SERVICE DESIGN IN SOCIAL ROBOTICS

Involving elderly care professionals into co-creation

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ABSTRACT

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Involving elderly care professionals into co-creation

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The global trend of the population ageing triggers the development of social robotics for the needs of elderly people in most European countries. After decades of being a subject of scientific research and a prototype in the lab, social robotics is finally becoming a consumer product. At the moment the logic of the consumer market points towards customer experience. Therefore, social robotics companies should follow this trend. This study considers service design as one of the best approaches to create a holistic customer experience.

There is a common belief that social robotics can solve such problems as social exclusion and manpower shortage in the social and health care sector, which are the consequences of the population ageing in Finland. However, this idea requires validation. This study represents the first stage of the service design process that invites elderly care professionals, as the major stakeholders, into a co-creation process throughout semi-structured interviews. The purpose of this thesis is to prove that service design, as a co-creative method, is able to open up new opportunities to satisfy different needs of elderly with the help of social robotics.

As the result, the study provides the service landscape for elderly people in Tampere, process description of the day center and nursing home services, critical issues highlighted by elderly care professionals and interesting ideas how social robots can solve these problems. These results can be used for the social robotics design for elderly people in the further stages of the service design process, such as idea creation, prototyping and implementation.

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1   INTRODUCTION

Among European countries Finland has one of the highest life expectancy on a par with Sweden, Norway and Denmark. According to the latest statistical results the average life expectancy for women in Finland is 83.4 years, which is 1.7 years higher than average life expectancy of women across the Europe. Likewise, Finnish men tend to live longer, approximately 77.5 years, while European life expectancy for men is only 75.3 years (Eurostat Statistics Database 2012).
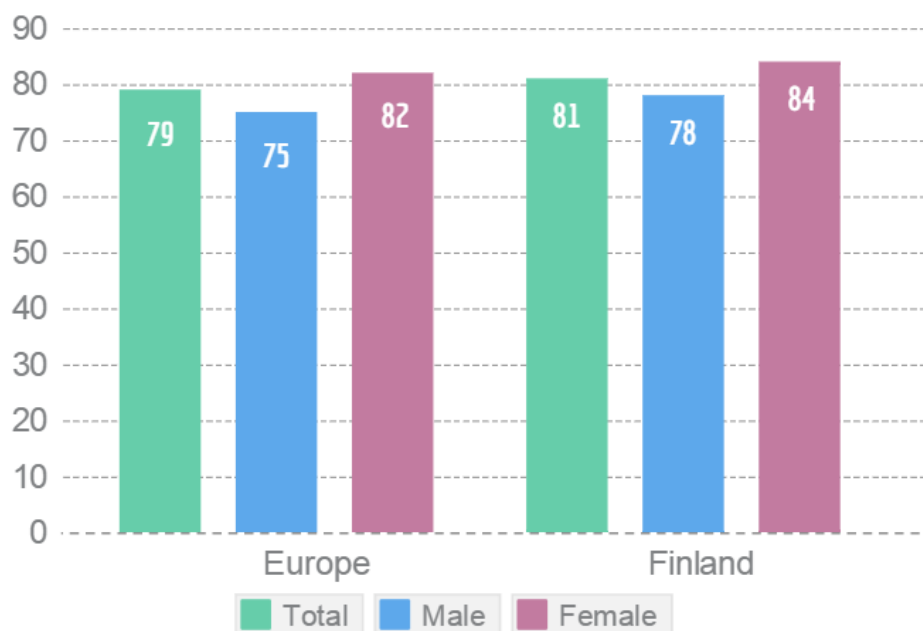
FIGURE1. Life expectancy in Europe and Finland by gender and on average.

However, the population of Finland is ageing more rapidly than growing. In the report of Finnish National Statistics, the number of people of working age is forecasted to decline by the year 2030 by 117 000 persons from the present (2014). The biggest proportion of population will be off paid jobs. The demographic dependency ratio, that is the number of children and pensioners per one hundred persons of working age, will go up from 52.9 and reach the limit of 60 dependents in 2017 (Official Statistics of Finland (OSF) 2012).

The Ministry of Social Affairs of Finland (2010, 19) considers the growth of dependency ratio as "the most significant national challenge for the economy of social protection".

Nonetheless, this challenge has a broader impact even beyond the government or public health care. Ageing of population has a very complex and extensive consequences, which have been a long time coming. The change that they bring is intangible. In the nearest future most of the companies will face the reality in which people over 65 years old are a dominant customer segment (Stroud 2007, 174).

This study aims to engage social robotics engineers, elderly care professionals and other major stakeholders into a co-creation process to meet the needs of elderly people. The third chapter, which is dedicated to professionals from the social robotics field, provides a better picture of the elderly as a very specific and heterogeneous target group with its opportunities and limitations. The chapter sheds more light on the common experience related to the state of being old in Finland in particular, from philosophical, as well as economical and physiological points of view.

Chapter 4 looks at the facts about social robotics development and design, as well as it explains the trend of economy servitization within the social robotics industry. Chapter 5 shows the link between different design methods and emphasizes why the co-creation methods, such as service design, might be one of the most useful approaches in social robotics development for elderly. Chapter 6 uses interview results of elderly care professionals to show their perspective and what aspects are significant for the design purposes. One of the main goals of this study is to show that elderly care professionals can be successfully involved into co-creation, and their ideas and insights can be used for the design of social robotics that is meant for elderly people. Last but not the least chapter 7 provides findings and recommendations, as well as the vision of the social robotics on the market of elderly care services.

2 METHODOLOGY

2.1 General research methodology

Originally, the research was divided into two parts, pre-research and actual research, that were conducted at different periods of time.

In January 2014, the Social Robotics department of Tampere University of Applied Sciences started a joint project with students from the innovation hub Demola. The ultimate goal of the project was to explore and create interaction patterns between a person and NAO robot, which in its turn was considered by the project supervisors as a coach for the unknown target audience.

To begin with, desk research was selected as the primary method aiming to discover a group, which required a physical training on the daily basis and experienced some difficulties with it. Hence, the project team defined elderly people as a target group, based on the information on the current trend of population ageing. After the target audience had been determined, observation became the leading method in order to collect data on the elderly people within a real-life environment, such as a nursing home setting. In spring 2014, the project team of three students visited a nursing home Jalmarin Koto in Kangasala to observe a typical physical exercise session of a group of elderly people. Additionally, the team got a chance to interview the physiotherapist before and after the session. The information collected in the nursing home pushed the project on the new level. As the result, the team developed a several interaction approaches of the contact initiation between a human and a robot. Eventually, the concept of human-robot interaction aiming to activate elderly people was finished and tested with the pilot group.

Even though the project was completed and the main goals were met, the knowledge gap regarding the overall needs of elderly remained huge. It was uncertain, if the team was targeting the most crucial problems. Probably, there were other needs, for which the robot-coach or other social robot would be even more useful. The project team just scratched the surface of a very important issue that is an assumption in the society that social robots are a remedy for the consequences of the population ageing, such as

manpower shortage. Unfortunately, the roots of this assumption remain unknown and require fact-based argumentation. Therefore, the pre-research became an origin of the actual research that is described in this study.

The methodological tool set of the actual research encompasses desk research and elements of the case study, such as evidence from statistics records, reports of Finnish national health organizations, Finnish Center For Pensions and Finnish Social Security, as well as from the interviews with elderly care professionals from Finland and the UK. The core idea of the case study method is to define the hypothesis of the research and then prove or disprove it by collecting different types of evidence from the several sources. The primary hypothesis of this study is the following: "Service design, as a co-creative method, is able to open up new opportunities to satisfy different needs of elderly with the help of social robotics".

Desk research brought new global trends that go hand in hand with the population ageing, for example, robotization and servitization. The least trend enriched the research with the service design techniques that were used to explain some findings and interview results from the designer's point of view.

Furthermore, the goal of the research was to identify needs of elderly people living in a nursing home and get deeper insights into how the technology could help elderly care professionals to perform their duties better. Therefore, the qualitative research method was chosen as the most suitable methodological tool for this task (Brikci & Green 2007, 2). In September 2014, during the Active Ageing seminar there a trial interview was conducted with elderly care professionals from Shropshire, UK (Heinonen 2014).

2.2 Interview methodology

Throughout the internal network of Tampere University of Applied Sciences there were found several professionals from both social and health care fields, who had been working with the elderly. Unfortunately, only one person had the time to participate in the interview. Other interview participants were found among friends and acquaintances. The total amount of the interviews was five, including the trial.

The research data was collected throughout the semi-structured interview consisting of five to six open-ended questions and the discussion. At first, the interviewees were asked questions about their work motivation in the field of elderly care. Interviewees described their routine working day and typical duties. This question was meant to shed more light on the service process in the nursing home. The sample comprised of two respondents, who started their career not a long time ago, and other two, who had decades of experience in this professional field. Therefore, the third question about how the work has changed over time since the beginning of the career was addressed only to interviewees with the greater experience. The aim of this question was to determine the development of the nursing home services. Interviewees were asked how they found working with old people and how could they describe their life. It was assumed that elderly care professionals were observers in a way. They see the life of elderly people and probably can point out some critical problems that they experience.

The last question aimed at putting the elderly care professionals into the shoes of the inventors by asking them what kind of technological solution that did not exist yet they could come up with to help elderly people. After the technology was presented as a possible solution, interviewees were invited to join a short discussion. They were provided with three pictures of social robots (NAO robot, virtual female human and Paro robot). Under each picture, there were listed functions that the robot could perform. Interviewees were asked to express their opinion on which robot could help elderly people in the best way and why.

The thematic method was applied for the analysis of the interview results. A thematic analysis approach examines the collected data in order to identify the main themes and issues that recur throughout the results (Brikci & Green 2007, 23).
Then the answers were combined into clusters according to the themes. These clusters are discussed in the interview findings part. Overall, the interview results display the things that elderly care professionals consider meaningful in the context of their profession.

PICTURE 1. The thematic analysis illustration.

Thus, the overall methodology of this study is a mixture of the case study research method, qualitative interview, desk research and service design techniques, such as customer journey.

3 THE POPULATION AGEING IN FINLAND

3.1 Insights into a life of an elderly person in Finland

The World Health Organization (2001) defines a person as an elderly in most developed countries if he or she has reached the chronological age of 65 years. The timeline of an old person living in Finland is illustrated on the infographic below (picture 2). On the vertical timeline, which tends to infinity, you can see a chronological age starting with 63 years, the beginning of earnings related pension. On the left side of the picture, there are listed the most typical consequences of age-related change in a human body.
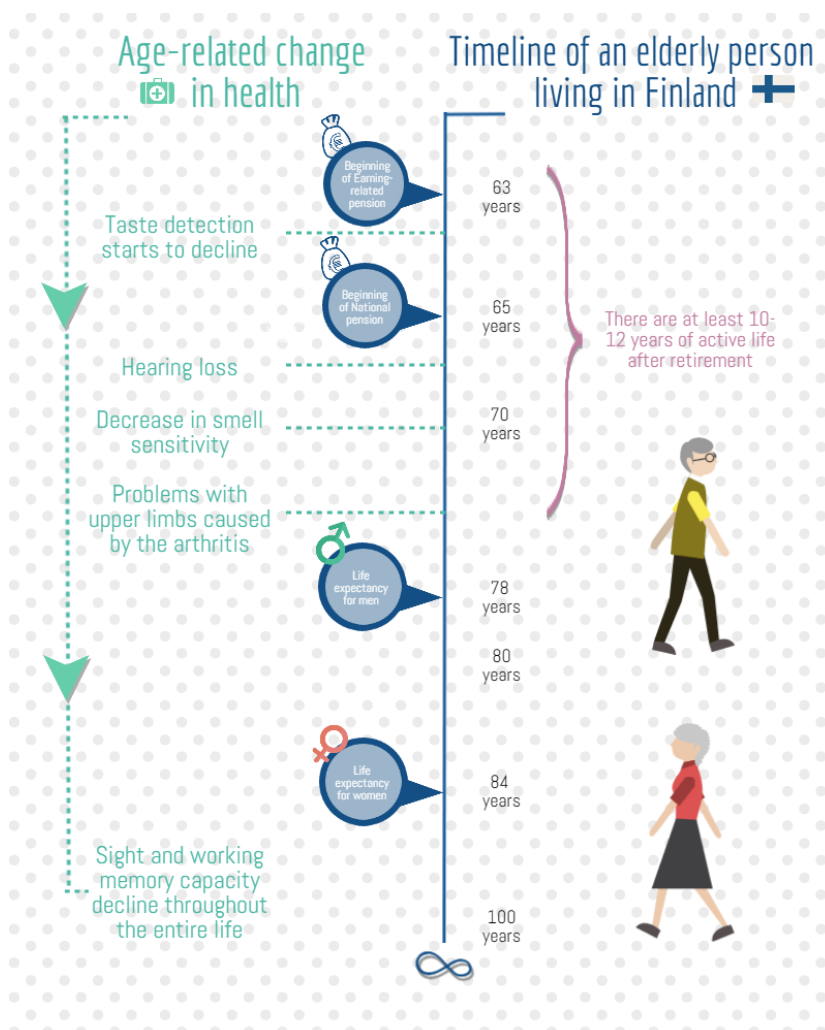
PICTURE 2. The timeline of an old person living in Finland and age-related change in health.

The Finnish pension system is divided into several types. The most common is earnings related pension, which is earned by the paid work and entrepreneurial activities, and national pension that is paid for those pensioners, who have no earnings related pension or whose pension is very small (Average Pensions 2014). As it was mentioned before, the starting point of earnings related pension varies between the age of 63 and 68 years. National pension begins at the age of 65. Two other circles stand for the average life expectancy for men and women in Finland. However, the Finns tend to live longer, therefore hundred years is the age, which the life expectancy in Finland could possibly reach in the future.

Furthermore, there are inserted years, when some of the age-related health changes begin to develop. For instance, decrease of taste detection, hearing loss, decrease in smell sensitivity, arthritis and decline in sight and cognitive functions.

Elderly people are a group that covers the interval of about 35 years. A priori, such a large group is very diverse and heterogeneous. Each decade brings its own change in the physical and mental state of an old person. The change opens up such advanced capabilities, as well-maintained verbal ability, increased experience and a broad data base (Fisk, Rogers, Charness, Czaja, Sharit 2009, 13). Not without reason, in most of the world cultures old age is associated with greater wisdom and sobriety and treated with deep respect. On the other hand, there are some constraints that occur along with ageing. Therefore, it is extremely important to take into account the most common ageing factors, such as change in cognition, perception and movement control during the design process of technological solutions for elderly people.

Certainly, it is not a universal rule that capabilities of a person decline with age at the same pace for everyone. However, according to the statistical data, there are some common patterns that show an age-related decline in capabilities (Fisk and et al. 2009, 24). The table below describes the age-related impairments that are, in general, inherent for older adults (table 1).

TABLE 1. Age-related impairments of older adults. (Fisk and et al. 2009, 15-24).

Sense/ ability	Description
1.Taste and sense of smell	The ability to detect some taste or odor starts to decline approximately at the age of 60. The sensitivity to smell tends to decrease past the age of 70. This age-related change highly depends on individual thresholds.
2.Haptic and movement control	As individuals grow older the variability in haptic control increases. Older people lose their sensitivity to haptic cues. Thresholds for temperature perception and vibration perception occur more often. In comparison to young people, older adults are, on average, 1.5 -2 times slower in movement tasks or in giving a response. The sense of movement, position and touch is also tending to decline with age. Problems with upper limbs caused by the arthritis are usually reported by 50% of men and 60% of women over the age of 75, on average.
3.Hearing	After the age of 65 the mushrooming proportion of elderly suffers from hearing loss. Older people become unable to hear too high sounds above 4000 vibration per second.
4. Vision	In the majority of cases the probability of having a visual impairment increases with age. Older adults are struggling with reading and driving at night due to the eyes' decline in ability to adapt to darkness. The sensitivity to glare, breadth of field, and speed of processing may also drop because of the age-related change.
5.Cognitive abilities	Decline in working memory is closely connected with ageing of a person. Older adults spend more time to orient their attention from one location to another. Other cognitive constructs, such as semantic memory, prospective memory, procedural memory, attention, spatial cognition and language comprehension may also change, as a person is getting older.

According to the Finnish National Institute for Health and Welfare statistics the total amount of old people receiving home care services equals 72 137. The home care services include support services, such as meals, bathing, cleaning, transportation, walking- and social interaction-promoting services. On the graph below you can see that

home service recipients are divided into age groups: 65-74 years, 75-79 years, 80-85 years and 85 years and over (Väyrynen & Kuronen 2013, 6).
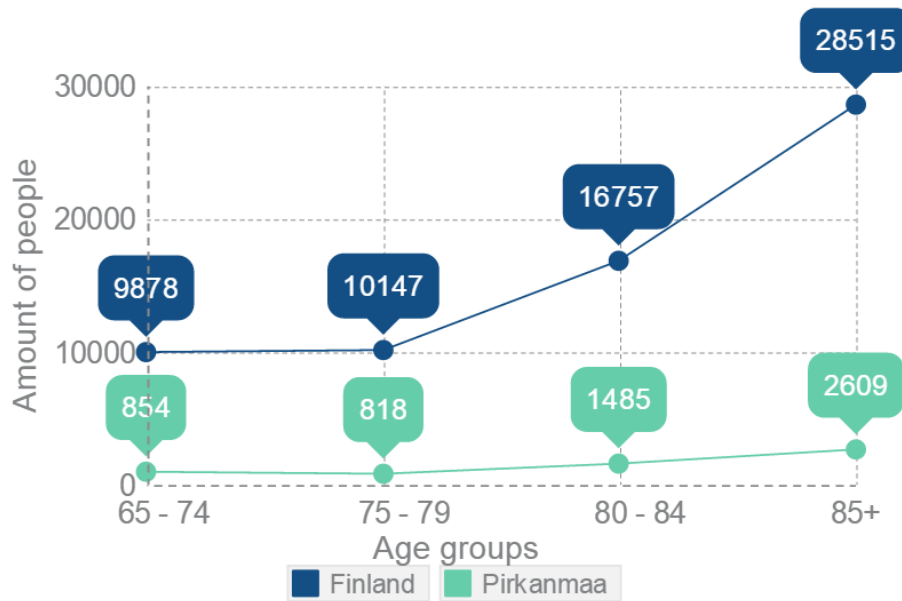
FIGURE 2. Home service recipients in Finland and Pirkanmaa region.

On the graph you can see that the amount of home care service recipients slightly increases between the first and the second age group. Further the growth becomes more rapid. It probably means that the health condition of people aged from 65 to 79 years changes slower than for people over 80 years old, who require more assistance.

Hence, it is possible to remain quite active for about ten or twelve years after the retirement, which starts the earliest at the age of 63 in Finland, upon the condition that the age-related change has an insignificant impact on the health of an elderly person.

In marketing, age is one of the main criteria for the customer segmentation. For some reason, in many cases people over 65 years old fall into the same category. In his research, Dick Stroud (2007, 165-166) claims that age can be used to predict important life events, for example, marriage, birth of the first child and ownership of a first home. From the picture of an elderly person timeline, it is clear that one of the most significant life events is retiring, especially from the financial point of view. In Finland, the average pension amounts to 1,549 euros per month, as stated by the Finnish Center for Pensions (Average Pensions 2014). Below you can see the table of average pension rates in Finland divided by the pension type on 31.12.2013.

TABLE 2. Pension recipients by size of overall pensions (Average Pensions. 2014).

	Men	Women	Total
Average total pension EUR/month	1760	1376	1549
share of earnings-related pension	1614	1190	1381
share of pension from Social Insurance Institution (including guarantee pension)	121	169	147

It is quite difficult to evaluate the pension rate without an additional data, such as average salary rate in Finland. The table below represents the monthly earnings for the private and public sector by gender in Finland, 2013. In comparison to the average salary rate (3361 euros) pensioners earn 46% less by receiving the earnings related pension (1549 euros).

TABLE 3. Total earnings by employer sector and gender, 2013 (Official Statistics of Finland (OSF) 2014).

Employer sector	Full-time employees			
	Number	Monthly earnings, €		
		Total	Men	Women
Private	939 965	3361	3599	2999
Primary production	. .	. .	. .	. .
Manufacturing	344 743	3443	3517	3153
Services	595 222	3313	3675	2964
Municipality	374 627	3005	3492	2873
State	74 440	3730	4014	3410
Total	1 389 032	3284	3610	2967

Thus, crucial life events have an influential impact on the future behavior of a person. Retirement may become a trigger for individuals to move home, look for a new job, or start new hobbies enjoying the extra free-time, or even to set off on a journey of a life-time and travel to other countries (Stroud 2007, 116). In his book, Dick Stroud states that it is a myth that people over 50 years old have a very special customer behavior conditioned by their age. If there are fluctuations in brand preferences or customer loyalty, they are either statistically insignificant, or they vary among countries due to financial and cultural differences.

Young and elderly people differ mostly physically. Even within a large group of people over 63 or 65 years the age-related changes create a greater difference (Stroud 2007, 99-100).

According to the Finnish National Statistics Center (Official Statistics of Finland (OSF) 2013), the use of the Internet in the country is getting more widespread. The amount of the Internet users continues to grow mainly among older age groups. Nearly everyone (97%) under the age of 55 already uses the Internet.

Among the oldest age group from 75 to 89 years, 27 % are the Internet users. Generally, the majority of elderly people use the Internet for the banking services (22%) and for watching web television (12%). Even though the amount of the Internet users among elderly people in Finland looks quite impressive, it is still lower than in other Nordic countries or Netherlands and Luxemburg. There are three main findings that can be drawn from this chapter:

> Old people, that are people aged over 65 years, are a huge and heterogeneous group. What suits for the age group from 65 to 75 years may not be applicable for elderly people over 80. Age-related change in health is the factor that creates these groupings. The solution one-size-fits-all can be hardly found for such a diverse group.
>
> Age itself does not have the direct impact on the customer behavior. Events that are connected with a certain age can determine the future behavior of a person. For instance, the pension rate determines the purchasing power of an elderly person.

The new generation of elderly people is getting more Internet literate. However, the Internet environment is not always adapted for older eyes, hands and minds.

3.2 Elderly service landscape in Tampere

In Finland, municipalities are responsible for arranging the social and health services that are required for elderly people (Ministry Of Social Affairs and Health 2013).

In a nutshell, the organization Kotitori of the city of Tampere is an example of a consulting and service organization for elderly. Elderly people or their family members can call, visit the office or check the information on the web-page about available services. It is possible to create a service plan according to a person's needs and income. From the infographic below you can see a service landscape for elderly in Tampere, Finland (Kotitori 2014).
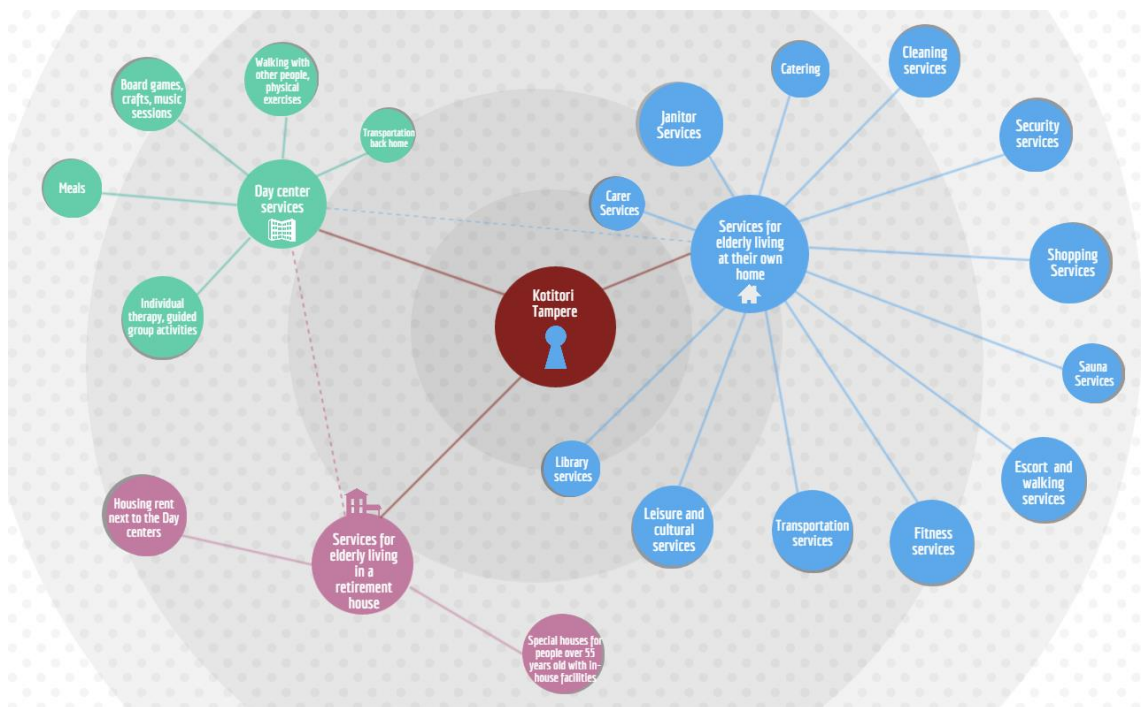

FIGURE 3. Services available for elderly people in Tampere, Finland.

Here is the list of services for the elderly provided by Kotitori:

1. For the elderly living at their own home:

Catering - delivery of warm lunches home;

Cleaning services - the service fee is calculated based on a gross income and the apartment size;

Security Services - meant for elderly living alone, they can send a message to the security phone from their own device in order to get required help;

Shopping Services - home delivery of groceries;

Sauna Services - provides help for older people who do not have an opportunity to go to sauna or need some ablution help;

Escort and walking services;

Library services - free home delivery of books, magazines etc. once a month from the Metso library;

Janitor Services;

Transportation services – for the elderly in the wheelchair and without;

Carer Services;

Leisure and cultural services;

Fitness services – includes, for example, gymnastics, walking, dancing, water gymnastics;

2. Day center provides social activities and other recreational services for the elderly.

The day center program includes meals (breakfast, lunch and coffee), board games, crafts, exercises, music sessions, walking with other people and free time. Also the package may include transportation to the day center and back home.

Rehabilitation activities designed for older persons and include meals, individual therapy, guided group activities, and leisure activities in the day center.

3. For the elderly living in a retirement house or service center - provides living at home supporting the daily support services, rehabilitation and a wide range of recreational opportunities;

Housing rent next to the day centers;

Special houses for people over 55 years old with in-house service facilities (restaurant, hairdressing or massage services);

Kotitori is a municipality organization that performs a function of a middle-man between elderly people and service providers. The share of private companies on the market of social and health care still remains low. However, it tends to grow, especially in the last decade. The trend of population ageing becomes quite evident throughout the statistical data that is presented on the graph below (figure 4).
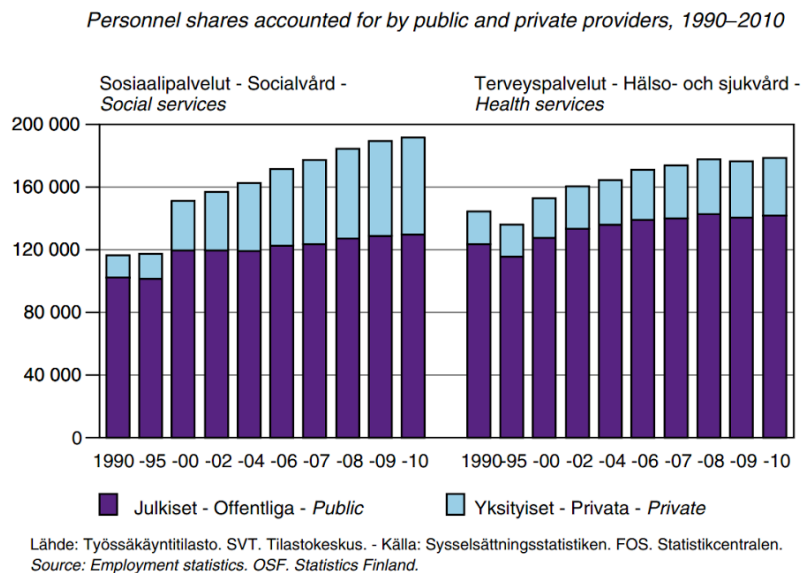
FIGURE 4. Home service recipients in Finland and Pirkanmaa region.

16% of the employed population of Finland works in the social welfare and health services. The total number of employees in the social and health care has increased drastically. In 10 years from 2000 to 2010, the amount of people working in these fields increased by 20%. According to the Finnish National Statistic Center the share of women (28%) working in the social welfare and health services is seven times higher than the share of men (4%) in the same field.

Almost half of the personnel are involved in hospital activities, when social welfare professionals are mainly dealing with elderly services (residential homes, sheltered houses and group homes, and home-help services) and child care.

It is evident from the statistics that the demand for elderly services grows very swiftly. As a matter of fact, the number of personnel in elderly care has risen by 34% in the last few years (National Institute of Health and Welfare 2014).

The paradox of the manpower shortage and extremely high demand for the elderly services seems to be quite probable. Furthermore, people working in elderly care services are getting old as well. If in 2011 the average age of the personnel was 43.4 years, by 2020 nearly one out of five employees will reach the age of 65.

The challenges of the population ageing are quite evident. In future, fewer personnel might be able to provide social and health services for quite a large amount of elderly people. Technology has always helped to improve the efficiency of services. Probably the whole process of elderly care will be optimized and changed, and it seems to be more feasible that the technology, such as social robotics, can be a good solution for the distressing consequences of the population ageing.

4   SOCIAL ROBOTICS

4.1 Definition of social robotics

If the ageing of population is a relatively new trend that people have never faced before, the social robotics seems to be quite familiar, at least to sci-fi fans. In 1939, Isaac Asimov published a story of a girl that became friends with a home robot Robbie (Wikipedia 2009).

The first attempt to build a social robot was made by Walter in the late 1940s. He attached headlamps to "the robot's front and positive photo taxis" (Fong et al. 2003, 144). The interaction between two robots gave the impression of being social, however, there was no direct communication, and the robots were not able to identify each other.

1990's saw a start of a new wave of research and development of social robots, which has been evolving and getting stronger year after year (Fong et al. 2003, 143). In 2012, a video with dancing NAO and Asimo robots, which got over 5 million views and became viral, drew attention and media focus to the social robotics among mass audience (World's Top3 Humanoid Robots - Asimo vs HPR-4 vs NAO 2012).

JIBO is the freshest example of home socially assistive robot developed by Cynthia Breazeal, an Associate Professor of Media Arts and Sciences at Massachusetts Institute of Technology and the creator of Kismet robot, and her team. It is called the first family robot. According to the official JIBO web-page, the robot can be used by people of different ages and is suitable for casual users, as well as for developers.

It can assist each family member in simple everyday tasks, for instance, sending and delivering voice messages, making video calls and using face recognition to turn camera in the direction of a certain person, telling stories, taking pictures and videos, setting up reminders and being an interface for the smart home.

The JIBO team was holding an extremely successful crowdfunding campaign during July-September 2014. The campaign represented by a short video about a social robot

being a part of a typical family raised over 2 million US dollars for the further development. As claimed by the company owners, the release date of the JIBO home edition is scheduled for December 2015 (Indiegogo 2014).

The core difference between, for instance, NAO robot and such familiar robots as Rumba and drones, may seem quite ambiguous. Most of the machines surrounding us in everyday life are robots: a dishwasher, an elevator and a parking payment machine. On the one hand, they all are tools that reduce the amount of energy or time to perform a function. In other words, they solve a problem in the mechanical way. On the other hand, they are automated, which means that they can do work without a human intervention. The same is true for social robotics. However, the essence of social robotics is in the interaction.

There are several definitions that conflict with each other. For instance:

> Social robot is a type of robot that has a body, can sense its environment   and respond to it, as well as has some understanding of social beings (Social robot. Dictionary.com's 21st Century Lexicon 2015).

It is debatable, if a social robot should necessarily have a physical form or whether screen characters, like avatars, can be included into a definition as well. In order to explore as many options as possible, in this study, avatars will not be excluded. Therefore, a definition of an American computer scientist and inventor Ted Selker will be used for this particular research:

> A social robot is an automated system, both physical and nonphysical, that improves something for people by using social communication approach that is social response or reaction (Selker, Computer scientist 2014).

The robot can be anything, for example, it could be a big red ball, which responds to the user's action like smashing by making a sound "Ouch!", or when it uses the speech to perform an action or as a response to the command. The improvement could be providing information and help or interaction itself.

4.2 Social robotics taxonomy

As a matter of fact, there are several research centers and independent researchers over the globe studying social robotics. The terminology is not yet unified, that is why there are different types of social robotics taxonomy.

Originally, the social robotics design was developing in two different directions. The first one is biologically inspired design, which is based on the scientific knowledge from natural and social sciences, such as anthropology, cognitive science, developmental psychology, ethology, sociology, structure of interaction and theory of mind. The main principle of this design method is that in order to create a robot, which will be understood by humans, it is required to understand how the interaction between living creatures works itself (Fong et al. 2003, 147). One of the brightest examples is the Kismet robot developed by Cynthia Breazeal at Massachusetts Institute of Technology.

The second approach is functional design, which aims to create a robot that appears to be socially intelligent, however, it has neither scientific, nor nature basis. It assumed that to create an artificial social robot driven by beliefs and desires, instead of trying to understand how the mind works, it is enough to describe the processes and mechanisms, by which people understand socially intelligent creatures (Fong et al. 2003, 148).

The trend of population ageing is one of the factors that drive the development of social robotics in Europe. From the previous chapter it became clear that the population of Northern European countries such as Sweden, Denmark and Finland is getting old, and the life expectancy of people is getting longer. There is quite a high risk of manpower shortage in these countries especially in the elderly care services, the demand for which is growing rapidly. Furthermore, elderly people prefer to live in their homes, instead of moving to a nursing home, more often nowadays.

Hence, many European research centers and universities, for example, Raltech research group for assisted living technologies from Austria, are developing social robotics solutions for the elderly. The classification of social robots that are designed for the

needs of elderly people is provided in the review of the Delft University of Technology from Netherlands:

Socially interactive robotics: are meant to develop close and effective interactions with the human user for the sake of interaction itself;

Socially assistive robotics (SAR): provide assistance to users through social interaction. The prime goal of SAR is to create close and effective interaction with the user for the purpose of giving assistance and achieving measurable progress in convalescence, rehabilitation and learning. SAR can be divided into two subtypes:

Service robots are meant to support independent living of an elderly person in such basic activities as eating, taking bath, toileting, getting dressed and mobility, including navigation. Moreover, service robots can provide house maintaining, monitoring the household activity and safety. Examples: nurse boat Pearl, iCat, Care-o-bot, Robocare project (Broekens, Heerink, Rosendal 2009, 96).

Companion robots (pet-type) are designed to provide companionship for elderly people enhancing health and psychological well-being of elderly users. Studies examine the ability of robots to increase the positive mood of elderly people living in nursing homes. Examples: Paro, Huggable, Aibo (dog-robot) (Broekens, Heerink, Rosendal 2009, 95).

Socially assistive robots are considered as helpers for elderly care in the hospital or in the retirement house, or at the elderly person's home. They can perform the following functions:

Daily assistance - to keep users up to date with the elderly home schedules, set up reminders;

Companionship - to create the effect of presence, help to reduce stress and depression;

Assistance for elderly people with disabilities - to help with mobility and navigation;

Rehabilitation - to assist in rehabilitation programme and exercises (Broekens et al. 2009, 96).

4.3 Servitization of social robotics

This study incorporates three megatrends: ageing of population, robotization and servitization. According to a manufacturing logic, social robot is perceived as a product in a sense of transformation of raw materials (plastic, metal and pieces of code) into a finished product that is supposed to be sold. However, the interrelationship between the product and service component, whose share and significance are increasing in modern economy, is evolving fundamentally, especially in technology driven industries. The term servitization is used to explain this trend.

The definition provided by Trends Institute Atos Consulting (2011, 6) states that servitization is a transformation process, during which product companies embrace a service orientation and, or develop more and better services, with the aim to "satisfy customer's needs, enhance the firm's performance and achieve competitive advantages".

Considering the satisfaction of customer's needs, it is important to identify and understand those needs, as well as be aware of the possible limitations and opportunities inherent to the customer group.

The previous chapter discussed the emerging challenges in social and health care for elderly people caused by the increasing demand for elderly services and lack of the personnel in this sector. These findings may lead to more concrete issues that elderly people are already facing.

As an illustration, pension rate and age-related change have been identified as crucial limitations for the pricing strategy and the design purposes. It is more likely that elderly people would be able to afford a service provided by a social robot rather than to buy it as a product.

Age-related change can affect the design of the social robot from the usability and utility perspective. According to Arthur D. Frisk (2009, 5), utility stands for the functionality that provides what the user needs. Usability, in its turn, explains how well the user can access the functionality.

Regardless of unique age-related challenges, the usability problems are shared between age groups. The technology proves to have a good usability, if it can be used by elderly people without major problems (Fisk et al. 2009, 5). For example, bigger spacing between buttons and high contrast between the font and background would work well both for older and younger adults.

Usability has five important attributes: learnability - how easy it is to learn a device; efficiency – how well user can achieve his/her intended objectives; memorability - how easy it is to remember how to use a device; errors – what actions result that user is unable to accomplish the desired goal; satisfaction – how pleasant is the user experience with the device.

There is a common belief that most of the household products are "user friendly" (Fisk et al. 2009, 7). Unfortunately, this statement is far from the truth. Even a very simple device has to be tested with a user, especially with elderly people. Social robotics is much more advanced technology than, for example, some kitchen appliance, therefore it is necessary to have more thorough tests with the target audience.

Moreover, older adults require longer and more detailed training to be able to use a new technology or device (Fisk et al. 2009, 90). The training for elderly people should be organized according to their unique learning abilities.

In his research, Arthur D. Frisk (2009, 90) describes the following principles of learning new technology for older adults:

Engage learners into the study process by making them solve meaningful problems that they may face in their everyday life, for example, training how to use online banking, public transport schedules, book an appointment to a doctor or other community and government services;

New knowledge has to be linked with the previously learned concepts. Older people understand new things better via analogy and understandable simplifications;

Training should be active, with the use of examples and scenarios.

One of the main principles of the service design is co-creation that requires all the stakeholders and end-users to be involved into design process. It allows creating solutions for the variety of needs and problems, fast testing and making improvements based on the user's feedback. Therefore, service design techniques can help to make social robotics more useful for elderly people, for instance, to provide better utility and usability.

5 SERVICE DESIGN

5.1 Definition of service design

Previously, there were discussed biologically inspired and functional approaches, which are applied to the social robotics design. This chapter reflects on social robotics from the service design point of view.

Based on the comparative analysis of more than 10 service design definitions acquired from the several sources, only one has brought up the essential features of the service design. The rest, however, described the basic characteristics and the main goals of the service design. For example, professor of service design of the University of Cologne, Germany, Birgit Mager emphasized that "service design aims to ensure service interfaces are useful, usable and desirable from the client's point of view and efficient and distinctive from the suppliers' point of view". Stefan Moritz, an author of Service Design – Practical access to an evolving field, shares the similar idea of usefulness, usability and desirability as essential features of the service design for customers and efficacy and efficiency for organizations. According to Moritz's definition, the service design aims to improve the existing services as well (Stickdorn & Schneider 2010, 31-32).

Center of Service Leadership, Arizona State University, in its turn states that the service design aims to involve various internal and external stakeholders into co-creation of holistic service experiences and bring service strategy and innovative service ideas into life (Stickdorn & Schneider 2010, 33).

However, the most universal and suitable definition for this particular study is provided by Continuum Advanced Systems (Continuuminnovation.com 2014) the service design is a process of development, creation and improvement of the service environment (where the service experience takes place), tools (front stage and backstage interfaces) and the processes that help employees deliver superior service in a way that is proprietary to the brand.

Definition analysis enriched the study with the goals that service design aims to achieve. These five goals are:

Ensure the usefulness, usability and desirability of the service interfaces for the clients;

Help service providers to create efficient and distinctive service interfaces;

Involve various internal and external stakeholders into co-creation of holistic service experiences;

Bring service strategy and innovative service ideas into life;

Help to improve the existing services (Stickdorn & Schneider 2010, 31-35).

5.2 Service design process

Service design is a four stage process that in the best case scenario should be repeated several times (figure 5).
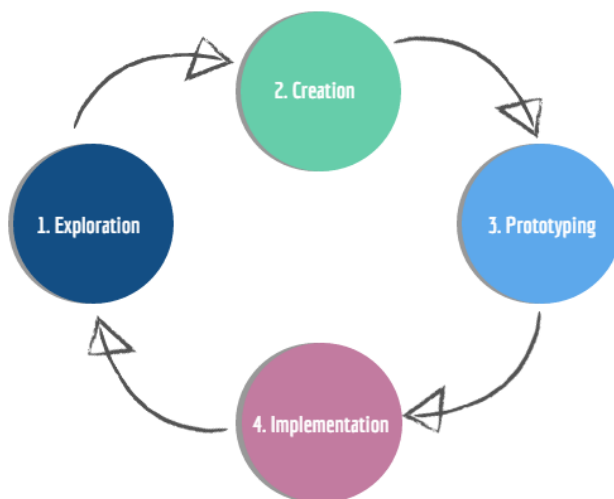
FIGURE 5. Service Design Process

Generally, service designers either develop a new service, or a service component for the product, or improve and revolutionize already existing services. In both cases, the aim is to get insights into customer minds and find out their needs and desires, motivations and expectations. Involving customers into creation process is one of the most important principles of the service design (Stickdorn & Schneider 2010, 128). From the service provider's point of view, it is crucial to pinpoint the process constraints that have bad influence on the service experience. The idea of the user-

centered service design emphasizes the significance of the customer perspective. The success of the service design depends on the clear understanding how current and potential customers see a certain service. Hence, during the first exploration phase, it is crucial not to find a solution, but to identify a problem.

The following phase is about creating concepts and solutions. However, instead of crafting a massive plan, it is better to test the idea as fast as possible. Creation phase is the best for making mistakes and learning from them. Based on the test results it is crucial to improve the concept and re-test it (Stickdorn & Schneider 2010,132). Service design is following the lean logic that allows designers to avoid failures at the latest stages of service development when the cost of a mistake grows exponentially.

When the optimal solution is found, it is time to create a prototype, which is not only a physical object but a construction of the intangible component of the service, as the environment and experience itself (Stickdorn & Schneider 2010, 133) In the conclusion of the service design process, there is a implementation phase that is focused on the application of the results of the three previous stages into reality.

The paper of Min Kyung Lee and Jodi Forlizzi from the Human-Computer Interaction Institute and School of Design of Carnegie Mellon University puts forward the view that service blueprint can be used for designing adaptive services that supports service experiences changing over the time, can possibly sustain the user's engagement with the service and strengthen the relationships with the service over the time (Lee & Forlizzi 2009, 1). The study addresses the problem of obesity and unhealthy food habits by providing an easier way of healthy snack delivery with the help of a social robot. It communicates with customers by the means of a simple speech recognition and series of cameras and lasers to capture human behaviors (Lee & Forlizzi 2009, 7).

Website and a social robot are the key touch points of the snack delivery service. By interacting with a customer the robot learns preferences and customizes responses. This research is an example of utilizing such service design tools, as blueprint, in order to create adaptive services provided by social robots.

Finnish welfare strategy 2020 emphasizes that the new technology will be used to support independent living, and the starting point for that is available, equitable, effective and customer-oriented services (Ministry Of Social Affairs and Health 2010, 12). This particular research is focusing on the exploration phase of the elderly services. The main goal is to get better understanding of the service landscape for the elderly in Tampere, Finland, illustrate the customer journey in the nursing home, and get elderly care professionals involved into co-creation, as well as find problems that could possibly be solved with the help of social robotics.

6   ANALYSIS OF INTERVIEW RESULTS

There is an interesting question, who is going to be affected by the consequences of the population ageing more? The first group that comes to mind is elderly people. Due to the lack of employees in social welfare and health care they will probably have to wait in line in order to get the necessary social and health services. The state will have to come up with economical solutions for the financial problems caused by the increased amount of pensioners. Moreover, the personnel which provides social and health services for elderly people is going to face an enormous amount of customers.

This research is an attempt to invite elderly care professionals into a co-creation. They work with elderly people and they witness their life, for instance, in the nursing home. Who, if not them, can provide service designers with the unique insights about this particular type of elderly service? As mentioned above, the results incorporate findings from the trial interview with elderly care professionals from the UK. Certainly, the experiences of professionals from Finland and the UK differ quite a lot. At the same time, ideas and examples from both countries can provide some interesting food for thought. Full versions of interviews can be found in the appendix. The interview results are divided into seven themes that reflect the most significant ideas expressed by the elderly care professionals.

6.1 Motivation

All the interviewees had different motives to start their career in elderly care services. However, for half of them the initial motivation, which was more income oriented, has changed after the actual working experience. "I was very young and I wanted to earn money" (Interviewee 4. Elderly care professional 2015) and "I had no other job. If it is paid, I can work with the elderly" (Interviewee 2. Elderly care professional 2014).
For one of the interviewees the summer job in the nursing home helped to make a decision about the career choice.

> I loved working with elderly people. They were nice and it was very easy to talk to them and somehow… I think yes, this is something. So after that summer I have

worked there I applied to study as a physiotherapist in Tampere (Interviewee 4. Elderly care professional 2015).

For another interviewee, besides the salary, a positive feedback received from interaction with elderly people made the work enjoyable "I really enjoyed it. I feel that I could cheer them up a bit" (Interviewee 2. Elderly care professional 2014).

The other half of interviewees had quite a personal motivation to choose this field. For instance, one said "I like nursing. After my son was born, I realized that I like it" (Interviewee 3. Elderly care professional 2014). Another elderly care professional seems to be very devoted to her profession.

> It feels natural to work with elderly people. I work 19 years at the same place. I am doing some volunteering work. I organize walks and meetings, where people can meet each other (Interviewee 1. Elderly care professional 2014. Translated from Finnish).

During such a long experience she got her inner motivation "I am volunteering, because I know that home service workers have no time to talk to elderly" (Interviewee 1. Elderly care professional 2014. Translated from Finnish).

The actual work experience may have an impact on the initial work motivation. However, it can still stay the same in some cases.

6.2 Client orientation

Undoubtedly, the significance of client orientation in elderly homes will increase in the nearest future, especially when the amount of elderly people grows rapidly.

Throughout the interviews the theme of customer orientation has been appearing several times. Previous experience of some interviewees has revealed the change in perception of customer orientation in elderly home "But now I think, in Finland as well we have talked much more about client orientation and what older people want to do. And also my experience is and my things have changed" (Interviewee 4. Elderly care professional 2015). When the elderly care professional imagines herself as a client of the nursing home, she wants things to be different and more customer oriented: "I have planned my

own ageing. I want to go to bed when I really want. Not this time when somebody told me that it's time now" (Interviewee 4. Elderly care professional 2015).

It is notable that some interviewees have a client oriented mindset.

> So you have to take it (when the client is not happy with something) like a customer as their own personality. Remember what they like. After you learn how you have to speak to them, it's much easier to communicate" (Interviewee 2. Elderly care professional 2014).

On the other hand, some of the interviewees express the change in the client orientation more explicitly throughout the words they are using "I have clients, not patients, just clients". Another example "Our clients are absolutely great". Some of interviewees have already established quite a personal contact with elderly people they are working with "I like them, they like me. When I change my job and move here, they will move with me as well. Great grannies. I tell them a lot about my life. We all are one big family. My grannies" (Interviewee 1. Elderly care professional 2014. Translated from Finnish).

It is difficult to evaluate the level of client orientation in nursing homes around Tampere and Pirkanmaa region based on such a small amount of interviews. However, the results seem quite optimistic. Elderly care professionals are getting into customer oriented mindset either on the level of the work place policy, or on the personal level, or even combining them both.

6.3 Life of elderly people in elderly care institutions (how?)

One of the core ideas that emerge in this theme is that elderly people are different. They have different physical state "some of them are so dimensioned or ill. They are a bit grumpy and their personalities have changed" (Interviewee 3. Elderly care professional 2014) and "some of them are maybe in so bad condition, so that they cannot go to the concerts or anything like that" (Interviewee 2. Elderly care professional 2014).There are people, who are in a better physical condition "some of them enjoys their days or moments there and likes nurses" (Interviewee 3. Elderly care professional 2014) and "generally it (elderly people's mood) was calm and positive" (Interviewee 2. Elderly care professional 2014).

Elderly people differ in terms of financial welfare: "We have elderly people in Finland, who are very active, and socio-economic level is very high. We have also that small group of elderly people in Finland, who are not, they are quite poor" (Interviewee 4. Elderly care professional 2015).

Probably, loneliness is one of the common issues for elderly people living in the nursing home. As an example, "some of them don't have visitors, it can be boring" (Interviewee 2. Elderly care professional 2014). The interviewees express it both explicitly "old people in our elderly home and at their own homes are lonely", and indirectly "everyone wants to speak, but there is nobody who is a good listener" (Interviewee 1. Elderly care professional 2014. Translated from Finnish).

When the interviewees express their opinion about life in elderly home, they all highlight different aspects. For instance, "it (working with elderly people) is nice and it is an own world" (Interviewee 3. Elderly care professional 2014) or "some of them were negative because maybe they didn't understand everything, why some things have to be the way they are" (Interviewee 2. Elderly care professional 2014). Even though there are some issues, for example, "it (life in elderly home) was not always so fun because it was quite routine" (Interviewee 4. Elderly care professional 2015), still "life of elderly people is easier in elderly home. All services are nearby" (Interviewee 1. Elderly care professional 2014. Translated from Finnish).

6.4 Service process and constraints (what?)

When the interviewees were talking about the daily schedules of nursing homes, they all were admitting that there were a lot of routines "a lot of routines like meals at the same time of course stuff like that" (Interviewee 2. Elderly care professional 2014) and "it's kind of a bit same for them every day a bit different, but routines are important as for kids" (Interviewee 3. Elderly care professional 2014). Even the program of the day center for elderly is "a bit like in kindergarten" (Interviewee 1. Elderly care professional 2014. Translated from Finnish). One of the interviewees was working in the nursing home 15-20 years ago. However, her description of the typical working day was almost

identical with the schedule of the interviewees, who started their careers not that long time ago. You can see the process below.

Morning shift
(Ongoing communication with elderly people)
The day starts at 7-8 o'clock in the morning;
Report from the night shift about the situation;
Changing diapers for some patients;
Breakfast (feeding older people in their rooms or inviting them to the dining room);
Collecting dishes;
Showering or medication intake;
Outside strolling or gymnastics;
Social activities (hobbies);
Lunch (feeding older people in their rooms or inviting them to the dining room);
Collecting dishes;
Group activities.

Night shift:
(Ongoing communication with elderly people)
Dinner (feeding older people in their rooms or inviting them to the dining room);
Collecting dishes;
Medication intake;
Put older people to bed.

Day center:
Arrival by bus;
Breakfast;
Gymnastics;
Sauna;
Lunch;
Recreation activities and socializing;
Evening coffee;
Departure by bus.

Throughout the answers, it is possible to identify probable process constraints that some of the interviewees were experiencing. For example, "There was one lady who was at the food serving place. I helped her in the morning" (Interviewee 2. Elderly care professional 2014), "we washed our bed patients, changed their diapers. Not all of them, because there is not enough time - just some" (Interviewee 3. Elderly care professional 2014) and "10-20 elder people and put them into bed. Almost same time. It was like phjew-phjew-phjew (very fast). It wasn't so fun" (Interviewee 4. Elderly care professional 2015).

> In the UK, a lot of the services within communities are IT-based. Some of the communities, which are in quite a rural location have difficulties with information input. Nurses or other healthcare professionals have to do double work by inputting the data into two different computer systems and fill the paper records as well.
> This information would be helpful to identify bottlenecks in the processes of nursing homes and probably find the ways to fix them (Interviewee 5. Elderly care professional 2014).

6.5 Change over the years and the attitude towards technology

As mentioned before, there were two interviewees, who had decades of working experience with elderly people. Therefore, they were asked to describe how their job had changed over the years. Both elderly care professionals started their career about 20 years ago. This period is also known as the time of rapid technology development. Computers, Internet and mobile phones became an inherent part of every workplace in Finland. However, the interviewees did not mention the technology in their answers. One of them expressed the opinion that "there is more pressure on rehabilitation and encouraging on self-reliance than previously" (Interviewee 1. Elderly care professional 2014. Translated from Finnish). The second interviewee expressed a different opinion.

> 20 years ago cleaning was a part of (public) services but not anymore. Maybe the quality of elderly care nowadays is more about this client orientation, that is the aim to develop these services. And that's good. It has changed during those 20 years (Interviewee 4. Elderly care professional 2015).

Probably the integration of the new technology has changed not only professional but also personal life of people, so they do not perceive it as a workplace change.

There was some confusion in the beginning, when the interviewees were asked to come up with an idea of a device that had not been invented before to help elderly or their work.

> For some of them it's hard to hear or hard to see so I don't know how the machine could help people like that. I don't know how open minded they are towards this kind of thing", or "that's difficult because they need human presence and no device can do that. But even robots cannot do the same (Interviewee 3. Elderly care professional 2014).

Professionals from the UK were also concerned about the social exclusion that could possibly occur, due to the technology spreading in elderly care.

> So there is a social isolation barrier, so you've got and you can't completely replace people with technology. It is the emotional connection that needs to be made to understand why somebody isn't as motivated one day compare to another. It is difficult to see how a robot could say, you know, you are so much better that you were yesterday. See the difference in you. You look a bit down. It's a kind of stuff that human connection is, isn't it? It has to be there somewhere (Interviewee 5. Elderly care professional 2014).

However, after some time, when the interviewees became more comfortable with generating ideas regardless of their perception constraints, they started to throw ideas that address the problems that they consider as important.

> Sometimes there were problems like getting them into a wheelchair, but that would be I don't know how machine could do that. I guess there are already machines that can do that (Interviewee 2. Elderly care professional 2014).

Certainly, the first confusion of the interviewees does not prove that elderly care professionals are technophobes. They were very eager to share their ideas how the technology could help elderly people and, especially, how social robots can be used for those needs. Perhaps, they are looking at the things from the care and social interaction perspective. These two concepts were highlighted the most throughout the interviews among all elderly care professionals. They are aware that seniors need an extra social assistance and communication.

6.6 Ideas and solutions

Most of the ideas that elderly care professionals were proposing are quite vague but, at the same time, they address the problems that they consider as topical and important.

6.6.1 Communication and interaction

"I want something like a robot that talks and socialize with them. Speaking and listening is very important" (Interviewee 1. Elderly care professional 2014. Translated from Finnish).

"Maybe something that you could communicate with" (Interviewee 2. Elderly care professional 2014).

"I would like to develop something that helps elderly people who lives alone and suffer loneliness" (Interviewee 4. Elderly care professional 2015).

"The equipment somehow combine that social interaction with family members for example, grandchildren, children, carers" (Interviewee 4. Elderly care professional 2015).

"I think that Facebook is interesting, isn't it? The information on people using the Internet. My parents and in-laws will use Facebook to keep in touch with their grandchildren. So I think there is an understanding where old people are currently using technology and not making assumptions" (Interviewee 5. Elderly care professional 2014).

6.6.2 Activities

"Some activity like to brighten up them every day" (Interviewee 2. Elderly care professional 2014).

"I don't know maybe some simple entertainment. Something that they can learn still" (Interviewee 3. Elderly care professional 2014).

"Maybe more something that brings memories and joy. And meaning to life. I don't know if they miss that or not" (Interviewee 3. Elderly care professional 2014).

"Also somehow have some physical activities" (Interviewee 4. Elderly care professional 2015).

6.6.3 Health related

"Maybe some medical things like helping with the stomach issues (vatsan toiminta), because it is so important for them" (Interviewee 3. Elderly care professional 2014).
"Helping if you have pain, or this kind of anxiety or confused mind" (Interviewee 3. Elderly care professional 2014).

"So the technology is the way forward. Some diagnostic attachments. I mean that somebody was telling that the telephone or iPads having an attachments. So it would be a part of the kit to feedback some physiological data" (Interviewee 5. Elderly care professional 2014).

6.6.4 Safety

"Safety thing that they don't fall too easily" (Interviewee 3. Elderly care professional 2014).

6.6.5 Other

"Something that helps nurse's ergonomics more" (Interviewee 3. Elderly care professional 2014).
"One challenge is to integrate the technology solution which is on the market already. Somehow to combine them all" (Interviewee 4. Elderly care professional 2015).

6.7 Ideas and feedback on Social Robotics

As previously explained, the interviewees were asked to give their opinion about three different types of social robotics and choose one of them, which, in their opinion, would

be the most helpful for elderly people. They were given three pictures of social robots with the short explanation of their functions.

6.7.1 Nao robot

NAO robot caused quite a lot of controversial opinions. Even though the functions of the robot seemed to be useful, for instance face recognition, there was always something that made the interviewees doubt or choose another robot over NAO.

> But maybe in general this NAO robot would be good because of, like I said, it is something concrete but it can also do stuff like this that seal cannot. Yeah, I think NAO can be good for more active people, who are still at home. But for some it cannot work because they can't hear or see. Sometimes his voice was a bit quiet (Interviewee 2. Elderly care professional 2014).

> In Finland, you need to only speak Finnish or Swedish. It's nice that it can recognize and remember people's faces. And set reminders. Yoga and Tai Chi I don't know if older people know. Play music, mmm…This is really good this robot, but the look is too much. I think the outfit is too tech and robot looking (Interviewee 3. Elderly care professional 2014).

> But maybe I think more about my opinion. This is not quite positive for elderly people. At least it would be better to not to apply it to caring, but rehabilitation is very good, and social robotic idea is very good. Of course it's very important that this NAO speaks Finnish because it's more familiar for elderly people that this robot has the same language. This is interesting that it can set reminders to take medicine for example. This is more for +65, who are curious for new tech and physical activities, for example, but not robotics … It would be very interesting to see how this NAO works with memory disorders, because I don't think that it's good. It is plastic, it's something not so familiar. Alzheimer people remember familiar things from the youth, they don't have experiences about this kind of things. I think more +65 and quite active seniors (Interviewee 4. Elderly care professional 2015).

6.7.2 Virtual social assistant (appears as an image of a female human on the TV or touch screen, has a mic and speakers to interact with a person)

The image of the virtual human was borrowed from the research project of the University of Southern California, which was funded by the Defense Advanced Research Projects Agency and the U.S. Army. The virtual human was used to interview people suffering from post-traumatic stress and other mental anguish. This study provides the empirical evidence that "virtual humans can increase a patient's

willingness to disclose personal information in a clinical setting" (Abrams 2014). In this research, it was important to examine if elderly care professionals can find the possible application for this technology in elderly home environment. The overall reaction to this example of social robot was quite positive. Most of the interviewees were surprised that a virtual female human appearing on the screen can be a social robot as well.

> Someone who listens, someone like this screen, which is present, which understands and listens. In my opinion it is dreadfully/extremely important. It is important that it listens, not necessarily talking a lot, but just saying "yeah, yes-yes" (Interviewee 1. Elderly care professional 2014. Translated from Finnish).

> Like with this TV screen you don't have anything concrete. This one could be nice for example because you don't need any hardware you can only turn on the TV and it will be there and you can put batteries or whatever. It would be an easy solution. I am wondering how the avatar is looking, how she talks. I would not mind talking to a game character myself (Interviewee 2. Elderly care professional 2014).

"Number 2 is actually good when you can talk to it companion. Can it respond? Maybe people won't be afraid of this" (Interviewee 3. Elderly care professional 2014).

"This function "good listener", for example for older people, who live alone, is a very good idea. Especially elderly who want to have social contacts. Absolutely! Why not?" (Interviewee 4. Elderly care professional 2015).

6.7.3 Paro robot

Paro robot got positive feedback from each and every one of the interviewees. It was interesting that they identified people suffering from Alzheimer disease as the primary target group for Paro robot.
"If you think about people with dementia, they need to hold something close their chest and pet it. We have bought a lamb skin or fur, something that is warm" (Interviewee 1. Elderly care professional 2014. Translated from Finnish).

> If I would choose for the place I was I would take a Paro robot. Because they really like to cuddle with the stuffed animals what are they like toys. I think they might be good for people with dementia. Because it's so natural to take care of this kind of thing and it does not always needs words or see (Interviewee 2. Elderly care professional 2014).

Many of the older people have soft toys. Even if they are really badly dementioned they have these soft thing to hold, but many of them like pets or dogs. I think that it would give these people so much the closeness what they need (Interviewee 3. Elderly care professional 2014).

You can wash it! Because it is one thing when you are in elderly home, when there is a Alzheimer patients you have to think about hygienic things. This is something very warm and soft and therapeutic as Paro is (Interviewee 4. Elderly care professional 2015).

One of the interviewees was thinking out loud and proposed quite an interesting idea.

I think Paro fits for elderly, for quite old elderly people and for all elderly as well. They like these beautiful eyes and everyone has this, they like this cute, nice Paro. Also it suits for children. It can also combine different generations to put children, grandchildren and grandparents together (Interviewee 4. Elderly care professional 2015).

As a result, half of the interviewees have chosen a virtual human and the other half preferred Paro robot. Overall, the discussion on social robotics was a very interesting and positive experience. It felt that the interviewer and the interviewees were on the same page. In each case, the discussion was lively and elderly care professionals provided a good justification for their choices. The answers were detailed and contained a lot of information. Use of images of the robots and explaining their features prove to be a good method to involve people with non-technical background into the discussion and idea generation process.

7   CONCLUSIONS

One of main objectives of this study was to explain that elderly people are quite a large group that incorporates people aged from 65 and up to 100 years old. Furthermore, this group is quite diverse and heterogeneous in terms of education, income level, marital status and state of health. Pension rate and age-related change in health have a crucial impact on the decision making process of an elderly person. Unfortunately, these facts are often ignored by the companies that are not directly involved in the field of elderly care services.

This study covered a range of challenges related to the population ageing in Finland. Statistical data provides confirmatory evidence that the population of Finland ages quite fast and there is a high risk of manpower shortage in the sector of social and health care services for the elderly. Throughout the interviews, there were found alternative solutions for this problem, such as optimization of a nurse's schedule by empowering elderly people to take physiological measures by themselves, or mobile phone consultations, and use of services provided by the third party, for instance, Red Cross and other charity organizations (Interviewee 5. Elderly care professional 2014).

However, the problem of providing social and health care for elderly people living in rural areas is quite challenging. On the other hand, loneliness and social exclusion are experienced by people living in a nursing home, even when they are surrounded by other people but are far away from their families and friends. Possibly, social robotics may be used to address these needs.

Moreover, this study provided the information about the service landscape that is currently available for elderly people in Tampere, and with the help of elderly care professionals, it highlighted the areas that require further development in this sector. As an example, a problem with lifting and showering people that requires more than one nurse can possibly be solved by the existing technology. Involvement of elderly care professionals into co-creation process has proved that they are open to generate technological ideas and believe that social robotics can address needs of elderly people. For instance, Paro robot was acknowledged by all elderly care professionals participated

in the interviews as the most suitable robot for the elderly suffering from Alzheimer disease. One of the key findings was that elderly care professionals saw problems from the perspective of care and social interaction. This approach may provide social robotics designers with good insights and new ideas.

The initial hypothesis: "Service design as a co-creative method is able to open up new opportunities to satisfy different needs of elderly with the help of social robotics" requires more research information and further validation.

This study was focusing on the first phase of the service design process - exploration, and it proved to be a good start. However, to fully prove or disprove the hypothesis, it is necessary to go through all the stages of the service design process. The next step would be to involve more stakeholders, such as engineers, service designers, elderly people and elderly care professionals into co-creation and testing. The further research would continue with the creation of the service concept that would use social robotics to address needs of elderly people, and then to complete the prototyping and implementation phases.

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APPENDICES

Appendix 1. Interview questions

Interview question	Research question	Prompts
Could you tell please, why have you decided to work in this field? What were the arguments to choose this field? Miten päädyit työskentelemään tällä alalla?	What motivates people to work with elderly?	work motivation
Please, describe your routine working day. What do you do? Kuvaile normaalia työpäivääsi ja tehtäviäsi.	What problems do professionals have while working with elderly?	process constraints social constraints
Has your job had changed since the time you have started your career? Onko työnkuvasi muttunut urasi alkuvaiheesta?	What problems do professionals have while working with elderly?	population ageing effects technology use addressing problems change in motivation
How do you find working with old people? Kuinka hyvin tulet toimeen hoidettaviesi kanssa? Are you getting along? How fast?	As the observers what do they think what is the critical problem for elderly?	motivation social contact
How can you describe their (older people) life? Kuinka kuvailisit heidän (vanhusten) elämäänsä?	As the observers what do they think what is the critical problem for elderly?	problems, needs, desires of elderly
If you were able to create some machine or device to help older	Is there some solution for the problem that however	Addressing specific problems/needs of

people that does not exist yet, what would it be? What could help/benefit your work? Jos voisit rakentaa laitteen, joka helpottaisi työtäsi tai vanhusten elämää, millainen se olisi?	works not effectively or does not solve the problem? Can the technology solve these problems/difficulties? How to help them? Are they ready to learn and use technology?	elderly, addressing specific needs of health and social care professionals, human touch, medical things, stomach issues, relive pain or anxiety, something that they can still learn; brings memory, joy and meaning to life; safety

Appendix 2. Discussion prompts

NAO robot

Functions:

Speaks several languages: Finnish, English;

Can recognize and remember people's faces;

Is able to set reminders (to take medicine) and alarms;

Can walk and grab objects;

Plays number game;

Does yoga and tai chi;

Plays music (Farr, C. 2014);

Virtual social assistant.

Appears as an image on the TV or touch screen, has a microphone and speakers to interact with a person (Abrams, T. 2014).

Functions:

Helps to create, organize and follow daily schedules of an older person; What time to go shopping?

Can be a good listener if a person wants to tell if she/he feels bad;

Helps to navigate within a space (provides a map);

Paro robot

Functions:

Has a life rhythm as a human (sleeps in the night and is active during the day);

Is soft and interactive like a pet (moving its head and legs, makes sounds);

Recognizes human speech (his name, greetings);

Can be trained (if stroke it after some action it remembers and repeats, if you beat Paro, it does not do the same action);

Does not lose its hair;

Is safe for pacemakers (PARO Therapeutic Robot.2014);

Appendix 3. Appendix 4. Interview transcriptions.

Interview 1

Miten päädyit työskentelemään tällä alalla?

Aika vaikea. Itse asiassa mä... hetkinen, mitä te mietitte. Se tunnu ihan luonnostaan miksi mä oon niin kun vanhusten alalla. Mä oli eka niin kun kotihoitaja. Kotihoitaja on siis semmonen joka niin kun on kunnon sosiaalinen puoleen töissä, niin kun perheissä. Mutta sitten pikku hiljaa niin kun mä kävin sosiaalinen ohjaajaksi ja sen jälkeen sitten erikoistun vanhuuksi. Sitten mä ollun koko aikaan mä oon ollun 20.... Mä olen 19 vuotta samassa paikassa.

2. Kuvaile normaalia työpäivääsi ja tehtäviäsi.

Mulla on tota mun työhön kuuluu sosiaalinen kunto tai ehkä se sosiaalinen kuntoutus avo puolella. Eli mulla on avoryhmiä mitä tarkoitta sitä näin ihmisiä omista kodeista ympäri Kangasala, ja sitten ne tulee päiväksi. Minun päiväkeskus ryhmä, mitä tarkoittaa semmoista että ne tulee aamuna ne mummut ja sitten on niin kun päivän meillä tavallaan vähän niin kun lapsetus päiväkodissa. Ja meijän päivä on semmonen päiväkeskus päivä on semmonen, että se tulee aamupala, sitten on kuntosalilla missä säkin olit on jumppa, sitten sauna, sitten on ruokailu, sitten on virikehetki ja iltapäivän kahvit, sitten ne lähtee kotiin. Se on päiväkeskuksen päivä. Sitten mulla on avopuolen tämmösiä avoimia ryhmiä Jalmarin kammari, jossa on kolmekymmentä mummoa ja ne tulee esinne ja sitten meillä on aina rukoushetki, sitten on jumppahetki, sitten sen jälkeen on kun virikehetki on bingo, alejumppa, askartelua, laulua, ja mitä muuta tämmöistä viriketoiminta sosiaalistaa kunnosta. Kaikkeä semmoista. Sitten mulla on vielä ite on vapaaehtois. Mä oon Kangasalan kunnon vapaaehtois henkilö. Sitten pari päivää viikosta mä meen siihen organisoin ihmisiä niin kuin tarvi apua saatu hommia, tai ystäväksi taika luku seuraksi, tai ulkoilua seuraksi. Mä järjestän ihmisensä tapaa toisensa. Ja vielä muulle tietysti kuuluu meijän asukkaat virkistystoiminta ja sitten mä järjestän niille erilaisia toimintatuokioita ja tämmöistä sosiaalista kuntoutusta ja kaikkea.

3. Onko sun työnkuvasi muttunut urasi alkuvaiheesta?

No tota oikeastaan joo. Niin kun enemmään painostetaan tämmöseen kuntoutotavan työteeseen ja tämmösen omatoimisuutteen kannustetaan entisten enemmään. Ihmisten

niin kun se ite, että niin kun itälle puolesta kuuletaan rinnalle ja tehdä yhdessä. Se niinku tuu lisää.

4. Kuinka hyvin tulet toimeen hoidettaviesi kanssa?

Mulla oon asiakkaita, ei tavallaan potilaita, vain asiakkaita. Mulla on aivan niinku mahtavia ne kyllä, tota mun asiakkaat. Niinku kerron teille mitä kaikki me tähän semmoista vähän extremeä tai ylimääräistä niinku extra. Ne ovat kaikki semmoista. Mä tykkään niistä, ne tykkäät muusta.

Ja kun mä lähden pois töistä mä muutin tänne ja mä vaihdan mun työpaikka tänne päin ja ne muuttuu minun kans… siellä on aika mahtavia mummoja. Kyllä semmoisia. Vähän niinku ehkä liikaa sillä tavalla niiden kanssa.. Mutta yksi mummo oli semmonen että hän tuo mulle ja Elsalle kassi semmonen villasukkia ja sitten tavallaan me kerron nille paljon mun elämästä. Seppo (husband) on hänen tuntee. Seppo on legenda. Me olemme yhtä suurta perhe. Vähän semmonen. Mun mummut.

5. Kuinka kuvailisit heidän (vanhusten) elämäänsä?

Mun mummojen. Ajattelen että meidän asiakkaat aika kuitenkin suihkut hyväkuntoisia ja tota asumis kodeissa asiat ovat sillä lailla hyvin. Sitten taas mitkä meillä niin kun asuu meillä talossa niillekin tavallaan niin kun palvelutalon helpottaa niiden elämää. Asiat hyvin ja helpompaa. Ja sitten se että, mun asiakkaat asuvat omakotitaloissa yksiössä kerrostalossa ne ei päässy ulos koskaan koska ei ole paljon, ei kaikki kerrostaloissa on hissia. Meillä ne pääsevät ulos helposti ja saatavat kaikki palvelut lähellä saatavilla. Ja se on huomattavasti helpompaa, kun asuu palvelutalossa.

6. Jos voisit rakentaa laitteen, joka helpottaisi työtäsi tai vanhusten elämää, millainen se olisi?

Mä haluaisin semmosen niin kun robotti mikä seurustelee niiden kanssa, jutteli niiden kanssa. Eli se kysy kysymyksiä ja olis niin kun ihmisten kanssa. Semmonen on tärkeä. Koska ne kaikki jotka asuvat meillä taika kotona ovat yksinäisiä, kaipastaa juttusia. Puhelu robotti. Semmonen olis ihan hyvä.

Keskustelu: Jossakin uutisessa oli tämmönen on niin kun tyyppinen.. Jos ajattelee dementia pitää sylissä paljon ja ne silittää sitä ja ne elää sen kautta. Meillä on ostettiin semmoisia lampaan nahkaisia taika lampaan villasta tehty semmoisia mitä … lämpöä,

mutta mun mielestä ajattelen että tällänen on niin kun se totta tai sitten että tämmönen kuitenkin niin kun robotti, mutta kuitenkin kun jos tä puhuu, kun se puhuminen ja kuunteleminen on ihan hirveä tärkeitä. Joku kuuntele, joku tämä semmonen näyttö joku on niin kun sille läsnä. Joku oikeastaan ymmärtää,se kuunteles. Se on mun mielestä hirveä tärkeä nille. Koska jos sinä se ryhmässäkin kaikki puhuu yhteen ja kukaan ei kuuntelee tuosta. On 10 henkilöä ryhmä ja mä yritän sille että pöydässä yhdessä viimekin kysyin pöydässä miten vietän Joulua ja yksi aloittaa ja kaikki ole hiljaa ja toisen kun hetken aika kaikki puhuu yhteensä. Kaikki halua puhua.Ihmisiä joku kuuntele ei ole hyviä. Semmonen.

Entisten korvastua, se että niin kun kotipalvelun ei niillä aikaa, ne pääse saman tien kun ulos. Siksi mä tehtän vapaaehtoistyö. Mä järjestän ihmisiä sinne kotiin yksinäisille. Tämmönen just, hirveä tärkeitä joka kuunteles ja vois vaikka semmonen sano ei välttämättä tarvi sano kun, niinku "joo", "yees-yes". Ni, kuuntele.. jos joku kuuntele.. Ei vähän koskettaa ehkä olkapäähän, usein ihmisiä ..tästä tai puuttan olkapäähän.. työntä tälle näin.

Interview 2:

1. Could you tell please, why have you decided to work in this field?

It was offered to me, and I had no other job. It's not like I was forced so.

Would you voluntarily choose this job to work with old people?

Yes, sure, if I get paid for it.

2. Describe please your routine working day. What did you do?

I usually went to work at 8 or 7 am. Then I help with the breakfast, like served them and help them eat, because some of them cannot eat by themselves, so I fed them. Then I collect the dishes and there was one lady, who was at the food serving place. I helped her in the morning. After that there was some time, when I could take someone out for a walk or usually I was pushing them in the wheelchair, because they could not walk so well. At some point there was a lunch. I helped with it too. Sometimes we didn't bring all the people to the dining room but patients, who were not in so well condition, were fed in their rooms. We brought the food for them there. I helped there. There were also some happenings, like concerts and stuff like that going on. I took all the people there. It was one of my jobs. And also one of the biggest things was just to talk to them and hang

out with them. Ask how they are doing. It was easy after I learned how each of them is. Are they social and what do they remember.

3. How do you find working with old people? How well do you get along with old people?

At first, I was a little bit scared because I didn't know what to expect but after, like I said, I learnt to know their habits and how they like to be talked to, it became easier and I really enjoyed it. I feel that I could cheer them up a bit. Like, for example, someone can't hear very well so you have to almost yell at them. So after you learn how you have to speak to them it's much easier to communicate.

4. How can you describe their (older people) life?

Well, they have a lot of routines. But I'm glad that there were some activities going on like… but yeah a lot of routines like meals at the same time of course stuff like that. What else?

What kind of mood do they usually have?

Well, generally it was calm and positive. Some of them were negative, because maybe they didn't understand everything, why some things have to be the way they are. So there were some problems. Like one was always throwing her food, because if we didn't know for her soon enough and stuff like that. So you have to take it like customer as their own personality. Remember what they like.

5. If you were able to create some machine or device to help older people that does not exist yet, what would it be? That could help/benefit your work?

I don't know yet… Like I said for some of them it's hard to hear or hard to see so I don't know how the machine could help people like that. I don't know, how open minded they are towards this kind of thing. If I could design anything… I don't really know. It's a really hard question. Like do you mean it could help them in everyday things or? Would it be like company? Something that could help them in everyday life that could make their life better.

Maybe some activity like to brighten up them every day.

 Something different than this routines?

Yeah, maybe. Some of them don't have visitors, it can be boring. Some of them are maybe in so bad condition, so that they cannot go to the concerts or anything like that. So they are just in their room and can't go to places so maybe something that you could communicate with.

For you?

I don't know. Sometimes there were problems like getting them into a wheelchair, but that would be I don't know how machine could do that. I guess there are already machines that can do that. Because I would have to change the chair to get them out. It was sometimes difficult.

Discussion:

Nao robot - I know this one. In general might be a different thing… If I would choose for the place I was I would take a Paro robot. Because they really like to cuddle with the stuffed animals that are they like toys. I think, they might be good for people with dementia. Because it's so natural to take care of this kind of thing and it does not always needs words or see. You can touch it also. Like with this TV screen you don't have anything concrete. But maybe in general this NAO robot would be good because of, like I said, it is something concrete but it can also do stuff like this that seal cannot. Yeah, I think, Nao can be good for more active people, who are still at home. But for some it cannot work because they can't hear or see. Sometimes his voice was a bit quiet. And there are a lot of configurations you have to do by yourself. They all seem kind of nice. Can I comment on this one? This one could be nice for example because you don't need any hardware you can only turn on the TV and it will be there and you can put batteries or whatever. It would be an easy solution. I am wondering how the avatar is looking, how she talks. I would not mind talking to game character myself.

Interview 3:

1. Could you tell please, why have you decided to work in this field?

Lähihoitaja. First of all my friend is lähihoitaja practical nurse and I got interested in the nursing, hoitoala. And I don't know helping people. It seemed kind of haastellinen

(challenging) also. And I don't know, interesting. And I like nursing after my son was born. I realized that I like it.

2. Describe please your routine working day. What did you do?

In the morning shifts I first discussed the morning report with my colleagues. What should we do next, and then we washed our bed patients, changed their diapers. Not all of them, because there is not enough time just some. And then was the breakfast serving and we were in the day hall (päivä saali) or feeding bed patients in their rooms. Then after breakfast was someone's showering day maybe 2 or 3 people. We were only showering 1, 2 or 3 patients. If there was needed 2 nurses to wash an old person it took more time. We needed a showering bed. Then there were medicines and drugs … Maybe some socializing with old people.

3. How do you find working with old people?

It is nice and it is an own world. Like they are kind of childish if they have dementia already developed, but it's nice and at first it was a bit scary, but it went away. There are changing situations all the time. Even though they are kind of slow and repeating all the same things, but every day is different.
 Do you get along with these old people?
Yeah, yeah…

4. How can you describe their (older people) life?

It's kind of a bit same for them every day, a bit different but routines are important as for kids. They have been there for so many years that they don't know how to live outside anymore, if it would be possible. Some of them enjoys their days or moments there and likes nurses. But some of them are so dimensioned or ill, they are a bit grumpy, and their personalities have changed. Something like that.

5. If you were able to create some machine or device to help older people that does not exist yet, what would it be? That could help/benefit your work?

That's difficult because they need human presence, and no device can do that. But even robots cannot do the same. But maybe some medical things like helping with the stomach issues (vatsan toiminta), because it is so important for them. It's everyday thing, how is your pooping and how is it working. And helping if you have pain, or this kind of anxiety or sekava pää confused mind. I don't know maybe some simple ajanviete entertainment. Something that they can learn still. But maybe that generation that is in elder home they won't learn this kind of technique but maybe in the future. But maybe more something that brings memories and joy. And meaning to life. I don't know if they miss that or not. Or safety thing that they don't fall to easily. Or something that helps nurse's ergonomics more. I don't know. They are just living day by day, and I don't know how their living is. They are enjoying the moment and the time so or living in the moment.

Discussion:

In Finland you need to only speak Finnish or Swedish. It's nice that it can recognize and remember people's faces. And set reminders. Yoga and Tai Chi I don't know if older people know. Play music, mmm…

The third one is kind of … because many of the older people have soft toys. Even if they are really badly dementioned, they have these soft thing to hold on, but many of them like pets or dogs. I think that it would give these people so much the closeness what they need. Because it has a life rhythm as a human. I don't know if it moves.

Number 2 is actually good, when you can talk to it companion. Can it respond? Maybe people won't be afraid of this.

This is really good this robot, but the look is too much. I think the outfit is too tech and robot looking. I don't know if it recognizes people's faces maybe it's different when it is in use.

Maybe I would pick the third. Paro robot.

Interview 4:

Could you please tell why you decided to work in this field? With elderly…
Okaaay…

Yeah, maybe I have to tell you about my history when I worked in that field. I was very young. I have graduated in high school. I was 19 years old. And I wanted to earn money. I was young and there was a possibility to work, summer job was available in elderly home in Ikaalinen municipality. Very small municipality near from Tampere about 50-60 kilometers from Tampere. Ikaalinen is my home town, I mean my home municipality. So I worked there during that summer and I loved that. I loved working with elderly people. They were nice and it was very easy to talk to them and somehow… I think yes, this is something. I like to cooperate with human beings and I respect elderly people and that kind of things. So after that summer I have worked there I applied to study as a physiotherapist in Tampere. Health care school that was the name before the Piramk University of applied sciences. So I started studying physiotherapy here and also during my studies I also spend time during holidays I worked in that elderly home. Still I like it more, and more and more. And somehow… yes. Of course there was a part where I graduated as a physiotherapist I worked with different patients of different ages. I mean I had also children, for example neurological children patients. And also elderly people. But somehow there was some dream that I wanna do the rehabilitation work for example and I always been interested to develop things. So that's the long history… After I graduated as a physiotherapist I continued my studies so I went to the university and studied health sciences. Public health sciences and graduated as a master. So that's my story. Not so short, but hehe.. and, yes, now I am here and I try to develop services and the work with the senior citizens. So somehow I want to do this and I think this is also field where are many possibilities. Also development and aa.. yes, from development and study this field.

2. Can you please remember and describe your routine working day, when you worked in the elderly home?

Wow that was… do you mean when I as a physiotherapist? Uuff..

Or like in the retirement house what you remember?

Okay that elderly care home...I was very young. As I said 19-20 years old. I worked at least 2 different shifts: I mean in the morning and in the evening. At 7 o'clock in the morning I started the morning shift. And the first thing we had a very short report time. When this night shift changes to morning shift. And we get that report, very short report. Is everything okay? Who of elderly person, patient had some problem, for example and that kind of things. So in the morning we helped elderly people to put the close on, and medication in the morning and we helped them go to the dining room to

have a breakfast. And or give them breakfast in their own room, patient room. Of course when i worked in that elderly home I didn't have education then, I mean I have no graduated as a physiotherapist yet. It means that I was not allowed, for example give certain kind of medication and that kind of things. During the day I helped in different kind of activities that elder people had. They had a lot of day care activities, I mean social activities and of course physical activities. We went outside and different kind of activity groups and this kind of things. Night shift started at 14.00 in the afternoon and ended 9 or 10 o'clock in the late evening. Yes, we continued afternoon activities and of course we helped with meals and in the evening we helped them to do to the bed and medication and that kind of things, and maybe shower.

3. Do you think that this work and the process of serving like helping these older people in elderly home has changed since you have started by now?

Yes, it's good. It has changes. Because I have to say that I've seen this history and understand when I was this 19-20 years young girl. It was 20 years ago. I have to say it was not always so fun because it was quite routine. You have to go during the evening shift all these, for example, 10-20 elder people and put them into bed. Almost same time. It was like phjew-phjew-phjew.. It wasn't so fun. Afterwards I understood that it wasn't so fun. I was there so young, maybe I didn't notice, but now I think in Finland as well we have talked much more about client orientation and what older people want to do. And also my experience is and my things have changed. I have planned my own ageing. Now I think what I want to do when I'll be an older person. So I try to think about this kind of things. I want to go to bed when I really want. Not this time when somebody told me. It's time now. Of course in Finland nowadays there is also this kind of, very hurry, very tight timetables for the night shifts. Especially for the home care. Maybe the quality of elderly care nowadays is more about this client orientation. What is the aim to develop these services. And that's good. It has changed during that 20 years. As I said I think it's better now.
Absolutely, we are in the middle of big challenges. Because the problem is, maybe we discussed this already before that now and in the future we will have more elderly people to take care of. And it means more that kind of hurry. So I hope this client orientation will win this hurry. And we talked a lot about in Finland, we compare public services and private services and maybe idea is that these private services are more

client oriented because you pay money. I think it's very good that we have different kind of services and different kind of service providers. It also means good competition. For example when I spend time in US there is really client orientation. Because there is insurance, it's really client who is the king. You decide where you want to buy these services and where you want to go, if you have this insurance.

4. How do you find working with old people? Do you get along with them easily?

Yeah, absolutely! Still I like this. For example Active Ageing project we had this living lab approach, which means that we operate in the real-life settings with elderly people. For example senior homes and senior centers and elderly people own homes. My aim is also that our students from different study fields will get very good experiences operation with older people. I think this kind of living lab approach is very good. Of course I notice when you don't spend every day with elderly people maybe it's not so familiar for me anymore as well, but I like that. I hope still in the position of development manager I don't tell about my position, I tell that we came from TAMK and we want to develop this kind of things and etc. But I think it's very nice and convenient to work with elderly people still.

5. How could you describe their life? Of this older people…

Today? In Finland? Em… Maybe we have to think about elderly people as a heterogeneous group..There is different kind of elderly people and maybe that's the challenge. I can't describe elderly people in Finland, because they are very different kind of elderly people and yes, we have elderly people in Finland who are very active. and socio-economic level is very high. They travel and learning more, and they have a lot of social activities and friends and they enjoy life. We have also that small group of elderly people in Finland who are not, they are quite poor. I mean the pension could be quite low, so the difference is quite wide. It's not easy to say what kind of world the elderly people are today. In general the situation with elderly people in Finland is quite good. Maybe very good. Because we live in welfare society. It takes care of you, but of course there are more elderly people and there are more needs, so for example, in public home care now there is more tight criterias that you will get that home care services. For example, during these 20 years public services have changed in the public center. i

mean maybe 20 years ago cleaning was part of the services, but not anymore. As you know in public sector services cleaning is not included in home care, you have to buy. For example maybe you know from Kotitori there are many cleaning services, I mean private services. The idea is that these home care professional could focus more on social and health care services as a home care. Customer orientation is the key point.

6. If you were able to create some machine or device to help older people that does not exist yet, what would it be? that could help/benefit your work?

Very good question....Hmm...Wow...Emm... It's quite hard to say, so short notice, but as the matter of the fact I had yesterday one lecture to physiotherapist students and I told about technology solutions for elderly people. Somehow I want to, I would like to develop something that helps elderly people who lives alone and suffer loneliness. The equipment somehow combine that social interaction with family members for example, grandchildren, children, carers. But also somehow have some physical activities. I mean maybe it's some holistic way to think about this elderly people's life, quality of life. How can I say that… For example yesterday we talked about that. Do you remember when I told about this active table, this touch-screen table for elderly people and I was very curious to have tested it with elderly people. Because I think it was very nice to see that they like, they were very motivated to use that and it was fun and they were together. This social interaction is important somehow...As we talked yesterday it would be very interesting to combine for example somehow Wii equipment and have different kind of exercises, balance and that kind of things. What i try to say something very holistic equipment which helps quality of life, social interaction and physical activities for elderly, so...That could be robotic as well if the content is all these kind of things. Maybe one challenge is to integrate the technology solution which is on the market already. Somehow to combine them all.

So you think that technology already exists?

Yeah, maybe some. Maybe the challenge is to find this kind of applications for elderly people and different kind of elderly people. Because as I said older people is a heterogenous group so that is very important to remember.

Discussion:

Can you please clarify what elderly people group do you mean? You mean group 65+, or +75, or +80;

When we talk about NAO. This is like robotic, so plastic and maybe this is something like not a human being. But I think nowadays elderly people are very curious and they have quite positive attitude towards robotics as well. I think they would like to try this. For example this experience we had robotics in Austria they used for rehabilitation. I think they could get quite good feedback from elderly people. So why not? But maybe I think more about my opinion. This is not quite positive for elderly people. At least it would be better to not to apply it to caring, but rehabilitation is very good, and social robotic idea is very good. Of course it's very important that this NAO speaks Finnish because it's more familiar for elderly people that this robot has the same language. This is interesting that it can set reminders to take medicine for example. Okay, so how that works? NAO says: "Hello! Now it's your time to take your medicine." Yes? Okay. That's maybe good. And that's what i said before how to integrate and how to combine different kind of functions. That's good idea. This is more for +65, who are curious for new tech and physical activities, for example, but not robotics … It would be very interesting to see how this NAO works with memory disorders, because I don't think that it's good. It is plastic; it's something not so familiar. Alzheimer people remember familiar things from the youth; they don't have experiences about this kind of things. I think more +65 and quite active seniors.

This could be very good solution for they, or maybe they have many ideas, for example what more functions could be there in NAO.

This virtual social assistant. Wow. This is something very new and I have to say that it is very interesting to hear about it the older people's feedback because it's quite hard to say what elderly think about it. This is very new solution. Again I say elderly people are heterogeneous group. Maybe someone like very very much this kind of virtual assistant. Someone: no, thank you. This function "good listener", for example for older people who live alone is a very good idea. Especially elderly who want to have social contacts. Absolutely! Why not?

And Paro. I think Paro fits for elderly, for quite old elderly people and for all elderly as well. They like these beautiful eyes and everyone has this, they like this cute, nice Paro. The experience of Alzheimer patients has been very fruitful, maybe you have heard in Netherlands they had experiences with Alzheimer patients and they had not so much sleeping pills anymore. It helps when you caress and it's relaxed and calms you down.

Also it suits for children. It can also combine different generations to put children, grandchildren and grandparents together.

And one thing: you can wash it! Because it is one thing when you are in elderly home, when there is a Alzheimer patients you have to think about hygienic things. This is something very warm and soft and therapeutic as Paro is.

Virtual assistant is a very new thing. It's hard to say what older people think. It would be really interesting to hear and more studies regarding that thing.

But NAO is very plastic, but there are many opportunities for active seniors +65 and for example and for rehabilitation.

As we know the background of NAO is somewhere else than elderly people. So more solutions and application for elderly. That's great idea.

Trial interview

Could you please introduce yourselves?

I am a nurse by background. Worked most of my career 30 plus years in primary care, which is outside of a hospital setting. And for the last 10 years I have worked within our Active hours organization Shropdoc, where I introduce a nursing team so we know half around 35 nurses, 12 community nurses and a team of physios.

I'm a doctor by background. I work in general practice or family practice also worked in a hospital set and public health medicine. And the last 8 years I've been working as a medical director of the organization Shropdoc so .. work as well as managing 300 GP's and overseen the quality and ...of organization.

As I understood you work closely with patients. Could you please tell how do you find out their needs health care or social care? How do you communicate with them? Do they express willingly what they want or you need to find some ways?

A lot of it is about problem solving. So the patient or the carer or a family member will contact Shropdoc by phone and we will take a clinical history, ideally for the patient if we can. To find out what the presenting problem is. Is it a medical problem or is it if they need some kind of a carer health support. And then we go from there and itself can

be a challenge, because active hours there is limited resources there in terms of what other care services are there and how quickly they can respond.

There is another two levels: the next level up is probably use of complaints that is negative, but actually complains are very useful. And incidence and feedback from patients so we do patient's surveys. We get frontline staff to feedback on things can be done better.

She goes out to meet patient groups. So as an organization we use that sort of a feedback to improve our services and focus more on what's actually needed.

The next level up again is probably population health statistics. So you know the usual demographic information, disease prevalence. We have a census in the UK so we know where people are who live alone, we know people with long term conditions, and we can use it to map deprived areas, or areas of particularly elderly patients that we know that patch is gonna need something a bit different.

We use death certification which is very comprehensive in the UK. So we can understand where heart attack deaths occur or cancer deaths, we can focus different health care on that. We can look service use so we've got general practice information, and we've got hospital information so you can tell how many people go with fracture hip or pneumonia and something like that.

And again that can help you. So there is a lot of data out there that can give you a pretty good picture from the individual phone call through to high level population statistics to tell what you patients need.

And I think because we both retain a clinical role so we both speaking directly to patients as well, we can also tell from our own information is the patient who has never contacted us, or repeatedly contacted us so that could be a quite telling. Also we have a very chimed understanding of the other health care organizations around us so we know what kind of services are available on the … and we would like to be available, so we understand issues and that could tend with it and also a good things in are being putting place and we know work.

And what about if there would be some organization that wants to create a new service or if there is some need for a or maybe potential need for the service like we have already talked about the possibilities to use social robotics or some ICT solutions, so what is your opinion how they should approach to find this need, what path they should follow?

Well in UK, I'm not gonna comment on Finland obviously, again there is a different level this understanding what the government of the day, what their direction is and what is the national strategy that we got in Britain, which is called "The new social and health care" that would give you a strategic context for where they are moving in health care. You then come down probably to clinical commissioning group and that future fit program I told about there is the document behind that will again set out all directions strategic direction they are moving in. Then you could do some research of organizations delivering services and make contact with them, just to understand what they are. I mean we get BT..Global come to us recently just to say what are the areas overlapping in business here cause I think the technology is something that everybody is looking at. We are not quite sure in Britain where is if it seen because it is quite expensive technology, and have got a lot of money and the evidence based case it is the other thing that needs an assessment. Is the evidence base. for these things a lot of people would say show me what is before I get called in it. Unless you want to do something like this like joining funding and you can do some active research on the ground. So you probably get different levels of organizations, just to go and find out what the context is that they are working in and what their plans are for the next couple of years.

The most clinical commission groups have 5 year plans and getting hold of those and finding out where you might fit in or where your niche is. You got big hospitals, medium sized hospitals, community hospitals and providers like us. General practice in Britain is a bit more to get the hangout... Because they are quite small businesses, they are quite independent. I mean they are working in a framework what they do it's up to them like many businessman. And they manage about 5000 patients, so pretty small but they are beginning to join up the federations in some parts of the UK. There are some big federations of general practices. If you take in account just next to us there is a company called Tores who just … 3 million pounds by the government to develop primary care and improve capacity of private care in a primary care there. They would be somebody you would talk to because they got money … cheap piece of job... they got strategy so they want money on the first place.

I mean it is a very steep side you can get intelligent …. Horizon scanning and find this sort of thing. And then you have to get out there, don't you? And find out what is going on on the ground, whether you can offer something. I mean BT Global came to us and

it was interesting, but we didn't come in thinking that is what we gonna do . It was a sort of initial discussion to find those areas to overlap. And follow-up discussion, I mean what other things we've talked about is a mobile access to the clinical information. In general practice in England it is very electronic, we don't have paper records. The trouble is that everything is on the hard drive so we would like to make it mobile to access to the same information and input information into common record. So that was what with BT Global was talked about. BT Global is a national telecommunications company.

And also understanding your competitors whom you up against and what is your unique selling point, why would somebody would choose our product … somebody else's. So I would say that there is a lot of relationship. Finding champions and those champions need to be very influential so they can do something in selling for you. If they are convinced by your product.

When we … with small clinically … We are not tight with any bureaucracy regulations and we do have money to buy prime things so we are looking for expanding the business. If we would find similar source of organization there are probably more fruitful than going into to a big hospital that are actually … tied down with a lot of bureaucracy.

Also as you mentioned in your presentation soon there will be a huge problem with manpower shortage, so do you see any solutions for that from your point of view?

We have supported a couple years ago …. health project for the reason to try to release the time of community nurses rather than having physio patients twice a week to take a physiological measurements, so the patient is empowered to do it themselves and then text it to a system and there will be access remotely for the community nurses. So very behind you empower patients to self-care, they are becoming familiar with their condition whenever they see, or do the asthma or whatever their long-term condition might be diabetics. So they know when they gonna have a bit off day and then they measure to take some intervention. Community nurses they have free time when see this initial investment in their time to get these people more independent. These people are more independent and they can have on the mobile phone a phone consultation or they would receive an alert if their physiological measurements are not okay. So it has to be time efficient, it has to be patient friendly. So there is no simple and it doesn't make

sense for patients. And there will never be "one size fits all". So I would say simple cost-effective, cheap and benefiting a patient so you can get complaints. It's very very difficult to get some real momentum with this kind of projects.

Third sector organizations, charity, we work very close to them. We have done enough of that in the UK. I think it's just a beginning to kick-off. So things like "Age UK", which is a big charity for older people, using them to deliver care, for who actually doesn't need a doctor or nurse can equally provide by that people.

And Red Cross as well is quite active. There is also some little local organizations that are increasingly starting coming to their own to provide care and night sitters. . So in the event of the event of the crisis somebody can pop in and stay with a patient overnight.

Do you think that there can be some technical equipment that could empower patients, or health care, nurses or carers to manage their time better or reduce some routine work that they could somehow do?

We feel strongly about this, because we are in the quite rural geography and a lot of services within the community are IT based. They all go back to the office and input information on maybe 2 computer systems and then go around to see the patient and then filling in the paper record. So we think if everything was be electronic and joined up not only everything could be dispatched the next visits there was their own. It wouldn't be required to come back to the office and also others could access the same record. But that's quite complex solution required... In the next 10 years somebody would have cracked it and change the mindset of a large number of staff who can't see the benefit of IT system because they are used to work how they've already worked. So there is a lot of change management that has to go alongside these kind of things.

Giraff thing I've never seen it before. You can imagine that it can be in a person's home and have a consultation with a nurse or doctor. .. You could do a blood pressure, you could do pulse or temperature and that would feedback to a carer worker. And you can do it remotely just to chat with people. ….balance.

The other thing is to train other people to use this technology so … workers... older person without technology. They would do the tests because that is straight forward to do them and in the healthcare on the other side a person would decide whether the person needs a help or not.

So the technology is the way forward. Some diagnostic attachments. I mean that somebody was telling that the telephone or... or iPads having an attachments ...mention this kind of things as … you want to use while you are sitting there with your iPad just getting some attachment. So it would be a part of the kit to feedback some physiological data.

It's starting the use of this interventions before somebody gets rely on somebody physically come to pop in to see them. So if the use of technology is the part of the clinical pathway whatever specific condition ...the hospital discharges.. Show how to use this equipment and send the results in wherever. ..For the patients is much easier to convert to this impaired self-management, such of mindset that the patient that would prefer not to use any technology, have somebody to visit them twice a week. So there is a social isolation barrier, so you've got and you can't completely replace people with technology.

It is the emotional connection that needs to be made to understand why somebody isn't as motivated one day compare to another. It is difficult to see how a robot could say, "you know, you are so much better that you were yesterday". See the difference in you. You look a bit down. It's a kind of stuff that human connection is, isn't it? It has to be there somewhere.

The Giraff thing somewhat has achieved that, because a person is talking to you. I think that is better than an avatar. It was like 1984. I felt like a Big Brother is watching you. Scary. But to have to book appointments with someone whom you are familiar with. You are getting used to some tech for example like a coffee machine;

I think that FB is interesting, isn't it? The information on people using internet.... my parents and in-laws will use FB to keep in touch with their grandchildren. So I think there is an understanding where old people are currently using technology and not making assumptions.

And the next generation will be far more IT literate than the current generations. It should get easier in theory.

And you have already mentioned the motivation of elderly people. Because they need to exercise to keep their limbs fit and prevent falling and also keep them motivated to communicate even. Do you have from your practice any ideas how to motivate elderly

people? Because there were some difficulties when we interviewed other healthcare professionals that they don't know how to motivate elderly people.

We've got a cycle of change there is some science around it. If you are not moving around it's like smoking sensation. If you are not in that cycle your mind is forgetting and you are not going to move forward. So I don't think that there is an easy answer to this at all. There must be some evidence based around. Like being in the group to become more active. But expecting an old person to do some physical activity all the day is unreasonable, especially in the UK. I've heard that Finns are better at doing it than Brits. So it is a behavioral change it is a really challenging. And I don't think that there is any technology that I am aware of offering a good poke for example that would get people move around. They are not motivated to take their medicine either. They are just telling that they are taking it, because they know it's what we want to hear. When you look at the bags of medicine left at the patient's home ...see not taking all of that stuff. You need to make sure that you focus on the older persons not on health care providers. That's the key thing.

It's a psychology that is underneath all this. Some patients enjoy being a patient. They adopt this patient helpless mode because it means that people respond that people come to see them.

There is no easy solution here.

If you can notice this trend that it is really cool nowadays to be healthy and do some sports, or go jogging. Do you think these people who are in this trend they will keep it up until they get old?

Interesting question! I hope so.

Yes, I think it is a diversity in human nature and some people will be healthy their entire lives. Other people will do it for short periods of time. Other people will never take physical exercise, never have done.

I mean the public health issues are huge. Finland has got a good background in public health initiatives. That we were talking about North Karelia project when the whole population is changing their eating and exercising habits. So Finland got better compliance than in the UK. I mean the public care usually do the legislation, road design, building design, it is not about health care. So keep people active, get rid of lifts,

make sure that the roads are safe these things do not tell people to exercise more. It's just don't work. So it is a quite a challenge. So working with … I don't know who is designing roads and buildings in Finland. We have local councils. A lot of local people are sitting in the council, so they make sure that you've got speed coming measures with high accidents, that building design is appropriate for whom you are building it for. We can write a prescription to exercise;