations results (Gonçalves 2014).

"Leveraging technology to advance service" was one of the main themes that an inquiry respondents referred to as a priority topic (see Ostrom *et. al.* 2015, p. 143) on a service research priority scope. This broad topic comprises, among other things, the need of understanding how the advance in technology can be applied in new service models that can benefit both customers and providers [e.g.: for most patients care in community is preferred to hospitalization and for providers it is usually less expensive (Miskeli 2001)].

Also ''Aging society creates pressures for welfare services" (Ostrom *et. al.* 2015, p.139) is an outcome of the same authors recent publication. Again, under the transformative services paradigm any service area could be investigated in relation to its impact on well-being, in this specific case the design of technology enable services that could enhance it. Though all the developments already done and undergoing in this area much more attention has to be given to investigating how service, mainly focusing on technology enabled services, can enhance well-being specially of more vulnerable customers (Miskeli 2001; Berry and Bendapudi 2007; Bujnowska-Fedak and Pirogowicz 2013; Gil and Amaro 2015; Ostrom *et. al.* 2015).

2.9.2 Technology impact on the elderly sector

Never stop learning. Life never stops teaching.

Unknown

Technology has a substantial potential to improve access to, as well as support efficient and effective care for the elderly, the world demographic changes imply a significant increase in the demand for health care on a global scale. Innovative solutions such as e-health may produce greater efficiency in care delivery for the elderly and improve service quality (Tse, Choi and Leung 2008, Gil and Amaro 2015, WHO 2015). New assistive devices and supportive environments may improve the ability of older people to do the things that are important to them despite significant limitations they might have in their capacity (e.g. Internet can provide video access to distant family and online support networks) (Grönvall and Verdezoto 2013; Yao, Zheng and Fan 2015).

However, some of the most important barriers to developing good public-health policy on ageing are pervasive misconceptions, attitudes and assumptions about older people. Typically, the elderly are identified as having less familiarity and mastery of ICT skills, and more so with advancing age, which limits the way society recognizes this segment in using it (Bujnowska-

Fedak and Pirogowicz 2013, WHO 2015). There's still scarcity of research and, therefore, inadequate information available on the needs, views, and attitudes of the elderly population in the use of technology enabled services (Bujnowska-Fedak and Pirogowicz 2013). Hence, it is increasingly important and timely to learn about the opinions, perspectives, and concerns regarding the use of technology in this segment of the population. Questions remain and must be addressed, regarding the challenges faced by the elderly in its use.

Many older adults do not perceive that health care technologies can significantly improve their lives. However, within literature there are several references to a positive influence in quality of life, safety, acceptance and empowerment when, for instance, self-monitoring fits into the older adults everyday life (Berry and Bendapudi 2007, Grönvall and Verdezoto 2013, Ostrom *et. al.* 2015).The attractiveness of services such as e-health, is directly related to the compatibility of the service with personal needs and the older people's perception of whether new technology can be of benefit to them. People take different stances towards their health and illness, even at the same age stage according to their life context (past experiences, individual expectations and beliefs) which supports that customer motives and will to co-create value vary with their benefits expectancy (Dagger, Sweeney, and Johnson 2007, Frow and Payne 2007, Grönvall and Verdezoto 2013, Verleye 2015).

Regarding technology, it is known that younger people are more comfortable in using it. But believing that learning is only intended to happen in early stages in life is totally outdated, so nevertheless that the elderly don't show mastery of ICT skills and maybe even some technology illiteracy, it doesn't mean they can't or don't want to learn how to use it to improve their health outcomes, well-being and quality of life (Bujnowska-Fedak and Pirogowicz 2013, WHO 2015).

2.10 Literature review gaps

The world complexity is increasing with new challenges such as technology developments. Given the importance of health care sector, and the heavy strains it is facing mainly due to the population aging, it is seen as a context for a variety of research priorities (Ostrom *et. al.* 2010) and a fertile field for service research (Berry and Bendapudi 2007). The interest in understanding how services can be more valuable to society has substantially increased. Examining the relationship between service and well-being, for instance, was ranked as a priority in research networks. Ostrom *et. al.* (2015, p. 140) emphasized the effect of service on improving well-being "through transformative service". McColl-Kennedy *et. al.* (2012) findings also revealed a link between customer value co-creation practice styles and well-being (see McColl-Kennedy *et. al.* 2012) therefore, understanding how individuals co-create value to manage their health care is important (Sweeney *et. al.* 2015, WHO 2015).

Customer value co-creation, as the enhancement of customer benefit from the integration of resources (both internal and external), has the potential to affect quality of life perceptions (Varleye 2014). Certain co-creation situations (as health care treatments) require a high level of emotional involvement, researchers require for studies that comprises the role of emotions in service experience co-creation, addressing the emotions of customers (Jaakkola, Helkkula and Aarikka-Stenroos 2015). Illness experience is not separate from the rest of the patient's life and can affect their quality of life, relationships with others as well as their emotions. Patients may experience different emotions in the need for stimulus, recognition, structure, belonging and control. When these factors are taken into consideration in patient contact, patients are more likely to have positive experiences of self-efficacy, confidence, motivation, as such "Identifying

customer attributes associated with a positive service experience" is a service research priority (Ostrom *et. al* (2015, p. 139).

Verleye (2015), supported by Fuller (2010), presented a theoretical framework, containing the individual and environmental determinants for a costumer experience co-creation, highlighting that customer motives and determinants to co-create value vary and are deeply connected to their expected "benefits" and "customer role readiness". In accordance to Varleye (2014) research findings, future research should investigate what impact different types of instruction forms have on the role readiness of customers with different expectations in terms of co-creation benefits. Illiteracy, for instance, is associated with worse health care system (Weiss *et. al.* 1992*;* Baker *et. al.*1996), reading difficulties have a deep negative effect on people and their ability to interact with the health care, and it has a profound effect on their daily life and self-esteem. The literature review suggestions for research emphasizes the importance of examining consumers in the context of the time and life circumstances, with a holistic perspective. Researchers encourage studies to enhance the understanding of how customers perceive their experiences (Berry and Bendapudi 2007; Ostrom *et. al.* 2010; Helkkula 2011).

Regarding technology, it has been the primary vehicle for health care innovation for more than 50 years, its improvement has been a driver to shift health care service delivery (Tettegah and Garcia 2016). Technology may have the power to turn health care experience superior for customers (Bujnowska-Fedak and Pirogowicz 2013). The technology-enabled services role in affecting well-being is being highlighted among researchers (Ostrom *et. al.* 2015; WHO 2015). ICT can be used to enhance the efficiency of current services provided, and it offers possibilities for totally new types of services. Ostrom *et. al.* (2015, p.141) highlighted important questions around this subject, such as "How can technology advances in e-medicine, remote health monitoring, and smart devices that track and analyze health information positively affect well-being? And, under what conditions might use of these technology-based services reduce well-being?"

Also Verleye (2015), referrers to the importance of understanding the role of technology enabled services in service co-creation phenomenon such as, online community that might generate more opportunities to connect with like-minded people – and thus better social experiences. Also, questions remain and must be addressed, regarding the challenges faced by the elderly in the use of technology (WHO 2015), and the illiteracy among the elderly can be an even bigger constraint if health care and technology are combined.

3   Methodology

This research methodology comprises a qualitative study based on semi-structured interviews with elderly citizens using a Grounded Theory (GT) approach. Literature review was undertaken interactively as data analysis occurred, however a moderate review was done in the beginning to get a first understanding of the concepts under study.

Firstly, we conducted a research methodologies analysis in order to comprehend which one was more suitable to be used in our research. A brief resume of the analysis and the final motivation to pursue with qualitative methods is explained further. Following, a description of the most significant attributes of qualitative methods is stressed, mostly regarding Grounded Theory that is the qualitative method followed by our research. After, the sample design is framed and the most significant topics described, as the principles that sustained our data collection and finally our data analysis, as for instance, the use of coding techniques.

Twelve individuals, separated in to two-stage sampling scheme were interviewed to represent elderly customers, using two different in-depth interview guides, with the aim of further analysis on the role of technology in supporting the health care service experience and the impact on well-being of the elderly. Each interview was recorded and then transcribed, in order to capture the most relevant information. The collected data was coded and analyzed with a Computer-Assisted Qualitative Data Analysis Software (Nvivo®) to support the analysis, and in order to understand customers' health experience, how emotions can affect it and explore the role of technology on supporting it.

3.1   Research methodologies analysis and motivation to choose a qualitative approach

Scholars face many approaches from which to choose when they conduct a research study. To Neuman (2000) there are two categories for data collection: quantitative, which provides data in the form of numbers and qualitative which provide data in form of words and pictures.

Qualitative research is often described as suitable when studying episodes, actions, norms, and values. The quantitative research process is directed toward the development of testable hypotheses and theories, which are generalizable across settings. Methods used in quantitative research include, e.g., surveys, simulation and experiments, it aims to achieve absolute an undeniable truths and it is measured in absolute, quantifiable terms (Neuman 2000). As opposed to quantitative methods, qualitative research methods are flexible, context-specific and situational, furthermore rather than avoiding involvement of the researcher, they recommend it (Neuman 2000). Quantitative research and qualitative research are often described as dichotomies in a number of ways and should be viewed as continuums rather than discrete categories on which a number of positions could be accepted and adopted. Depending on the knowledge needs of the research field, different research strategies are available - quantitative, qualitative, or a combination of both (Sandem 2007). Within this research the focus was towards the use of qualitative methods, due to its objectives, and the increased recognition of the benefits of a qualitative approach to health care research (Marchall 1996). This approach provides insights that would be difficult to get otherwise, as such is suitable for investigating human interactions, meanings, and process that underlie the phenomenon under study (Gephart, 2004).

3.2 Qualitative methods

The qualitative research term is used to refer to a set of different approaches to research within social sciences (e.g. nursing, education, public health, among others), lying in its origins, it is also known as "hermeneutic, reconstructive or interpretive approach" according to which research perspective it belongs (Flick 2002, p. 6). These methods have been widely used in different areas.

This dissertation intends to gain deeper insights to "subjective viewpoints", due to its theoretical position - "phenomenology"; the intended method for data collection is "semi-structured interviews"; and the methods for data collection interpretation - "content analysis and theoretical coding" (Flick, Kardoff and Steinke, 2009, p.19).

For a "subjective viewpoint approach" (Flick 2002), there are some methods that are more suitable than others. An overview of the characteristics of some qualitative research methods, is shown in Figure 4, allowing a comparative analysis of the different approaches, as well as the elements of each design (Creswell *et. al.* 2007, p. 241).

Characteristics	Narrative Research	Case Study	Grounded Theory	Phenomenology	Participatory Action Research
Type of problem best suited for design	When detailed stories help understand the problem	When researcher has a case bounded by time or place that can inform a problem	When no theory exists or existing theories are inadequate	When the researcher seeks to understand the lived experiences of persons about a phenomenon	When a community issue needs to be addressed so that change can occur
Discipline background	Humanities	Psychology, law, political science, medicine	Sociology	Psychology, education	Philosophy, broadly in the social sciences
Unit of analysis	One or more individuals	An event, program, activity, or more than one individual	A process, action, or interaction involving many individuals	Several individuals who have shared the experience	An entire community
Data collection forms	Interviews, documents	Multiple forms: interviews, observations, documents, artifacts	Primarily interviews	Primarily interviews, although documents, observations, and art may also be considered	Depends on the community needs; can be both quantitative and qualitative
Data analysis strategies	Chronology, elements of a story, restorying	Description of the case and themes of the case as well as cross-case themes	Open coding, axial coding, selective coding	Bracketing, statements, meaning units or themes, textual description, structural description, essence of the phenomenon	Involve the community in decisions as to how to analyze the data

Figure 4 Some of qualitative research methods overview adapted from Creswell *et. al.* (2007, p. 241)

In order to choose the appropriate qualitative method for this research, the different methods were analyzed. Grounded Theory was considered the most adequate because it provides an in-depth understanding of the phenomenon. Grounded Theory has gained popularity in sociology, nursing, education, psychology, and other social science fields, as it is a valuable aid for practitioners in the field as well as for students in training, nowadays accepted both by quantitative and qualitative researchers for combining both flexibility and legitimacy (Charmaz 2006). In this approach the inquirer generates a general explanation (a theory) of a process, action, or interaction shaped by the views of participants (Creswell 2007), it involves the researcher in data collection and analysis and theory emerges from the data by means of his inductive reasoning (Charmaz 2006). Taking into account that we were not totally free of knowledge (Charmaz 2006), but from experience, about the subject under study, GT was

applied as an abductive method (Charmaz 2006; Corbin and Strauss 1990), which entails an iterative process that builds upon previous knowledge.

3.3 **Grounded Theory**

It's "grounded" on data.

(Charmaz 2006)

Qualitative research (in comparison with quantitative methods) doesn't aim to achieve absolute an undeniable truths, it is not measured in absolute, quantifiable terms, instead, it is flexible, context-specific and situational (Neuman 2000). Due to this specific characteristics there was a frequent judgment saying that it lacked method and scientific rigor, which lead to a supremacy of quantitative methods use, even in fields such as sociology (Golding 2004, Charmaz 2006).

This lead to the recognition of the need for a methodology that could track and validate the process of theory building. In 1967 Glaser and Strauss proposed a "general method of comparative analysis…as the best approach initial, systematic discovery of the theory from the data of social research" (see Glaser and Strauss 1967). This method is called Grounded Theory, to reflect, as the name suggests, theory that is grounded in the words and actions of those individuals under study, an area of enquiry that is focused on society and the individual (Golding 2004, Charmaz 2006).

According to Charmaz (2006), for Glaser and Strauss (1967; Glaser, 1978; Strauss, 1987), the defining components of Grounded Theory practice include:

- Simultaneous involvement in data collection and analysis;
- Constructing analytic codes and categories from data, not from preconceived logically deduced hypotheses;
- Using the constant comparative method, which involves making comparisons during each stage of the analysis;
- Advancing theory development during each step of data collection and analysis;
- Memo-writing to elaborate categories, specify their properties, define relationships between categories, and identify gaps;
- Sampling aimed toward theory construction, not for population representativeness;
- Conducting the literature review after developing an independent analysis.

Nowadays there are two main approaches to Grounded Theory: the more systematic procedures of Strauss and Corbin (1990) and the constructivist position of Charmaz (2005, 2006). In the more systematic, analytic procedures of Strauss and Corbin (1990), the investigator focuses on a process, action, or interaction.

Charmaz (2005, 2006) instead of embracing the study of a single process or core category, assumes diverse local worlds and multiple realities and aims to show the complexities of particular worlds, views, and actions (Golding 2004, Creswell *et. al.* 2007). Accordingly constructivist GT, lies directly in the interpretive tradition of qualitative research with flexible guidelines, a focus on theory that depends on the researcher's view, learning about the experience within embedded, hidden networks, situations, and relationships. She sees Grounded Theory methods as a set of principles and practices, not as prescriptions or packages (Charmaz 2006).

As a dynamic and developing methodology, Grounded Theory generates much discussion and perhaps the most interesting one is between the "founding fathers", Glaser and Strauss (1967). Despite their collaboration, the two authors have tended to disagree in perspectives and took Grounded Theory in somewhat divergent directions. Glaser, for instance, has criticized Strauss's approach to GT as too prescribed and structured (Charmaz 2006, Creswell *et. al.* 2007). Strauss and Corbin view is more straightforward, closer to Charmaz position (Charmaz 2006).

Another point of discussion in the literature review process, regarding GT, is the nature of "induction" preconized by Glaser and Strauss (1967). A method of conducting qualitative research that focuses on creating conceptual frameworks or theories through building inductive analysis from the data. A common misconception is that the researcher is expected to enter the field ignorant of any theory or associated literature relating to the phenomenon and wait for the theory to emerge purely from the data (Golding 2004, Charmaz 2006, Creswell *et. al.* 2007).

Every researcher has background assumptions and world perspectives, they often begin their studies with certain research interests and a set of general concepts which alert them to look for certain possibilities and processes in their data. These assumptions and perspectives shape research topics and conceptual emphases, they give ideas to pursue and sensitize you to ask particular kinds of questions about the topic and not others. With this logic of research, GT falls within the realm of abductive research logic, were sensitizing concepts and disciplinary perspectives provide a place to start, not to end (Charmaz 2006).

Grounded Theory guidelines describe the steps of the research process and provide a path through it. Researchers can adopt and adapt them to conduct diverse studies (Charmaz 2006). Therefore, accepting Charmaz's, Glaser's, Corbin's or Strauss' Grounded Theory strategies, and Glaser and Strauss (1967) invitation for flexible GT strategies use, this research cannot be said to adhere completely to a single vision. It is an interpretation of GT, using its adaptability to fold it to a project scope and goals.

3.3.1 Sample design

Choosing a study sample is an important step in any research project and the selection of the appropriate method depends upon the aim of the study (Marchall 1996). As in other aspects, such as the use of literature review, also the sampling process is different in a GT research when compared with other qualitative methods. In GT research the principal strategy for sample is usually theory driven, that is the sample is defined as the research develops, it adapts itself as new ideas surge or, if existing ones need additional proof to gain strength, this is corresponds to an interactive process of qualitative study design and is called Theoretical Sampling (Marchall 1996; Goulding 2005; Charmaz 2006).

Within this research, after some literature review and taking into account the study main theme, in a first stage, a first sample was defined and consisted in elderly citizens living in a nursing home. Inside the nursing home the choice of the residents relied on factors such as their capacity to comprehend the questions and to articulate speech, and willing to participate in the study, and was made by the director of the nursing home.

Unfortunately due to the setting constraints it was not possible to do a geriatric assessment using the Mini-Mental State Exhamiation (MMSE) as was desired, but it was possible to apply the

Barthel Index Activity (see Appendix C for an explanation) in order to evaluate the respondent's performance in the Activities of daily Living (ADL) (Table 6).

During the interviews it was noticed that the average age of the interviewed people was 79 years old (Table 6), they were all women and they do not use any kind of technology or didn't understand it that way, some important themes were left out by this group and new ideas emerged that needed an in-depth understanding and more exploration. According to this and the literature review that was being iteratively done as data was being collected, the sample was extended to older adults who somehow used technology and recognized it.

As the simultaneous data collection and analysis should guide subsequent sampling, in order to achieve the theoretical saturation of categories recommended by GT (Goulding 2005; Charmaz 2006), contacts with other institutions that could help in this process were searched, but unfortunately unsuccessfully. As such, the second stage of sampling, was obtained through personal network contacts and it was possible to interview six older adults who used health related technology, which was again not easy at all. The average age of this group was 65 years (see Table 6).

Table 6 Sample Socio-Demographic Information

Age	Male	Female
55-65	4	2
65-75	0	2
>75	0	4
Occupation		
Retired	4	7
Employed	0	1
Education Level		
Basic (4th grade)	0	6
Secondary	3	2
Higher	1	0
Chronic Diseases	2	6

Residence Type	
Family	6
Nursing home	6

Activities of daily living (Barthel Index Activity)	
Dependent	0
Independent	8
Semi dependent	4

A simple overview shows that:

- Concerning gender, it is somewhat unbalanced with 72% females;
- Also 72% of the individuals has, at least one, chronic disease;
- Most of the interviewed individuals are already retired;
- High percentage of only primary education 54, 4%;

- 50 % lived at the nursing home while the other 50% lived with their family (mainly the spouse/husband);

- None of the respondents was dependent on his ADL, 66, 6% independent and 33,4% semi-dependent.

Due to time set and access to people constraints the sample size was limited. Marchall (1996) states that the larger the sample size the smaller the chance of sampling error and all these constraints produced a less than ideal sample, but the same author also states that due to the fact that the sampling error is inversely proportional to the square root of the sample size, there is usually little to be gained from studying very large samples, thus the sample was, sufficient and satisfactory for the proposed goals and available time. Nevertheless, in future research on this or related theme, it would be beneficial to rely on a larger sample, but mainly to have access to more users of health related technology.

3.3.2 Data collection

Data was collected between the 5th and the 23th of May 2016. In-depth interviews (or semi-structured interviews) are valuable tools to get insights into what the individual thinks about a certain topic and to obtain his unrestricted feelings towards the subject, they allow the researcher to gather as much detail as possible about the knowledge and the behaviour of the individual, thus they are in line with GT appeals: a wide range of data (Goulding 2005; Charmaz 2006; Lacobucci and Churchill 2010).

As said previously the interviews were undertake within the elder segment, through an elderly nursing home, which kindly allowed us to interview six of its residents during one day and with this group time activities constraints. The other interviews were done to older adults through networking, at individual's time and day of choosing.

The interviews were audio recorded for later analysis and it was done with the customer's written agreement, having them signed and retained a duplicate of an Informed Consent form (Appendix A).

Owing to the thesis general area under study and the interest in trying to understand if some differences exist between the two samples: elderly people that do not use technology or do not have the perception of it and older adults who somehow call upon technology on their health experience, two different interview guides were developed, the respondents were grouped into two sets: users and non-users (Appendix B).

The interviews were done face-to-face, and started with an introduction about the research scope. The interviewer also included contextualizing information to provide a frame of guidance (Foddy 1993). For example, it was explained that the interview methods and that there were no right or wrong answers, the objective was to obtain their personal opinion.

In-depth interviews were used to ensure that all the topics were addressed. Due to the fact that literature was not exhaustedly reviewed prior to data collection, rather it was "consulted as part of an iterative, inductive and interactional process with simultaneous analysis and emergent interpretation", there was the need to redirect some subjects to appropriate extant theories and literature that had relevance to the emerging data (Goulding 2005, p.296).

The interview guides were constructed in a flexible framework and questions were adapted, depending on the individual behaviour towards the questions (Fontana and Frey 2000; Froddy

1993). Although, the principles of collecting both attitudinal and behavioral data were followed by addressing questions which included: Motives; Behaviour; Current feelings and Future intended behaviour. Probing questions were used as well to get more data on the topics (Creswell *et. al.* 2007; Lacobucci and Churchill 2010)

Regarding the interview guides, one had as target audience: non technology users, it was built thinking in the elder people, to try to understand their health experience, their knowledge/ perception about health related technology and their emotions towards both. The other guide was developed for technology users, with aim of understanding how they use technology concerning health care, what kind of technology is used and their health experience.

As said, the interview structure was not rigid but intended to give a "conductive wire" towards the topics to be addressed, letting space for improvising (Newman 2000). Both interview guides started aiming to understand the customer's health experience, the first question intended to explore their day-to-day activities and the periodicity of attending health care services. It was intended to understand how the customers perceive the experience of resorting to health care services, and for those who do it with a certain regularity how they feel about it. Afterwards, the question aimed to know their main difficulties during that experience and if they wanted it to be different, if they wanted to reduce the periodicity for instance. The next step was to collect data about what meant the most for each one of them regarding the health care service, what they value the most.

At this stage the guides followed different paths. The one for non-technology user's goal was to comprehend the elderly knowledge about technology, their knowledge about health related technology and their feelings towards technology use, their will. On the other hand, for the technology users the goal in this second part, was to know which technologies they use, how is that experience and how they wanted it to be. Finally, for both audience the last part aimed to attract their creativity, appealing to their innermost feelings, wants and needs enquiring about a proposal of a new technology or service that could enhance their health/health management.

3.3.3 Data analysis

How we make sense of it shapes the ensuing analysis.

(Charmaz 2006, p. 46)

Despite the open and flexible nature of the data that may be used in a GT study, there exist a set of specific principles for analyzing and abstracting the information (Golding 2004, Charmaz 2006). Coding is the fundamental analytic process to be used by researchers, it "generates the bones" of the analysis (Charmaz 2006, p. 45). Through coding, the researcher moves beyond concrete sentences and makes analytic interpretations, which is the essential connection between collecting data and developing theory to explain it (Corbin and Strauss 1990; Golding 2004, Charmaz 2006).

According to Strauss and Corbin (1990) there is a specification of steps in coding data and in developing a visual model of the theory. Researchers begin with open coding, coding the data for major categories of information. From this coding process, axial coding emerges in which the researcher identifies one or more of the open-coding categories and reexamines the data or collects new data to build a model around this core phenomenon. The model generated—often is a visual model in the form of a figure or diagram (Golding 2004, Creswell *et. al.* 2007). Charmaz in turn, places more emphasis on individuals' views, values, beliefs, feelings,

assumptions, and ideologies than on research methods, although also describe the practices of gathering rich data, coding the data, *memoing*, and using theoretical sampling (Charmaz, 2006).

Therefore in accordance with GT premises, to assign significance, coherence and meaning to the data collected, a literal transcription was performed and data analyzed using NVivo®. The information was analyzed through the application of open coding techniques, or line-by-line analysis (looking for words and sentences in the text that have meaning). The segments were named with some granularity. This included a constant comparison of the interview texts, they were analyzed line by line, provisional themes noted, and subsequently compared with other transcripts in order to ensure consistency (Corbin and Strauss 1990, Charmaz 2006, Creswell *et. al.* 2007). In the next phase the focus was on sorting, selecting and organizing the data into main categories searching for links through the identification of concepts that may go some way to offer an explanation of the phenomenon under study (Corbin and Strauss 1990; Golding 2004, Charmaz 2006, Creswell *et. al.* 2007). For each of the categories an interpretation of the inherent ideas was made in order to frame them into the most appropriate theoretical approaches (Charmaz 2006).

Within GT there should not exist "preconceived" theories into which data is framed, it is the other way around, learning emerges from data collection and analysis, so in fact the analysis has brought results that somewhat differ from what was planned earlier, it brought new concepts and "unforeseen areas" (Charmaz 2006, p.46) that needed deeper study and literature review. This involved balancing between previous knowledge and keeping an open mind to new concepts as they emerge from the data. This meant contrasting literature iteratively with data as the process evolved (Golding 2005).

The research started with initial concepts of the activities, interactions and the role of technology and evolved as data were analyzed. Differences between the elderly living in the nursing home (more than seventy-four years old) and the older adult living with family (more than sixty years old) emerged so the analysis compared the two groups. Both short-names and categories are a result of researcher interaction with the interviewed individuals, parallel with data analysis and self-understandings about empirical world. The codes were chosen, taking into account the participants perspectives, the moment of data collection and their non-verbal expressions (hidden assumptions), as such there is a deep researcher involvement in data analysis and findings (Neuman 2000, Charmaz 2006, Creswell *et. al.* 2007).

4 Results

Qualitative research of all sorts relies on those who conduct it.

(Charmaz, 1990, 1998; cf. Glaser & Strauss, 1967; Glaser, 1978)

In this section the results of the qualitative study are going to be presented with the identification of the value co-creation activities, interactions, and technology supportive role, its benefits and impediments.

4.1 Customer Value Co-creation Activities

According to S-D logic, providers only deliver partial inputs into the customer's value-creating processes (Vargo and Lusch 2004), thus customers also contribute for value creation on their own (McColl-Kennedy *et. al.*2012). Value co-creation is composed by the costumer's active role in a series of activities (Vargo and Lusch 2008) to achieve the expected benefits (Prahalad and Ramaswamy 2000, Vargo and Lusch 2008, Verleye 2015) with great effect on their well-being (McColl-Kennedy *et. al.* 2012). Therefore, the analysis started with the identification of the value co-creation activities (VCA) (McColl-Kennedy *et. al.* 2012 and Sweeney *et. al.* 2015). These authors identified eight activities: *Cooperating; Collating information; Combining complementary therapies; Colearning; Changing ways of doing things; Connecting; Coproduction; Cerebral Activities engaged in by the self that ultimately contribute to the cocreation of value.*

The analysis of the activities performed by the interviewees revealed five from the eight VCAs which are as follows: *Cooperating*; *Collating information*; *Colearning*; *Cerebral Activities*; and *Changing ways of doing things* (see Table 7). Thus confirming that a wide range of activities support the individual's goal of good health (McColl-Kennedy *et. al.* 2012). Regarding "Changing ways of doing things" activity, McColl-Kennedy *et. al.* (2012) study descriptions for this activity, doesn't clearly match with our analysis. In our study this activity is related to individuals' changing their former way of doing things, to adapt to a new life situation such as, aging, a new situation (e.g. retirement) or a health problem. Thus a new explanation more suitable to represent this activity outcomes was added. Also, results show that respondents undertake a different range of behaviors from minimal or active compliance, or "simple (low level)" to "complex (high level)", in line with previous research (McColl-Kennedy 2012, p. 375).

Results also show that the majority of respondents engage in activities requiring less effort, such as "cooperating", than activities which require greater effort, as previous shown by Sweeney *et. al.* (2015). In a first glimpse, illness might be pointed as a reason for this resource reduction due to the impairments it might cause, affecting one's capabilities and turning the tasks more difficult to complete (Sweeney *et. al.* 2015). However a further exploration showed that individuals from both respondents groups (elders in nursing home and older adults living at home) have had severe health problems with current consequences and manifestations, however the elderly, living in the nursing home, revealed lowest/simpler levels of compliance within their health activities. On the other hand, older adults showed higher levels of compliance in more complex activities. Thus within health care the treatment plans and health care related activities should include aspects of the individual's life such as lifestyle, beliefs and personal resources McColl-Kennedy *et al.* (2012).

Table 7 Health experience value co-creation activities (Based on McColl-Kennedy *et. al.* 2012)

Activity theme	Compliance level	Description	Example quote	Number of individuals
Cooperating	*Low level*	*Accepting information from the service provider* *Compliance with basics*	"No one does anything on the device, just me, it's the 1st thing I do in the morning. When I finish treatment I take it and wash the site, only at night when I come from treatment I put water again. And the doctor says: - "I see that they treat it very well" and I say: - "Oh Doctor, is me who do it all" and he is amazed. " (Female, POCD, 88) "The chronic medication, I write it down for the doctor give me the recipe. It's faster." (Female, Arthritis, 77)	10
Collating information	*Low level*	*Sorting and assorting information, managing basic every day activities*	"(…) I weight myself every day and I put it there, so I have my track record."(Male, 62)	3
Colearning	*High-level*	*Actively seeking and sharing information from other sources*	"Usually when I have some difficulty, any doubt about the medication, food ... I consult the internet to know more about it." (Male, CVA, 60) "Regarding the Internet, when something appears, I search about it. There's always that internet curiosity to go see what it is, what are the symptoms for e.g." (Male, 62)	3
Cerebral Activities	*High-level*	*Having a positive attitude* *Reframing and sense-making*	"It is a pleasing effort, given that it is to my quality of life maintenance and enhancement. To have a better quality of life we cannot consider an effort to go to the doctor." (Male, Multiple Bypass Heart Surgery/CVA, 60)	5
Changing ways of doing things	*High-level*	Managing daily life according to health situation/enhancement Adapting to new social roles/age	"(...) nowadays I go hiking, given my poor health situation (the diabetes and the hypertension), then a healthy lunch and return to a walk in the afternoon." (Male, CVA, 60) "From a certain age I began to go from 6 in 6 months to the health center. Now that I'm retired I go to a specific doctor, to do the same occupational medicine did while I was still on the active. These were the criteria I've adopted." (Male, 62)	4

It has been proved that customers involvement in activities that require higher effort, such as health care activities (Ostrom *et. al.* 2015) have shown to result in improved individuals' health status. Thus it is expected that individuals who engage in activities beyond basic compliance will report relatively higher quality of life and well-being. As such, is important to analyze the respondent's quality of life to understand its impact on customers' compliance. Four domains of quality of life (Existential, Psychological, Support, and Physical) previously identified (McColl-Kennedy *et. al.* 2012), were used to frame the analysis. Medical experts and service

marketers have argued that health-related quality of life is a vital indicator of health care service performance (Yao, Zheng and Fan 2015).

To enable exploring if the interviewees context made a difference on the results, the sample was divided into two groups and their answers classified as positive or negative in each domain (see Table 8). The results show a difference between the "institutionalized", who are also the older respondents of our study, and "no institutionalized". The first ones revealed a worst quality of life evaluation in all its four domains, although mostly on "Existential" and "Psychological". The older adults showed a better evaluation of quality of life aspects, including "Psychological". This group also showed having higher levels of compliance with complex activities, such as self-generated activities, positive thinking and emotional regulation, consistent with customers' emotional resources (Sweeney *et. al.* 2015).

Table 8 Quality life domains evaluation: Institutionalized vs. Non Institutionalized

Quality of life domains	*Institutionalized* *Elderly group*		*No Institutionalized* *Old adult group*	
	Positive *n*	**Negative *n***	**Positive *n***	**Negative *n***
Existential	0	6	5	1
Psychological	0	6	5	1
Support	3	3	6	0
Physical	1	5	3	3

The results show that the ways in which customers co-create service experiences are dependent on individual's own context characteristics (McColl-Kennedy *et. al.* 2012). Also Vargo and Lusch 2014 emphasized the subjective, case-specific, and context-specific dimensions of experience co-creation. Generally older adults possess a wide array of resources, integrated from exchanges with friends and family and from their own resources (as self-regulated emotions). In the institutionalized sample respondents integrate fewer resources, which affects negatively their co-creation compliance (Sweeney *et. al.* 2015).

Accordingly, this study results shows that health care value co-creation activities have the potential to improve patient's health care experience and therefor enhance one's well-being (Raleigh *et. al.* 2009), extended by the level of compliance that each individual has towards a given activity and its complexity. According to Sweeney *et. al.* (2015) "engaging in more demanding and effortful activities should result in stronger quality of life perceptions, while undertaking activities that are less effortful is unlikely to maximize quality of life". This study confirms these results, but further shows that compliance is also affected by current quality of life perceptions, which might be seen as a continues cycle with no defined starting and ending point. Also, for Pine and Gilmore (1999, p.12) "experiences are events that engage individuals in a personal way and derive from the individual's prior state of mind". Thus, the level of compliance is affected by many factors, such as individual quality of life (composed by its four domains), context and personal resources (see Figure 5). Therefore, health care experience as to be seen considering its holistic dimensions (Helkkula 2010, Lemke *et. al.* 2011, McColl-Kennedy 2012, Sweeney *et. al.* 2015, Ostrom *et. al.* 2015).
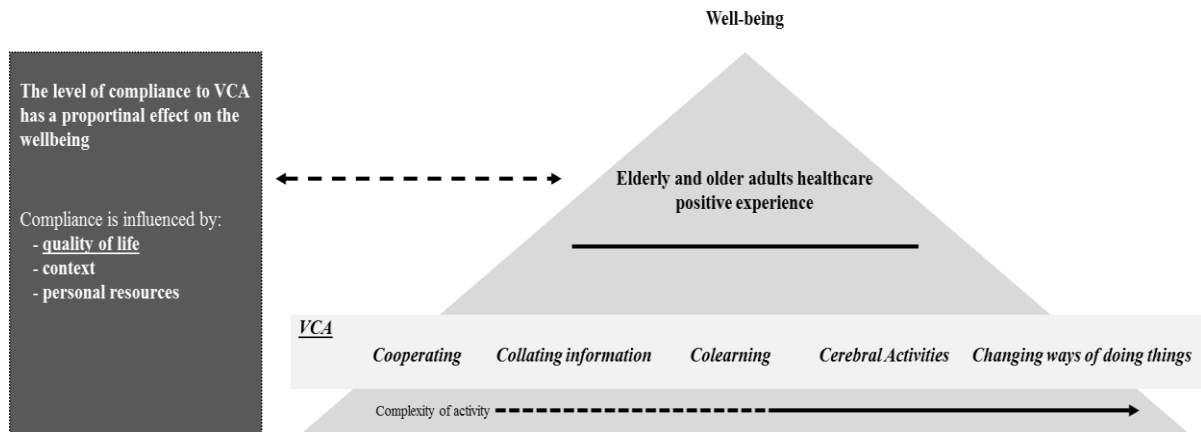
Figure 5 VCA compliance impact on well-being

4.2 **Customer Value Co-creation Interactions**

After exploring the co-creation activities, it is important to understand the interactions customers have when performing these activities. Interactions are the ways individuals engage with others in their service network to integrate resources (McColl-Kennedy *et. al.* 2012).

The results were broadly grouped around interactions with: Supportive figure /Network; Health Professionals (in general); Doctor; and Technology. For each of the major categories, a set of attributes were found in the respondents discourse, which are the characteristics that could enhance or deteriorate one's health experience. Each interaction and corresponding attributes was identified and labeled. Also important are artifacts or "means" respondents explicitly or implicitly refer to as facilitating or supporting interactions. Table 9, show the interactions, artifacts used, example quotes and previous research supporting the findings. The results were analyzed around the two groups; elderly institutionalized in nursing home and older adults.

Supportive figure /Network includes people that support the elderly in their different activities and can be family, friends, the nursing home staff or even others patients. These interactions occurred implicitly or explicitly. When the elderly living in the nursing home were questioned about their health experience, there wasn't a single negative answer, which raised the need to further understand the underline motives for such a positive experience. All of them referred to a figure to whom they recur when issues related to their health have to be sorted, they rely on this figure to help them in resolving practical things such as: schedule appointments, doctors recommendations or transport arrangement. When living apart from family or friends, this figure is their support and the key factor for their prompt positive answers. According to Mochis (2012) and WHO (2015) older adults often delegate difficult decisions to others whom they apparently perceive as more competent than themselves. However, the findings showed other factors beyond that, because of their low capacities and capabilities impairment (both physical and cognitive) they may need the support of figures to help them articulate the daily living activities.

Table 9 Health experience value co-creation interactions and its attributes

Interactions/ attributes	Description	Example quote	Artefacts/Resources	Supporting authors
<u>With Supportive figure /Network</u> (Family, Friends, Nursing home staff, other patients …) - **Recommendations (worth – of – mouth)** - **Health care processes support /facilitator** - **Daily activities support** - **Information exchange**	Can be explicitly or implicitly performed. The old adults respondents refer to recommendations and the information exchange between friends and family with or without disease experiences as a mean of enhancing their health experience. For the elderly group family support is also explicitly or implicitly important. But even more, the supports figure that ease their daily activities/health processes, and is critical for a good health experience. Customers are not alone, they are part of a network of actors who somehow contribute to value co-creation.	"The other point is that we sometimes are not aware of medical quality, for example, we have a problem and wondered: - to what doctor should I go?" (Male, 61) "(...) our network, the contact we have with other people, the acknowledge of other's experiences can help us a lot, knowing the others experiences leads us to or not to resort to that or another doctor. The experiences of friends, the mouth-on-mouth. " (Male, 62) "(...) And then the nurse every day check my diabetes and makes the daily results journal and the stings in the belly. Here we have a post of nurses, you know that? " "I do not make any effort, I speak to them and say - I need you, and they say: - Go downstairs then, and we make the appointment. Is easy, I have to say, regarding health care experience I have nothing to complain about." "No, nothing. Even now I request to schedule an appointment, I said Linda: - I want to go to a private doctor. I'm not walking well because of my leg and a few minutes ago I found her in the elevator and she told me: - is already scheduled. And I said: - then that's good."		Holbrook and Hirschmann (1982); Baker *et. al.* (1996) Edvarsson (2008) Vargo and Lusch (2004, 2008); Helkkula (2010); Hakanen and Jaakkola (2012); McColl-Kennedy *et. al.* (2012);
<u>With Health Professionals</u>	Within this category, the two groups showed different considerations,	"(...) From the nurses, a professional attitude and also support the patient." (Male, 60)		Wallston (1991); Stewart (1995);

(in general)

- **Empathy**
- **Attitudes**
- **Behaviour**
- **Communication**

With Doctor

- **Competence**
- **Reliability**
- **Reputation**
- **Efficacy**
- **Availability/waiting times**

divided into two categories: health professional in general and doctors. The doctor is referred in the first place, by all of them as the central figure in their health care experience.

The elderly referred as most important the "transcendent"/intangible aspects of the experience. This group mentioned the health professional's communication (both verbal and nonverbal), their attitudes and behaviour towards them as the factors that could change the way they experience the situation and even affect health outcomes.

The older adults also mentioned intangible aspects as the most important in their health experience. Again, doctor's figure is above the others, and competence, efficacy rates and availability to see patients is critical.

For all interviewees, the worst aspect of a medical appointment or treatment is the waiting time, this aspect was referred by all in a negative way.

"From of all people. I am well, if a person speaks to me badly I get nervous, it seems to me that bind me an electricity wire, I'm all unnerved. And when they treat me well, I am a wonder. " (Female, 88)

"I think what is even more important is the doctor's words to the patient, the attitude they have with the patient. It seems we've been already cured with good words. Now, when we go and they start to scold us, uh, then we come worse than we went. " (Female, 80)

"(...) The professional has always the last word. Is in the professional that I trust, and not on the internet. "(...) Then I turn to my doctor to know effectively, because it's on him that I trust." (Female, 60)

" I can see from the doctor if he is more or less able, if he is a good professional ... whether it is competent" (Male, 60)

"The most important in health care is the success that the doctor does, if he does it well done, we come to the end and we had success. The effectiveness, more to do, is to have results, be effective. The success." (Male, 62)

"But if we schedule through the assistants sometimes we have to wait a month or more!"(Male, 60)

"We got there and wait indefinitely, sometimes two hours waiting, it annoys me to be waiting. It is a perfect doctor, but to be there waiting ... annoys me. " (Male, 62)

"Oh to be fast, hours and hours waiting no please..." (Female, 77)

O'Connor *et. al.* (2000);

Fottler *et. al.* (2006) ;

Neuman *et. al.* (2011)

Ponsignon *et. al.* (2015);

Tettegah and Garcia (2016)

With Technology

- **Usability**
- **Ability**
- **Literacy (academic, medical and technological)**
- **Trust**
- **Reliability**
- **Education**

The most highlighted aspect was usability, (which is expected since most of them are not familiar with using it),. Easiness of access is also very important. Mainly due to the fact of high levels of illiteracy in the sample. The elderly also showed academic illiteracy which is a heavy constraints to technology usage, most of them didn't know how to read or write.

For the old adults, who also mentioned usability as a key factor, the other important factors are trust or distrust on technology outcomes, and its reliability when compared to technology existent in health care facilities.

All of them, with more or less practice and /or difficulties in technology usage, shown a great will to learn, though education, the volition and desire to learn, is a critical finding to highlight and seems to be independent of age.

"If I hadn't the BPAP I had to be without it. But it helps a lot. But I do not like it, I tell you now, it is a sacrifice… For God's sake. You put this ... Have you seen all night with this? In the morning I get up with the face all scratched, no joke. If this was manageable, but it's hard."

"The Internet, like all other technologies, is handling that makes it easy or difficult to practice. But it's easy. What makes it easy is the language used, which allows you to understand by interpreting what it says. It may be easier for some than for others, but it has to do with the cultural level. " (Male, 60)

"Sometimes information is very advanced. Or I'm not quite understanding, or it seems very simple and after all is not so." (Female, 60)

"Oh! If I were alone, I was able to learn. But in a crowded computer like that no, my head no longer works properly and I am ashamed." (Female, 77)

"I wish there was a website where I could check information, it should be certified by one of those governmental entities, so that I can have confirmation of data quality. I would like that the information on the internet was safeguarded by those entities. That they validate information, so that I have the notion that I'm not making serious mistakes. " (Male, 60)

"(...) I want them to speak and that I understand them, it does not need many words." (Female, 84)

- *E-mail:*

"The email, I use to talk to the doctor, which makes it much easier, especially to send the tests, or if we need anything." (Male, 62)

"On the Internet what I like most is the use of emails and social networks." (Male, 60)

- *SMS:*

"I have no problem, they send me an SMS, both in public and in private, for appointments alerts and stuff"

- *Internet (internet search engines):*

"Usually when I have some difficulty, any doubt about the medication, food ... consult the internet to know more about the subject."

- *Individual health devices (e.g. blood pressure machine/glucometer);*

"(…) Nowadays technologies already allow us to control diabetes and blood pressure at home."

"From what they tell me and the experience I have, measuring at home is never equal to the hospital, it fails, I think. I feel the need for a

Weiss *et. al.* (1992);

Baker *et. al.* (1996);

Demiris (2004)

Berry and Bendapudi (2007)

Tse, Choi and Leung (2008)

Mochis (2012);

Gil and Amaro (2015);

Ostrom *et. al.* (2015)

WHO (2015)

doctor to confirm, and I feel more comfortable. "

- *Mobil phone;*

"Mobile phone, I think is perhaps the means of communication more accessible to citizens, because the mobile phone is with us on a day-to-day"

For the older adults living in their own homes, supported by friends and family, this interaction was also clear, but more relating to a source of recommendations (*worth – of – mouth*) and information exchange within a network they previous knew or that happen to have similar health issues or interests. Thus, sharing and co-create experiences collectively in communities is important (Hakanen and Jaakkola 2012, Tax *et. al.* 2013, Sweeney *et. al.* 2015) and act as a support to their health care experience. This enables them to integrate resources through activities and interactions with different actors in their network (McColl-Kennedy *et. al.* 2012).

The way elders view health professionals was clearly different, doctors assume the main and critical role, as such the analysis was conducted first for health professionals in general and then doctors in particular. Regarding Health Professionals (in general) and Doctors, our results confirm that patients give much more significance to intangible aspects such as reliability and medical staff empathy, than to tangible aspects, in accordance with previous research (O'Connor *et. al.* 2000, Fottler *et. al.* 2006, Ponsignon *et. al.* 2015). In addition, most of the elderly institutionalized respondents give more importance to attitudes and behaviour as a key factor for health experience quality than the younger ones. The later rely more in concrete aspects such as doctor efficacy rates and his reliability among peers. This findings are in line with Ponsignon *et. al.* (2015), that presented factors such as reliability, efficiency and competence as factors of direct interactions that are considered by customers has fundamental for a health quality experience.

One important aspect for all respondents was the waiting times/doctor availability. This factor emerged as critical to their health care experience deterioration resulting in negative emotions. The anxiety caused by potential waiting times is felt even before the actual experience, harming their service experience quality. Thus value driven from resource integration behaviors may occur when service is actual performed or spatially or temporally distant from it (Sweeney *et. al.* 2015). Also customers are involved in a cognitive process given that "past, present or imagined future experiences are valuable for them" (Frow and Payne 2007, p.90). As such is important to understand the customer experience from a perspective of both normal day-to-day routinized actions, as well as more emotional experiences (Holbrook and Hirschmann 1982).

The fourth category was Technology, and the differences between the two groups, the elderly and the older adults, are even more evident. From the analysis it was perceived that the older respondents don't acknowledge the technology impact on their lives/health care, even what technology means. But when technology was further explored and observed within their context (e.g. bedroom), it was easily found some technology artefacts supporting health care (e.g. BPAP) or routine monitoring (e.g. glucometer). Thus it seems that the elderly do not perceive that health care technologies can significantly improve their lives (Grönvall and Verdezoto 2013). Although after these first reactions, in the interview respondents were confronted with present artefacts and offered a contextualization of technology with actual examples, linking them with their daily health activities. After this acknowledgment some referred them as actually fundamental in their health maintenance.

On the other hand, the older adults have shown themselves more comfortable with the subject, giving clear examples of technology artefacts or means they use and that they link to health care improvement and quality of life. They referred artefacts, such as the glucometer and blood pressure machine, and also within this group, even implicit, the e-health service arose. Individuals from this group have referred the internet as a resource for information collection and exchange in their health processes delivery and management (e.g. through SMS and e-mail), in line with previous research (Gil and Amaro 2015; Tse, Choi and Leung 2008).

While both groups have shown different positions towards technology, they have stated common attributes and concerns to its usage. Usability, although in different ways, was a clear factor that respondents consider when talking about technology use, either internet or medical devices. Thus, in accordance to Grönvall and Verdezoto (2013) when designing for health care technology adoption, features such as simplicity and a person's ability to control the technology should be considered.

Another important aspect towards technology adoption for both groups, that was directly referred by the older adults, but implicitly understood from the elderly during the interview, was illiteracy constrains (technological, academic and medical). Most of the older respondents have less than the fourth grade, some don't know how to read or write, and hence the technology accessibility is limited. For example one 88 old female said "I only have the third grade, in that time for my father girls didn't need to study, though I learn almost all by myself, nowadays I can read newspaper front page capital letters but slowly." For the younger ones this was pointed more in relation to medical terms knowledge and technological illiteracy, as an example we found it more related to internet use than the use of medical devices, which they refer to as "ease of use". Another important finding that clearly emerged from both groups, was the will to learn, which was evidenced by all and explicitly mentioned. Importantly learning should be extended beyond early stages in life (Bujnowska-Fedak and Pirogowicz 2013, WHO 2015). As such although elderly don't show mastery of ICT skills and maybe even show some technology illiteracy, it doesn't mean they can't or don't want to learn how to use it to improve their health outcomes, well-being and quality of life, when it is known that low literacy is in fact associated with worse health care (Weiss *et. al.* 1992*;* Baker *et. al.*1996).

The last technology related category was "Trust", referred mainly by the older adults and especially concerned self-monitoring devices results reliability when compared to hospital's devices, and this was one of the challenges also pointed by Grönvall and Verdezoto (2013) for technology adoption. But mostly regarding information quality and relevance, the respondents have mentioned their doubts on relying to medical information found on the internet because it is spread all over, with easy access, but hard to interpret and not always accredited by proper entities, with the potential to lead to misunderstandings with severe consequences (Maria João Gomes *at. al.* 1999). Figure 6 frames the major results of the analysis regarding health care experience interactions and each attributes pointed by the respondents as enhancers and facilitators of their positive experience towards well-being.
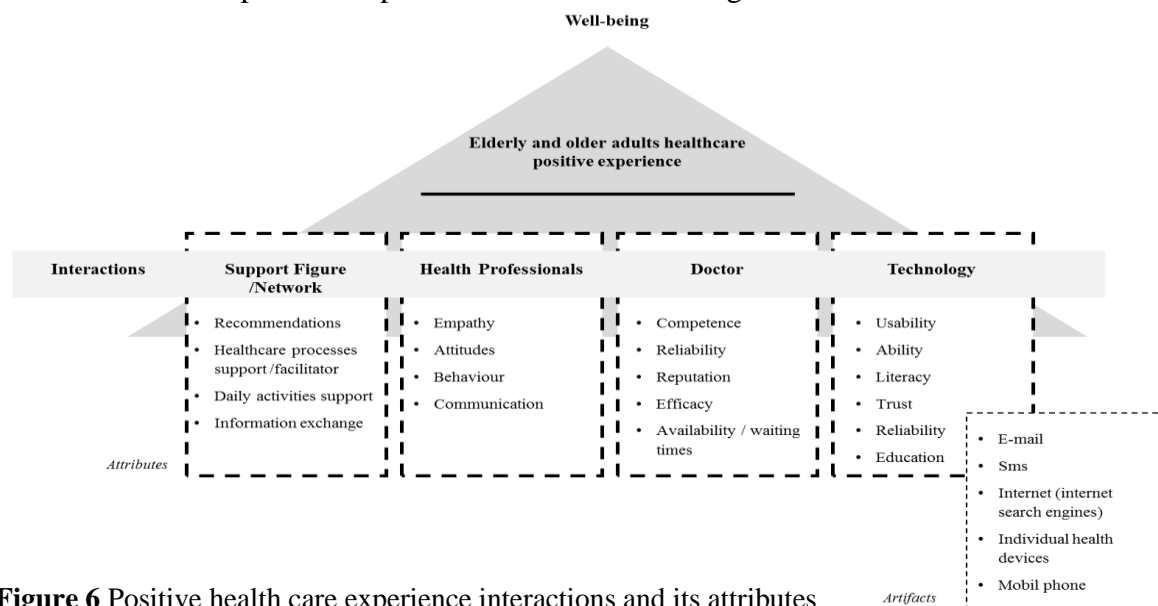

Figure 6 Positive health care experience interactions and its attributes

4.3   Technology supportive role, benefits and impediments

Research is fundamental to "deconstruct customers overall experiences, resulting customer satisfaction into its component experiences" (Meyer and Schwager 2007), is important to investigate the determinants involved in health care customer experience, and how may technology facilitate it, specifically the role of technology-enabled services in improving the well-being for vulnerable customers, such as the elderly (Ostrom *et. al.* 2015). Therefore, our third task was, again, a compilation of results obtained through coding techniques, to better understand how technology may support the service experience and the role of emotions of the actors involved in the experience (Jaakkola *et. al.* 2015). The detailed results are exposed in Table 10.

According to Verleye (2014, p. 322) the co-creation experience depends on customer characteristics, such as "expected co-creation benefits" and "customer role readiness". Both benefits and impediments for technology usage and adoption were found on the data, thus it was decided to separate them and group each determinants according to what Verleye (2014, p. 323) states to be the main categories for co-creation benefits: hedonic benefits (having pleasurable experiences); cognitive benefits (acquiring new knowledge/skills); and social benefits (being able to connect with other people). Nambisan and Baron (2009) also added to this categories "personal benefits" (e.g. self-efficacy), which were also included. This task is critical since, even that used heterogeneously among customers, co-creation expected benefits are the main drivers for value co-creation (Fuller 2010).

It is known that health care is as a high emotion service, as it often involves intense feelings even before the service begins (Berry, Davis and Wilmet 2015), thus the creation of customer's experiences should be considered from both rational and emotional perspectives (Frow and Payne 2007). Due to the highlighted role that emotions have on customers life conditions, which can influence their well-being and life satisfaction (Kraus *et. al.* 2000, McColl-Kennedy *et. al.* 2001), it was also significant to analyse the data considering the perceived emotions that technology provokes, its benefits and impediments. Furthermore there is still, a lack of information relating patient's emotions and technology, especially in the health care context (Varleye 2014).

4.3.1   Technology Benefits

The perceived benefits of technology usage on their health care experience were, hedonic, cognitive, pragmatic and social. Examples of hedonic, cognitive, pragmatic benefits are:, better health outcomes (e.g. improved health), information accessibility, independence/autonomy and enhanced self-efficacy. As said previously, although the elderly respondents had to be directed for technology use in their daily activities, then they acknowledge the impact that even simpler medical devices have on their health care and quality of life improvement. For the older adults the impact of technology on their health care experience is much clear, this group highlights the benefits technology brought to their lives in terms of an easy access to information, and most of all on their independence and autonomy, due to the fact that it allows them to perform daily tasks such as self-monitoring, increasing their control and assurance about their health status, hence their self-efficacy. The use of technology provides independence and personal autonomy to the elderly (Miskelly 2001). Also, for Holman and Lorig 2000, patients' successful management of diseases implies individual active involvement.

Regarding social benefits, it clear on the "Supportive figure /Network" interaction mentioned earlier, that the contact with others is very important on health care experience value co-creation. Results reveal the role that technology could play in supporting this. Although, again, differences among the two groups emerged. On one hand, the elderly respondents see technology (internet) a mean to contact (see and speak) with family and relatives. On the other hand, for the older adults, already using internet to contact with their relatives daily, rely more on the technology supporting role regarding the access to networks of interest which could support them on similar subjects and with pertinent information (such as "recommendations"). As such, patients' successful management of their health implies collaborative interactions between the individual, their health providers and customer service network (Holman and Lorig 2000), also the characteristics of the environment, such as having help from other customers are important to the experience co-creation (Verleye 2015).

According to Holbrook and Hirschmann (1982) emotions and contextual, symbolic and non-utilitarian aspects are core for experiential perspective, because value resides not in the object of consumption but in the experience of it. The results show that the importance of emotions to the health care experience. Positive emotions such as, joy (e.g. better health outcomes), pride on self, due to the enhanced independence and autonomy on daily care activities, gratitude and confidence about their health status that they can verify as often as they feel the need to, emerged. According to Kraus *et. al.* (2000) the concept of quality of life should include not only individuals comfort and social relations, but also also considering their emotions. Emotions are an integral parts of the experiences of events and circumstances over the life course that define the stages of psychological development, the person's responses to stressful events and transitions into and out of roles (Mochis 2012). As seen before in the results concerning quality of life evaluation, the "Psychological" and "Existential" aspects have great impact one individual behaviour towards an experience. These aspects concern "feelings regarding being depressed, nervous or worried, sadness, and fear of the future" and "individual's belief about their life, including the belief that life is meaningful and worthwhile, and that goals are achievable, how they feel about themselves, and whether they have a sense of control over life" respectively, thus deeply connected to one's emotions in a cycle manner.

Technology may be seen as a supporter for both value co-creating activities (VCAs) and interactions found earlier, therefore a supporter for a positive health care experience and consequently well-being enhancement. Examples include the social benefits, "contact with others", that can benefit interactions such as "Support Figure/Network", which are related to value co-creating activities such as "Colearning". About pragmatic and personal benefits, such as "Independence/Autonomy or "Self-Efficacy", as an example, they can also benefit from interactions such as "Technology" artefacts and attributes, which in turn, can be linked to higher compliance in VCAs as "Collating information" or "Cerebral activities". An overall deeper analysis reveals that technology may support in some way each interactions and VCAs. In Figure 7 a representation of the results and conclusions of technology role are presented.
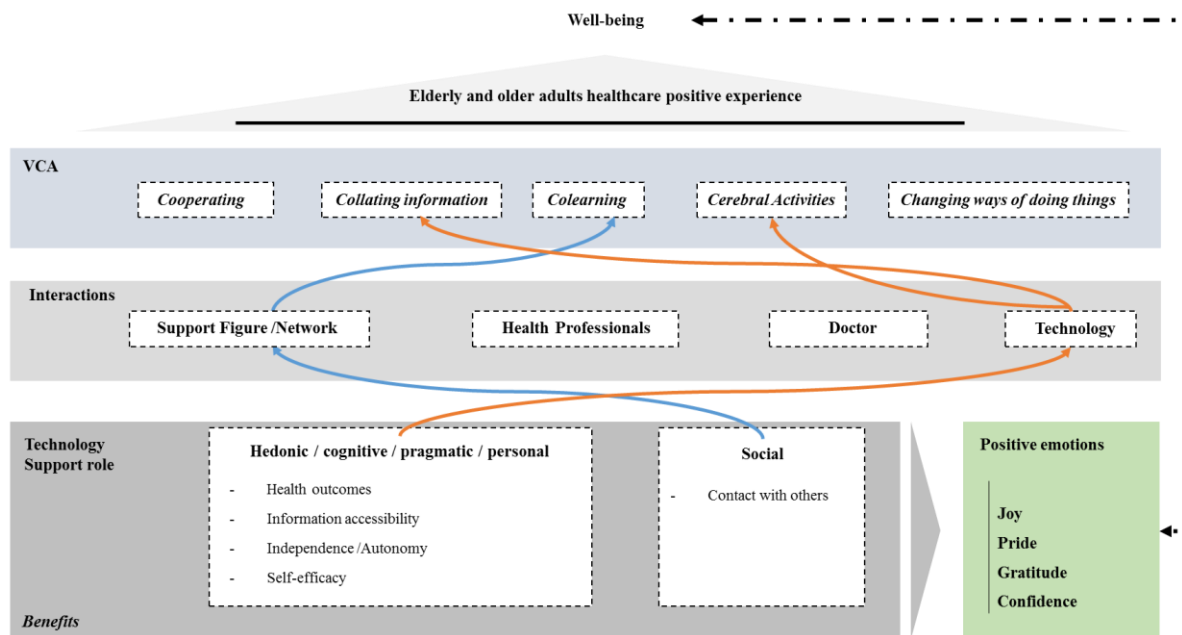
Figure 7 Supportive role of technology to the elderly health care experience: benefits and its positive emotions

4.3.2 **Technology Impediments**

Despite the benefits technology have on supporting the health care experience, it was also found some impediments for its use and adoption especially due to the negative emotions it may provoke (Ostrom *et. al.* 2015, p.141). Previous value co-creation expected benefits categories (Varleye 2014, Nambisan and Baron 2009), were used to divide the impediments determinants. Regarding impediments, three value co-creations benefit categories were found in our analysis: cognitive, hedonic and personal. About cognitive, the illiteracy (academic, medical and technological) was the determinant that most constrained technology full use. This was because individuals either, do not have the capabilities to read or write, preventing the experience on its earlier stage and causing heavily negative emotions such as shame and sadness, or have medical and technological illiteracy which also harm their experience, causing again negative emotions such as apartness. Since we are living a technological era, individuals that do not get along with it could be damagingly affected by it when compared to ones that master its use. According to Verleye (2015) "customer role readiness" is also a fundamental factor for value co-creation, it reflects the degree to which customer know how they are expected and are able to perform their role or their role clarity. Thus if they don't have literacy abilities, that they might not be able to constructively participate in service creation and delivery processes.

The distrust on information found on the internet, also causes negative emotions and act as impediment for a deeper and pleasant experience, since it causes anxiety and distrust. Likewise the distrust on technology reliability acts as an impediment in the sense that it affects one's emotions, provoking anxiety and fear (e.g. wrong daily monitoring results).

Concerning hedonic and personal categories, the determinants found were: self-beliefs and self-esteem, and the fear of use/fear of the unknown. Regarding the self-beliefs and self-esteem that is, the confidence in oneself and one's abilities, it impacts the readiness to use technology, acting as deterrents of technology adoption and consequent use. The most depressed elderly respondents [evaluated with worst quality of life indicators, mainly in the "Psychological" domain (McColl-Kennedy et al. 2012)] point advanced age and few years to live as lack of

motivation to start using it, therefore diminishing their "customer role readiness" (Verleye 2015). Finally, the fear of use/fear of the unknown is considered as hedonic, in the sense that the fear of unpleasant experience prevents customers to totally enjoy technology use, retracting them from a total experience and placing negative emotions such as guilty for not having the necessary skills to deal with it.

Table 10 Technology supportive role on the health care experience, its benefits and impediments

Technology supportive role	Description/Example quote	Emotions

<u>Benefits</u>
 	
Hedonic/cognitive/pragmatic /personal determinants:
- **Health outcomes**
- **Information accessibility**
- **Independence /Autonomy**
- **Self-efficacy (control and assurance)**
 	
Social determinants:
- **Contact with others**
	- Every respondent, with more or less readiness on the answer about the concept of technology and technology on itself, recognized the importance it has in their lives/health. There is recognition about the support technological devices, such as Bi-level Positive Airway pressure (BPAP) give to health maintenances or improvement. Regarding the BPAP (e.g.):
	
	    "I think it is very good to help on people health because without these devices… if it wasn't for this device I wouldn't be here anymore." (Female, 88)
	
	- The acknowledgement that technology improved health care was also connected with the feeling of independence and autonomy it has provided to the respondents:
	
	    "There are health care tasks that 20 years ago weren't possible to do at home, we had to go to the doctor. Today I do it myself from home (blood pressure and glucose monitor) which allows me to go less times to the doctor. Nowadays the appointments are less and less because we can do things individually from home." (Male, 60)
	
	- Technology as the mean to access information regarding subjects of interest to the individuals, to support treatments (as drugs indications) as to discover signs and symptoms possible reasons:
	
	    "Normally when I have some doubt regarding drugs, symptoms or proper feeding for my health condition, I search for information on the internet first." (Male, 60)
	
	- Relating to the feelings of autonomy provided by technology, the control and assurance (self-efficacy) need regarding health data was also manifested during the interviews. The individuals rely on technology as a mean to not only measure and monitor data, but also to save and exchange it, giving them control and security feelings:
	
	    "I've discovered on my cell phone an app that I started do use, because this is important to the future, if we have a problem, if something happen to us, we are properly identified, we can share our health data (historical) with the professionals through the cell phone." (Male, 62)
	
	- In what concerns to social benefits, they are pointed more times by the elderly respondents that by the younger ones, they see on technology, mainly cell-phone and internet, means to contact (keep-in-touch) with relatives:
	
	    "Oh yes, family and friends that I still have. I would learn as I've learned to use the cell phone, if it was to seem them. I always want to see and speak to them."(Female, 72)
	
	    "I would spoke to my relatives, see other things and people. It would distract me." (Female, 74)
		- Joy
		- Pride
		- Gratitude
		- Confidence

Technology supportive role	Description/Example quote	Emotions
Impediments **Cognitive determinants:** - **Illiteracy (academic, medical and technological)** - **Distrust on information** - **Distrust on technology reliability** **Hedonic/personal determinants:** - **Self –beliefs /esteem** - **Fear of use/fear of the unknown**	- One of the cognitive attributes pointed by all the respondents was illiteracy, on its three dimensions: academic, medical and technological. For the older ones the academic illiteracy is the "basic" constraint that leads to the other ones. For the older adults mainly medical illiteracy and technological is stressed. "I cannot read or write, how can I deal with computers?" (Female, 88) "The information on the internet should be accessible, not very long, with easy language and terms, that every age and cultural group could understand, because there is still a great level of illiteracy." (Male, 60) - Other impediment for technology broader use is the distrust on the information found on internet, mainly because that combined with high medical illiteracy, the information available is not credited by proper entities. "I do not know, why? Because we want to believe that what is there is reliable, is a reliable thing, we think certain text is not negative for those who read it, I think it is always written by the positive, I think that there is no bad faith regarding medical information but I do not know for sure, the ignorance of medical terms can mislead me" (Male, 61) "It is on the professional that I believe. I don't know who writes the information on the internet, I don't if it is controlled and accredited by an official entity, as the health ministry. Though for a first overview I search on the internet but then I have to go to the doctor because it is on me that I believe." (Male, 60) - Distrust on self-measurement devices was also stressed when comparing its reliability with hospital devices. Also the uncertainty regarding information flows processes concerning its timeliness scares the older adults: "For me technology is not 100% reliable, I fill more comfortable in going to the doctor after to confirm the values I collect. It is good for a daily autonomous control, but it doesn't mean I believe on it on 100%" (Female, 60) "From what I've been told and from my experience, to measure at home is not the same as doing at the hospital. It fails more." (Male, 61) "The difficulty is if the doctors don't open the emails, they distract, they are not organized people, and we have to send emails over and over again to be sure that they have receive and seen it. It's important information, our health information." (Male, 62) - The hedonic dimensions mentioned as impediments for technology use and adoption regard to the confidence in oneself and one's abilities: "I would like to be taught, it would be funny. But I don't have the skills and the age doesn't allow me to do those things anymore."(Female, 77) - Also the fear of using something with what they are fairly unfamiliar with was revealed mostly by the older ones as constraint for technology use and adoption: "Are you afraid of damaging it? – Yes, That's way I don't want to even touch it." (Female, 74)	- Fear - Shame - Sadness - Anxiety - Depression - Distrust - Apartness - Guilty

5 Conclusion and future research

The results allowed understanding that there isn't a homogeneous "elderly segment group" with characteristics common to all, corroborating previous research (Mochis 2012). Several differences among the interviewees were found, due to the variance in the aging processes, social context and quality of life (McColl-Kennedy *et. al.* 2012). Elderly are not homogeneous and their behaviour is constrained by a multicity of factors that happen trough each person life course (Mochis 2012, WHO 2015). Therefore, is important to focus research attention on customer heterogeneity when designing co-creation environments and/or evaluating co-creation experiences (Verleye 2015).

This research aimed to better understanding the elderly customer health care experience and technology supporting role. The analysis was embedded on S-D logic perspective, focusing on the value co-creation phenomena aiming to provide insights into the customer health care experience as a co-creation situation.

Concerning the first research question, about what influences elderly customers' health care value co-creation experience for better well-being, customer value co-creation activities and interactions were uncovered, following McColl-Kennedy *et. al.* (2012) and Sweeney *et. al.* (2015) proposed categories. Specifically, this study shows the value co-creation activities, and that the level of compliance in each one varies among respondents. Suggesting that this is a cycle phenomenon, we confirm previous studies showing that people with lower/simpler levels of compliance, demonstrate also lower levels of quality of live, when all its four domains are evaluated. Therefore, the results suggest that the way individuals integrate activities may affect the quality of life an individual achieves, but also the integration can be previously affected by their current quality of life (McColl-Kennedy *et. al.*,2012; Mochis 2012; WHO 2015). Additionally, the findings also show that co-creation experience is multidimensional (Verleye 2015), contextual (Vargo and Lusch 2008 McColl-Kennedy *et. al.* 2012), and also depend on personal resources (Frow 2008). All these is important when aiming for a better health care experience and consequent individual's enhanced well-being. Also, the level in which each individual engage within the co-creation of their experiences is not homogeneous (Ouschan, Sweeney, and Johnson 2006) and it's affected by not only the co-creation process itself, but also by the characteristics of the environments and other actors in the customer network (Veleye 2015).

There are important differences about the compliance level, between the elderly group and the older adults, besides the obvious age difference, but, also different life contexts and personal resources availability. It would be interesting to further explore in a longitudinal study if the compliance levels of the younger ones will change and overlap the elderly or not, since preferences appear to change with life course (Mochis 2012, WHO 2015).

Interactions influence the health care experience and four types were found in this research. A set of attributes of each of these interactions was also elicited, being aspects that could enhance or deteriorate their experience. Here again differences were found between the groups, the elderly valued more experiential factors and the older adults more concrete ones. Mochis (2012) and WHO (2015) suggest that behaviour may change over the life course, at an older age individuals may shift their stimulus from materialistic perspectives to more transcendent ones. One interaction and its attributes should be highlighted: Support Figure/Network, due to its influence on the individual well-being and life satisfaction. These supportive interactions help people to fight health consequences of life stress and can reduce patient's depression (Yao, Zheng and Fan 2015), among other benefits. Understanding the different resources such as

information and technology that can be integrated to co-create value within the customer network is vital, as has the potential to enhance customer well-being and also reduce the burden on the health care system (Sweeney *et. al.* 2015).

The second and third research question aimed to investigate how technology may contribute to improve the elderly well-being, the role of emotions on the elderly health care experience, and the role technology play. The analysis was based on Verleye (2015) research on customer expected benefits (e.g. hedonic, pragmatic, among others) from the co-creation experience. Results shows that the benefits that both the elderly and the older adults find in technology, but also the impediments for a deeper and broader adoption and use. The technology benefits were linked to the health care value co-creation activities, showing that in fact, with proper attributes, technology can support or even enhance one's health care experience and consequent well-being. As the benefits taken from technology use and adoption translate into positive emotions for the individual, thus improved quality of life domains. On the other hand, if technology doesn't have the proper attributes, the interaction with it is harder, acting as an impediment for its use provoking negative emotions. If technology induces negative emotions on the users they will stop or decrease its use, thus what could act as a benefit (as in enabling contact with others) may become negative.

Regarding technology use for individual health care experience enhancement, research could benefit from studies that focused on understanding if the technology unavailability (e.g. individual monitoring devices or computers) is a factor that could constrain heavily its level of adoption. Within this study, as an example, every older adult had his own personal computer, but the elderly living in the nursing home on the other hand only have limited access to computers (the institution only has five computers that have to be shared).

This research has some limitations, namely sample design and size. It was difficult in the study time frame to access eligible respondents and half of the sample lives a nursing home with particular conditions, since they are institutionalized. Thus their experience has particularities that, though have given important insights about elderly health care experience interactions, cannot be applied to a more generic elderly population living alone or with family. Therefore, further research with elderly respondents living in other conditions should be developed to complement and strength the findings. However one important result came out, that is the need for someone acting as a support to manage their health care.

Further research could use other methodologies for data collecting; such as quantitative methods that could provide broader results allowing to obtain generalizable results. Also, it would be important to understand the impact and role different technologies (e.g. robots, wearable devices, and so on) might have on the elderly well-being and contribution to their quality of life.

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APPENDIX A: Informed Consent form

CONSENTIMENTO INFORMADO

Estamos a solicitar a sua participação para um estudo no âmbito da tese de Mestrado, para a obtenção do grau de Mestre em Engenharia de Serviços e Gestão.

Este estudo tem como objetivo estudar e experiencia do consumidor sénior nos cuidados de saúde e qual o papel da tecnologia nessa mesma experiencia/melhoria da mesma.

Estas entrevistas serão gravadas para possibilitar a sua transcrição e análise aprofundada. Só iniciaremos a gravação após a sua concordância, expressa através da assinatura deste consentimento informado.

A informação recolhida é estritamente confidencial e será apenas utilizada no âmbito deste estudo. Os resultados serão reportados de forma agregada, sem identificar individualmente os entrevistados. Se no decorrer do estudo e do reporte dos resultados for relevante citar de forma não anónima um excerto da entrevista, tal só será efetuado após pedido por parte dos investigadores e autorização expressa por escrito por parte do entrevistado.

A sua participação neste estudo é voluntária, pelo que a poderá interromper a qualquer momento. Nesse caso toda a informação recolhida até ao momento será inutilizada.

Data........../........../..........

Assinatura do investigador

Data........../........../...........

Assinatura do entrevistado

_____

_____

APPENDIX B:Interview guides

GUIÃO DE ENTREVISTA

Público-alvo: Não utilizadores de tecnologia

Os setor dos serviços tem hoje em dia um peso substancial na economia, pelo que a importância dada à forma como estes decorrem, ao que oferecem e como oferecem, é também cada vez mais relevante.

O mesmo se passa com os serviços de saúde, nos quais a voz do consumidor sobre a sua experiencia e necessidades, é fundamental para a sua melhoria e inovação.

Dados demográficos: Idade

Portador de doença crónica? (Se sim, qual?)

Situação social: (Mora sozinho?)

Tem visitas regulares de família, amigos? Gosta quando vêm? É importante? Torna seu dia melhor?

Autocuidado: Independente? Semi/dependente?

Para começar gostava que falasse sobre:

1. Como é o seu dia-a-dia? Quais as suas atividades durante um dia normal?
    a. Quantas vezes vai ao médico/enfermeiro /hospital/centro de saúde?

Relativamente às suas atividades diárias que envolvem cuidados de saúde,

2. Como é essa experiência? Como descreve o seu esforço em manter visitas regulares ao médico/ centro saúde? Porquê?

3. Quais as principais dificuldades? Pode dar algum exemplo, história? Como gostaria que fosse?
    a. A redução no número de visitas seria benéfica? Gostaria de ir menos se pudesse? Como isto o poderia ajudar?

Quanto aos cuidados de saúde,

4. O que considera mais importante nos cuidados de saúde que recebe?

Na atualidade é quase impossível desligarmo-nos da tecnologia. Também esta tem um papel cada vez mais relevante na sociedade, no dia-a-dia de cada cidadão,

5. Pensa que a tecnologia o podia ajudar na sua saúde?
    a. Conhece alguma tecnologia que poderia usar para gerir melhor a sua saúde?
    b. O que pensa do uso de tecnologia nos cuidados de saúde? O que acha que se poderia fazer?

6. Usa algum tipo de tecnologia na sua vida diária (telemóvel, internet, computador)?
    a. Gostaria de usar? Qual a probabilidade de usar algum tipo de tecnologia?
        i. Os seus familiares/amigos usam, e já lhe disseram para usar tecnologia?

Para finalizar,

7. Que poderia ser feito para se sentir mais confortável a usar tecnologia? Imagine daqui a 5/10 anos, como gostaria que tecnologia fosse para se sentir bem a usa-la?

GUIÃO DE ENTREVISTA

Público-alvo: Utilizadores de tecnologia

Os setor dos serviços tem hoje em dia um peso substancial na economia, pelo que a importância dada à forma como estes decorrem, ao que oferecem e como oferecem, é também cada vez mais relevante.

O mesmo se passa com os serviços de saúde, nos quais a voz do consumidor sobre a sua experiencia e necessidades, é fundamental para a sua melhoria e inovação.

Dados demográficos: Idade

Portador de doença crónica? (Se sim, qual?)

Situação social: (Mora sozinho?)

Tem visitas regulares de família, amigos? Gosta quando vêm? É importante? Torna seu dia melhor?

Autocuidado: Independente? Semi/Dependente?

Para começar gostava que falasse sobre:
1. Como é o seu dia-a-dia? Quais as suas atividades durante um dia normal?
    a. Vai muitas vezes ao médico/enfermeiro /hospital/centro de saúde?

Relativamente às suas atividades diárias que envolvem cuidados de saúde
2. Como é essa experiência? Como descreve o seu esforço em manter visitas regulares ao médico/ centro saúde? Porquê?

3. Como gostaria que fosse?
    a. Gostaria de ir menos se pudesse?

Quanto aos cuidados de saúde,
4. O que é mais importante para si nos cuidados de saúde?

Na atualidade é quase impossível desligarmo-nos da tecnologia. Também esta tem um papel cada vez mais relevante na sociedade, no dia-a-dia de cada cidadão,

5. Que tipo e tecnologias usa relativamente ao acesso a cuidados de saúde?
    a. Como é essa experiencia? O que torna o uso da tecnologia fácil ou difícil? Pode partilhar exemplos?
    b. O que gosta mais ou menos? O que sente ao usar? E conveniente? Encontrou problemas, descreva p.f.
    c. Como gostaria que fosse?

6. Que outro tipo de tecnologias usa no seu dia-a-dia? (telemóvel, internet, computador).

Para finalizar,

7. Proponha novas tecnologias/ serviços que pensa que seriam úteis na gestão da sua saúde.

APPENDIX C: Barthel Activities of daily living Index

Barthel Index Scoring Form

Patient Name: _____ Rater Name: _____ Date: _____

FEEDING
0 = unable
5 = needs help cutting, spreading butter, etc., or requires modified diet
10 = independent

BATHING
0 = dependent
5 = independent (or in shower)

GROOMING
0 = needs to help with personal care
5 = independent face/hair/teeth/shaving (implements provided)

DRESSING
0 = dependent
5 = needs help but can do about half unaided
10 = independent (including buttons, zips, laces, etc.)

BOWELS
0 = incontinent (or needs to be given enemas)
5 = occasional accident
10 = continent

BLADDER
0 = incontinent, or catheterized and unable to manage alone
5 = occasional accident
10 = continent

TOILET USE
0 = dependent
5 = needs some help, but can do something alone
10 = independent (on and off, dressing, wiping)

TRANSFERS (BED TO CHAIR AND BACK)
0 = unable, no sitting balance
5 = major help (one or two people, physical), can sit
10 = minor help (verbal or physical)
15 = independent

MOBILITY (ON LEVEL SURFACES)
0 = immobile or < 50 yards
5 = wheelchair independent, including corners, > 50 yards
10 = walks with help of one person (verbal or physical) > 50 yards
15 = independent (but may use any aid; for example, stick) > 50 yards

STAIRS
0 = unable
5 = needs help (verbal, physical, carrying aid)
10 = independent

TOTAL SCORE= _____

The Barthel ADL Index: Guidelines
1. The index should be used as a record of what a patient does, not as a record of what a patient could do.
2. The main aim is to establish degree of independence from any help, physical or verbal, however minor and for whatever reason.
3. The need for supervision renders the patient not independent.
4. A patient's performance should be established using the best available evidence. Asking the patient, friends/relatives and nurses are the usual sources, but direct observation and common sense are also important. However direct testing is not needed.
5. Usually the patient's performance over the preceding 24-48 hours is important, but occasionally longer periods will be relevant.
6. Middle categories imply that the patient supplies over 50 per cent of the effort.
7. Use of aids to be independent is allowed.

APPENDIX D: Conceptual model of experience quality in health care (Ponsignon *et. al.* 2015)

Direct Interactions (96%*)
- Attitudes and behaviours (80%)
- Personalisation (41%)
- Communication (39.5%)
- Competence (33%)
- Availability (18%)
- Dealings with others (10.5%)
- Relationship with staff (8.5%)
- Efficiency (7%)
- Reliability (1%)

Indirect Interactions (73%*)
- Procedures and processes (29%)
- Premises and facilities (28.5%)
- Communication (21.5%)
- Timeliness (20%)
- Accessibility (13%)
- Food and beverages (12.5%)
- Atmosphere (7.5%)
- Service variety/choice (5.5%)

Independent Processing (15%*)
- Timeliness (11.5%)
- Reputation and brand (3.5%)
- External communication (0.5%)

Speed and Medical Outcome (22.5%*)
- Speed (9%)
- Medical outcome (13.5%)

Healthcare experience quality

Relationship Outcomes (15%*)
- Satisfaction (8%)
- Loyalty intentions (5%)
- Word of mouth (4.5%)