Master's thesis

Master of Business Administration in Leadership and Service Design

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SMART LIVING ENVIRONMENT FOR AGEING WELL

MASTER'S THESIS | ABSTRACT

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SMART LIVING ENVIRONMENT FOR AGEING WELL

During the last few decades there has been a dramatic increase in technology development, which has brought ease and comfort in all aspects of housing and for almost all age groups. However, the elderlies are the neglected ones in almost all areas of technology usage, including supporting them to age in their own home. It could be, that the industry finds the young society more interesting and profitable and the elderly market is not considered attractive. But due to the changes in the aging trend of Finnish population, this image will change, and new investment opportunities will emerge, because the future elderlies are today's technology users.

To research the possibilities to improve elderlies' quality of life, the research questions were composed to address issues about the current caregiving process and possible improvements, and how technology could be implemented to accomplish these improvements. To answer these questions, insights and requirements of caregivers and seniors have been gathered by applying service design methods such as workshops, observation and interviews, to analyze and understand their pains, frustrations, and bottlenecks of the current processes. By investigating the current processes, the measures and the points in which technology could be utilized to improve the efficiency of the system were also identified and described.

This research generated useful findings answering the research questions and suggestions were made according to these findings. Although the validity of this research is questionable, the results clearly indicate a need of reconsidering and redesigning current elderly care processes. The researchers would be happy to see additional research on this field to ensure good quality of life and satisfactory services for our elderlies and ourselves.

KEYWORDS: service concept, smart care, care services, service design, Finnish elderly care

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SMART LIVING ENVIRONMENT FOR AGEING WELL

Teknologia on kehittynyt dramaattisesti viime vuosikymmenten aikana, mikä on lisännyt esimerkiksi asumismukavuutta erilaisin sovelluksin lähes kaikissa ikäryhmissä. Iäkkäitä on kuitenkin laiminlyöty lähes kaikilla teknologian käytön aloilla, mukaan lukien itsenäinen asuminen ja ikääntyminen omassa kodissa. On mahdollista, että teollisuus pitää nuorempaa väestöä kiinnostavampana ja kannattavampana, eikä suunnittelua ja markkinointia vanhuksille pidetä houkuttelevana. Suomen väestön ikääntymisen myötä tämä tulee muuttumaan ja uusia investointimahdollisuuksia syntyy, kun otetaan huomioon, että tulevaisuuden vanhukset ovat nykypäivän teknologian käyttäjiä.

Tämä tutkimus etsii mahdollisuuksia vanhusten elämänlaadun parantamiseksi ja tutkimuskysymykset käsittelevät nykyisen hoitotyön prosesseja ja mahdollisia parannuksia, sekä sitä miten teknologiaa voisi implementoida näiden parannusten toteuttamiseksi. Tutkimuskysymyksiin vastaamiseksi on koottu hoitajien ja eläkeläisten näkemyksiä ja vaatimuksia soveltamalla palvelumuotoilun menetelmiä kuten työpajaa, observointia ja haastattelua. Tutkimalla nykyisiä prosesseja tunnistettiin ja kuvattiin kohdat, joissa teknologiaa voitaisiin hyödyntää järjestelmän tehokkuuden parantamiseksi.

Tutkimus tuotti hyödyllisiä havaintoja, jotka vastasivat tutkimuskysymyksiin ja näiden pohjalta tehtiin kehitysehdotuksia. Vaikka tämän tutkimuksen validiteetti on kyseenalainen, tulokset osoittavat selvästi, että nykyisiä prosesseja on tarkasteltava ja suunniteltava uudelleen. Tutkimuksen tekijät näkisivät mielellään asiasta tehtyjä lisätutkimuksia, joiden avulla varmistetaan hyvä elämänlaatu ja tyydyttävät palvelut vanhuksillemme ja itsellemme.

ASIASANAT: service concept, smart care, care services, service design, Finnish elderly care

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LIST OF ABBREVIATIONS

EEA	European Economic Area (Efta).
EU	European Union (Europa).
GDPR	General Data Protection Regulation (Tietosuoja).
ICT	Information and Communications Technology (Rouse, 2017).
IoT	Internet of Things (AT&T Business, 2019).
IoMT	Internet of Medical Things (AT&T Business, 2019).
Kanta	Nationwide social and healthcare information system service for processing customer data and welfare information provided and maintained by Kela (Kanta).
KELA	The Social Insurance Institution of Finland (Kela).
MSAH	Ministry of Social Affairs and Health (MSAH).
SuPer	The Finnish Union of Practical Nurses (SuPer).
THL	The National Institute for Health and Welfare (THL).
TYKS	Turku University Hospital (TYKS).
Valvira	The National Supervisory Authority for Welfare and Health (Valvira).

1 INTRODUCTION

According to THL (National Institute for Health and Welfare), Finland has one of the oldest populations in Europe (THL, 2017). Also, according to Statistics Finland, the number of people aged 65 or over in Finland will rise to 29% by the year 2060 (Statistics Finland, 2015). The working age population has lessened to 58% due to the rapid growth of aging citizens. (Statistics Finland, 2018). As a result, there is a threat that the increasing number of elderlies who require special care, is not being balanced with an equal rise in resources or funding.

One solution to make a caring experience more complete, could be technology. Technology can mitigate the lack of trained caregivers, and also the shortage of domestic care places. Moreover, technology such as continuous monitoring tool can connect the elderly who are living alone at their home, with medical professionals' staff or relatives, and promote their wellbeing by analyzing their daily life data 24/7 and as a result, bring more transparency to the traditional methods of caregiving.

Elderly face many challenges in- and outside of their home: from remembering to take their medication, eat and drink and get through daily tasks to getting help in case of physical injury. Moreover, loneliness and feeling of isolation are big problems among the older population. It is also acknowledged that the health of the elderly could be improved, maintained and developed by technological support.

As a result, the challenge of societies aging will open areas of opportunity in countries, such as Finland, that are facing these challenges. In these countries, technological innovations can improve the living conditions of the elderlies and mitigate the risks and difficulties in their daily life, by building a possibility to promote elderlies' wellbeing.

At the moment, it is believed in our society, that the elderlies are better off staying at their homes, instead of going to an elderly care home. But also, the elderlies prefer to stay in their homes as long as possible. However, the sad truth is that

there is not enough technology or equipment to support them while they stay at their homes and if something happens no one will help or even notice. (News Now Finland, 2017.)

In a common case, a caregiver goes to the elderly's home and observes their situation. However, due to the short visit, there is a high possibility that the caregiver does not notice possible changes in the elderly's functional or cognitive capabilities. When the changes are noticed, it may be too late for an early intervention. In the worst case, the elderly needs to transit to the next stage for more intensive care, for example from their home with home care to a nursing home, and after that, to a hospital. By deferring this transition, the caring costs will be reduced notably, and the elderlies will be living in their preferred environment with a higher quality of life.

Elders might visit a doctor or a nurse once in a while but between the visits, nobody knows what is happening at the elders' home. So, all the minor changes and symptoms are simply ignored and not noticed due to the lack of monitoring technology and working resources in the health care system. Unfortunately, caregivers see the problem when it is too late, and the damage is already done.

1.1 Aim, frame of reference and methods

The aim of this thesis is to gather insights and requirements of caregivers, elderlies and their relatives by applying service design methods such as observation, interviews, workshops and such to analyze and understand their pains, frustrations and bottlenecks of the current process. Moreover, by understanding the current processes, the steps and the points in which technology could be utilized to improve the efficiency and effectiveness of the process, are also detected and defined.

The original plan of this thesis covers Finnish elderlies who are living alone in their own home or in care homes, but not in hospitals. As a pilot case, this thesis includes resources such as medical staff, relatives, companies and technology. Home care requires all of these, in order to deliver good services and as a result,

prolong elderly wellbeing. The key stakeholders of this research are for example Finnish elderly and people involved in providing elderly care services such as medical experts, social workers and relatives; not to mention taxpayers as future customers, without whom these public services would not exist. Added with technology, the stakeholders form the frame of reference presented in Figure 1.

In the frame of reference, the public sector covers the government and services provided by it, such as social services and the social insurance institute of Finland. Customers are the elderlies using home care services, but also doctors, nurses and other medical experts may be considered as the customers of home care services, as they are in close collaboration. Technology refers to the current technology in use but also the technology that is being developed to serve future purposes. Service providers refer to the public and private home care companies and institutions, their subcontractors and representatives, such as administration, nurses and other employees within the field.

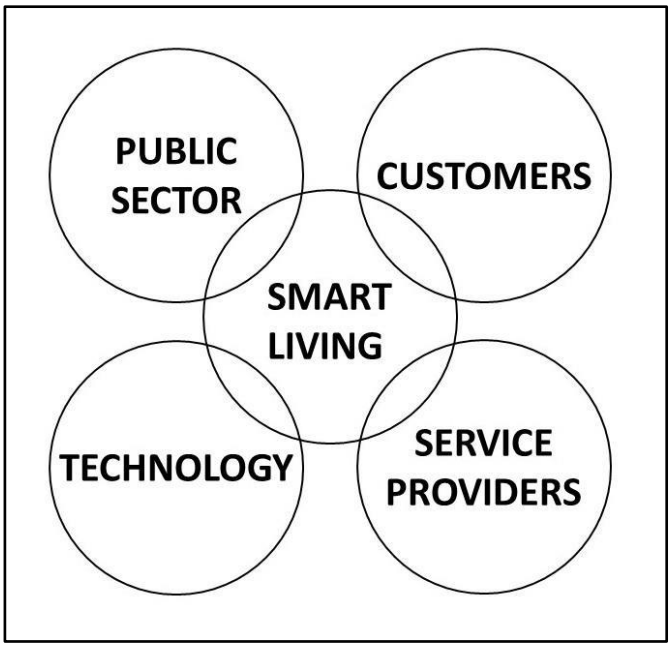

Figure 1. Frame of reference.

As design and service design thinking is not meant only for styling, researchers hope that this research can provide insights for people who are willing to work in this field such as senior care specialists. Moreover, researchers hope that it can

help to find sustainable solutions for problems caused by demographic aging in order to prolong elderlies independent and healthy life in the future.

The research questions revert to the thesis objective in order to identify what kind of improvement and development is needed to make Finnish elderly care services more joyful, accurate and transparent for the elderly and their relatives. Hence, the research questions proposed are:

Research questions

- What are the issues in the current caregiving process?
- What improvements can be introduced?
- How technology can satisfy the improvement needs?

1.2 Methodology

This study was carried out by following a methodology consisting of three phases, as represented in Figure 2. The first phase is the ideation phase which focuses on the data gathering, analyzing the current situation and benchmark criteria by integrating literature review and online research. Via desk research, a long list of issues will be identified. In addition, it will identify the problem and the resources required to solve the problem for example target users and key stakeholders.

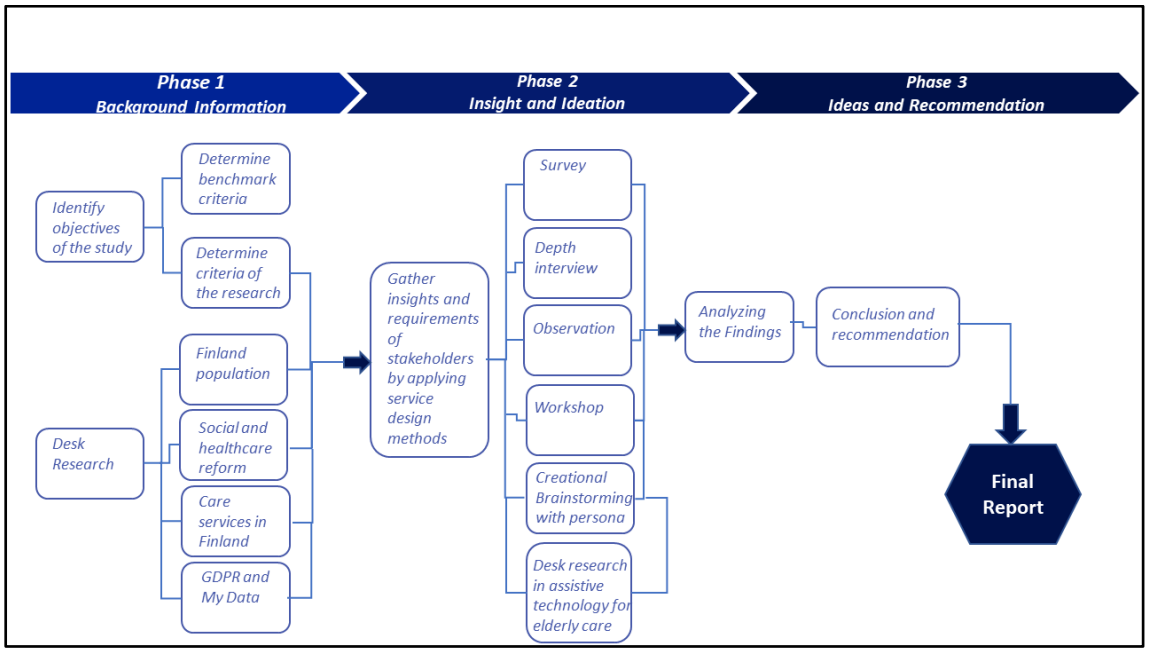

Figure 2. Process chart

In the second phase, by applying the service design methods such as interviews and workshops the insights and issues from the main stakeholders of the research will be gathered. This data will be analyzed in detail according to the findings, in order to obtain a clear understanding of the current situation in the health care system. The third phase of the study is the concept offer phase, in which the analyses of the second phase are conducted in order to either manifest the service value created or distinguish fields of possible further development.

1.3 Thesis structure

The structure of the thesis is formed of 8 chapters. The first chapter opens up the thesis dilemma, the background, the aim, the research questions, the methodology employed to clarify the research questions and the structure. Chapter two presents the background information such as Finnish population, care services and social and healthcare reform in Finland and also GDPR and MyData. Chapter three is an introduction to design thinking and service design.

Chapter four is about mapping the stakeholders and creating a business model canvas. Chapter 5 introduces the service blueprint and customer journey map of the current situation of the seniors who are receiving home care services at their

home in Finland, by applying the service design methods such as survey, interview and observation. The theoretical parts are discussed in chapters two, three and four which guides to the chapter five.

In chapter six, the importance of assistive technology in elderly care is discussed, based on the research presented in previous chapters, aiming to raise awareness. Also, customer journey maps and service blueprints of the future, with a modified care model assisted by technology, are presented. In addition, this chapter provides the key findings of the study as well as the answers to the thesis questions.

Chapter seven raises ideas and recommendations about the preferable services in the future and recommendations of the research with reviews and benefits of the study. Lastly, chapter eight presents the analysis of the process, discussing also the limitations which affect the research results.

2 BACKGROUND INFORMATION

According to Making Ageing Better, the final report of design led innovations for active ageing-project[1], demographic ageing will be a great challenge in the coming decades for Europe. The share of people 64 years and over is likely to be almost 30% of the entire EU population. This will affect the dependency ratio[2] (Figure 3), meaning that less people are being active in the workforce and therefore increase the burden on social and health care sectors. (DAA project, 2014.)

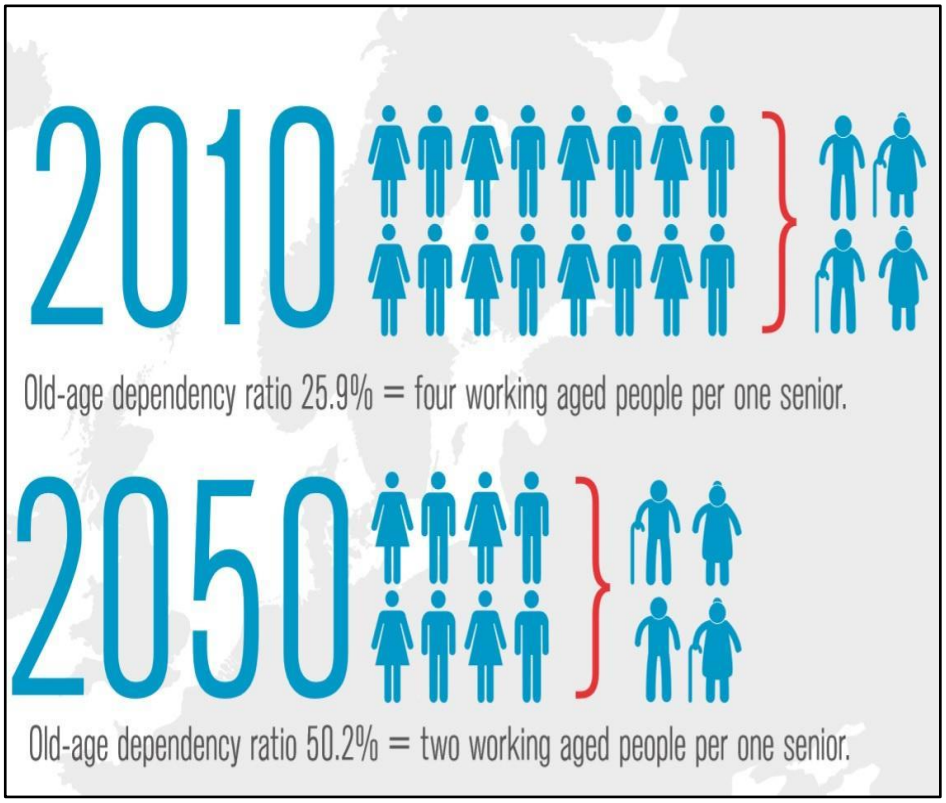

Figure 3. Dependency ratio in Europe in 2010 and projections for 2050 (DAA project, 2014).

[1]The "Design-led innovations for Active Ageing" project, funded by European Regional Development Fund, was set up to develop sustainable solutions for demographic ageing by senior care specialists and service designers. Project duration was from January 2012 to June 2014. (European Commission.)

[2] The dependency ratio is when the number of children and pensioners is compared to the amount of working aged citizens. Most commonly the dependency ratio is indicated as the number of dependents against a hundred working aged. (Statistics Finland, 2018.)

2.1 Population in Finland

The situation in Finland is alike. Statistics Finland generate and upkeep statistics of Finland's population and according to those the population was a little over 5,52 million at the end of January 2019. As Figure 4 shows, in 2010 the birth-rate has taken a negative turn for the very first time post-war. (Statistics Finland, 2018.)

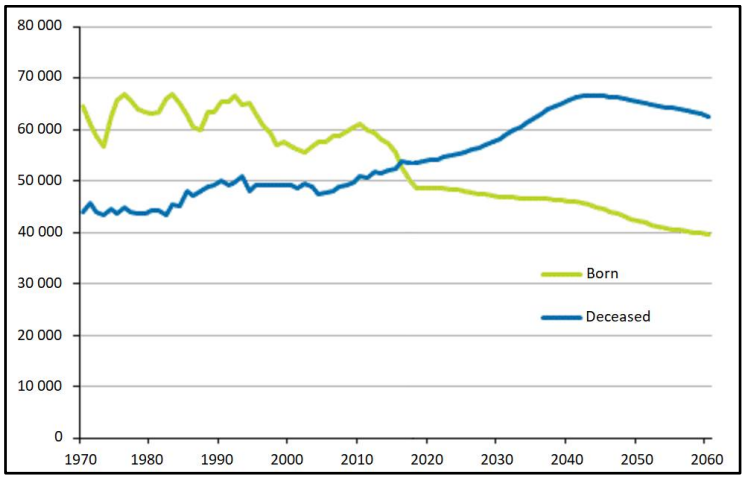

Figure 4. Newborns and deceased in Finland (Statistics Finland, 2018).

The family Federation of Finland suggests that education affects fertility strongly, because childlessness is at its highest among highly educated women, although childlessness seems to decrease with increasing education among men. (Väestöliitto.)

Education has been a popular explanation to low fertility, but couples are also visiting fertility clinics in growing numbers and procreation has become a challenge for many. During January 2019, there were 961 newborns less than deceased, but the population grew by 370 persons due to immigration, because there were 2186 immigrants more than emigrants (Statistics Finland, 2019).

According to the latest projections in Figure 5, published in November 2018 by Statistics Finland, in 2070 the population would be less than 5,4 million with the current rate, which is actually less than today. If this trend continues, immigration

and nationwide procreation are vital for maintaining Finland's infrastructure and essential services.

Year	Population	Population aged under 15 and 65 or over	Population aged 15 to 64
1970	4 598 336	1 546 038	3 052 298
1980	4 787 778	1 542 591	3 245 187
1990	4 998 478	1 637 168	3 361 310
2000	5 181 115	1 713 531	3 467 584
2010	5 375 276	1 828 718	3 546 558
2017	5 513 130	2 069 742	3 443 388
2020	5 543 221	2 124 603	3 418 618
2030	5 611 987	2 225 282	3 386 705
2040	5 601 713	2 259 135	3 342 578
2050	5 531 725	2 296 126	3 235 599
2060	5 448 354	2 348 720	3 099 634
2070	5 370 501	2 399 795	2 970 706

Figure 5. Population projection until 2070 in Finland (Statistics Finland, 2018).

As shown in Figure 6, the number of pensioners will increase drastically and at the same time, the working-age population is in danger of decreasing, during the next 20 years (Statistics Finland, 2018). This will inevitably affect negatively to the dependency ratio between pensioners and working aged citizens (Figure 7) and alarmingly the dependency ratio is weakening, during the next decade, nearly the fastest pace of all the EU27 countries. (Statistics Finland, 2018.)

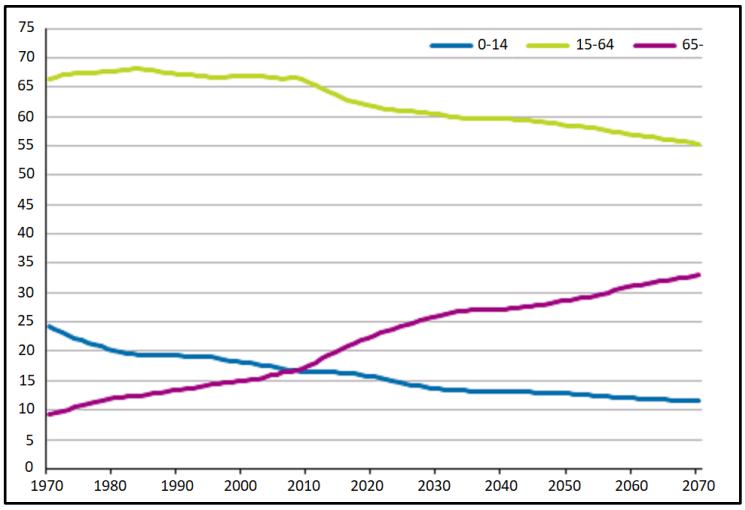

Figure 6. Age groups by percentage in Finland (Statistics Finland, 2018).

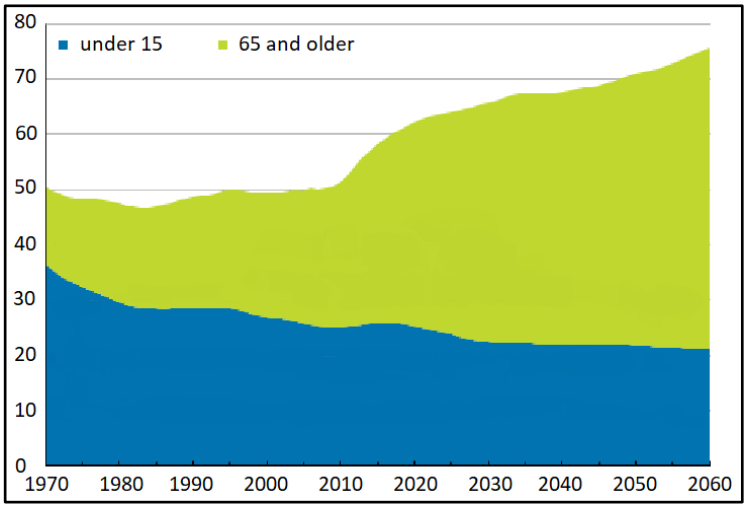

Figure 7. Dependency ratio 1970–2060 in Finland (Statistics Finland, 2018).

The trend with dependency ratio weakening is affecting the whole of Europe. Recent studies and projects suggest that actions must be taken to create frameworks providing healthy and caring environments for the aging population. The weak economic situation and vast unemployment makes this even harder to be accomplished. Some regions are struggling to find competent staff and are also losing a large number of professional care workers to retirement in the coming years. (DAA project, 2014.)

The regional difference is clearly shown in Figure 8, which presents the dependency ratio in Finland by municipality in 2017. The rural regions are suffering from negative migration, losing competent working age population to larger municipalities and their outskirts.

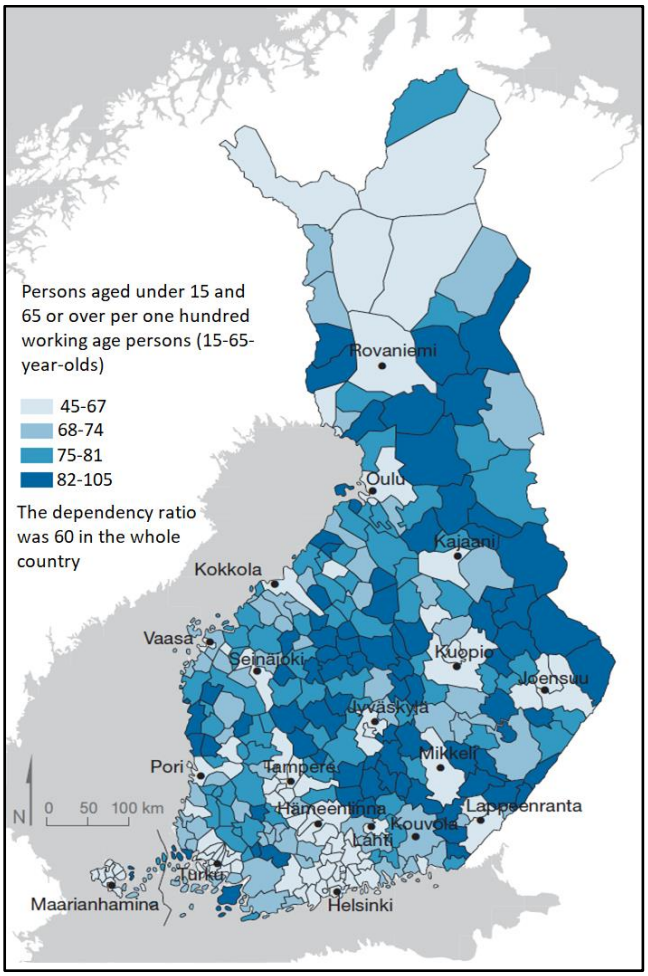

Figure 8. Finland's dependency ratio by municipality in 2017 (Statistics Finland, 2018).

In order to tackle the challenges mentioned above, sustainable solutions should be found to: healthier lifestyles to avoid costly and long-term illnesses, keeping elderly active both physically and mentally and to enable them to live independently as long as possible, as well as make care models economically sustainable to ensure funding also in the future. (DAA project, 2014.)

Although there is a contradiction against the research above, KELA suggests that the increased need for elderly care is a short-term phenomenon. Therefore, it is questionable, whether the public sector should invest in providing more elderly care services, to meet a relatively short-term need and it would be better to create high-quality businesses in the sector. Compared to public services, private care companies are more flexible and public-private partnerships should be developed in the direction of a genuine partnership. (Kela, 2011.)

2.2 Health and social services in Finland

As it is common knowledge, health and social services in Finland are divided into public service providers and private service providers, based on the funding. Both parties offer similar services which are described by classification in Figure 9, published in a study by Finnish Government in 2017. This table does not include for example occupational health services. Employers can obtain occupational health services from the municipal occupational health service or from a private health care provider, entitled to provide occupational health services (Työterveyslaitos).

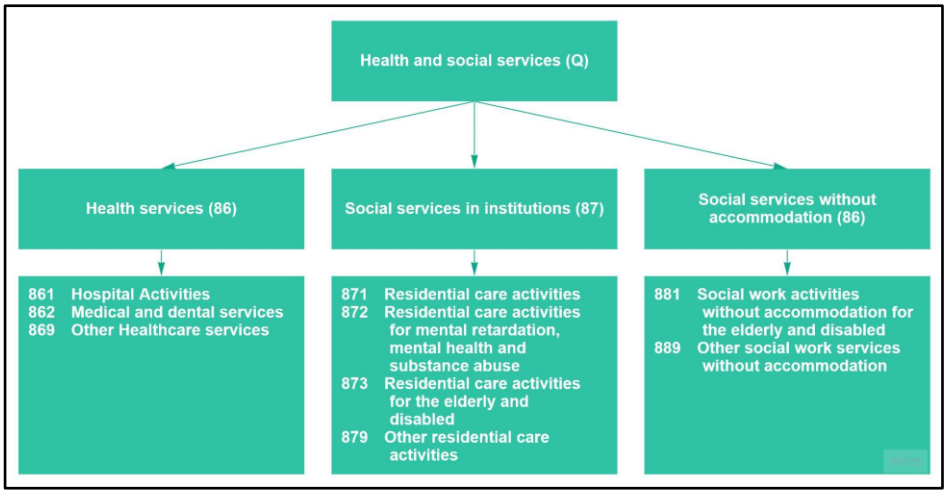

Figure 9. Health and social services by classification (Tevameri, 2017, 9).

According to Lääkäriliitto (Finnish Doctors Union) the Finnish healthcare system has traditionally had a clear division into public and private sector, but the situation is changing. Separation between the private and public sectors is no longer as simple, as cooperation between these sectors increases and customers are able to choose from whether they use the services of a public or a private service provider. (Lääkäriliitto.)

Public sector health care

Public health care services are funded by the government. According to KELA, these services are at the use of any citizen, who has a permanent residence in a Finnish municipality, free of charge (Kela, 2019). The costs are covered with customer fees and social insurance funded with taxes. Although it is said that Finnish health care is free of charge, fees may occur depending on the service and the service provider. The municipality decides whether to charge for the services and how much, although there are maximum fees by law (Sosiaali- ja terveysministeriö).

Hospital Districts have determined client fees which include for example clinic fees, day surgical fees, certificate fees and fees for emergency visits. There is a maximum annual fee, after which all care is free of charge. If the customer is unable to pay for their care, it is possible to get payment commitments for example from the social services. Patients from EU/EEA countries are eligible for immediate hospital care with a European health insurance card or an equivalent. People residing outside the EU or the treaty countries will be charged with the actual costs. (TYKS, 2019.)

However, free health care does not mean free access to all health care services. The need and the urgency for care is determined by medical experts and therefore customers consult the private sector to avoid queues.

Private sector health care

There are numerous companies and organizations providing, both basic and specialized, medical healthcare services in Finland, directly to the customers or municipalities. Healthcare professionals can also provide services as a self-employed person and the services are subjected to authorization. Service providers can freely price their services, which customers pay for themselves. Kela reimbursement of the costs is possible, if the customer lives or is insured in Finland. The reimbursement is paid based on the health insurance law. Also, private insurance can replace the costs to the customer according to their insurance agreement. A private company must apply for a license from its regional government agency or from Valvira. When a healthcare professional

provides services as a self-employed person no license is needed, but as a legalized healthcare professional, he or she must be authorized by Valvira to fulfill his/her profession. (Hoitopaikanvalinta.)

Regulations

Health care is regulated by law. The health care law promotes and maintains health, well-being, working and functional capacity of the population, quality and patient safety of the services, reduces health inequalities and ensures equal access to health services. Health promotion is understood in the law as an activity concerning an individual, population, communities and the environment, with the aim of reducing health inequalities and allocating resources to health. According to the law, municipalities must monitor the health and well-being of its inhabitants as well as the factors affecting them, and the measures taken by the municipality to respond to the needs of the citizens. For example, the Health Care Law requires the creation of well-being and health promotion structures, welfare reports and the use of upfront evaluation. (THL, 2019.) The activities of healthcare professionals and business units, in both public and private health care services, are monitored by Valvira. (Valvira, 2015.)

Social and healthcare reform

Yle News published an article “Yle News explains: What is Sote?” in March 2017, explaining what Sote reform all is about. The abbreviation Sote comes from Finnish terms for social and health care and the reform means renewing the services to meet the customer’s needs. (Yle uutiset, 2017.)

The article states that two hundred and ninety-five (295) municipalities, excluding the archipelago of Åland which has the status of an autonomous province, are responsible for providing their residents the necessary care services. This is considered an inefficient method, because in Sweden 290 municipalities serve almost twice the population. (Yle uutiset, 2017.)

Sote reform has been on the agenda for the last four Prime Ministers, but again the reform failed on the 8th of March 2019. Right after this the prime minister Juha Sipilä resigned from the government. President Niinistö asked Sipilä and his

cabinet to continue in a caretaker capacity until the coming parliamentary elections are finalized. (Yle, 2019.)

In the late government's model, the responsibility for the social and health services would have been transferred to eighteen regional authorities. Experts have pointed out that the system would be most efficient if there were only four to five regional authorities, but in no circumstances more than twelve. The proposal also envisioned customers being able to choose their care from either public or private service providers by the year 2019 as explained in the Yle article. (Yle uutiset, 2017.)

The Yle article also tells that the idea to choose the service provider is supposedly to help save taxpayers money, because private service providers are quick seeking efficiencies and cut costs, although having profit in mind. This has become clear by the recent events in Finnish privately owned elderly care homes where profit has surpassed customer service and safety. Also, critics have noted that in Sweden total costs have actually risen after the reforms. (Yle uutiset, 2017.)

The state of elderly care

Elderly care is largely done by practical nurses at the elderly's homes or public (municipality run) and private (privately owned) care facilities. SuPer (Suomen lähi- ja perushoitajaliitto), is the Finnish Union of Practical Nurses. According to their webpage, it is the largest trade union in Finland for social services and health care professionals with an upper secondary level qualification and also for students in this field. SuPer is also the only trade union which represents practical nurses and its main goals are for example ensuring adequately trained care staff in workplaces, a salary which compensates the demanding work and full utilization of nurse's competence in their work. (SuPer, 2017.)

SuPer has raised its members' voices in situations where care personnel have been concerned about their customers best interest and the nurses' own capacity. In particular, private-sector employees have asked SuPer for assistance. In 2018, SuPer has worked on thousands of cases and from September to December alone, SuPer received nearly 2,000 messages from private sector nurses about defects at their place of employment. (SuPer, 2019.)

Surveys to SuPer members have revealed the severity of the situation in privately owned care homes. The most important issue is inadequate staffing which weakens work and customer safety and leads to numerous other problems such as the elderly not taken to the toilet or getting fed. The results have been discussed with nursing home administrators, regional government agencies and Valvira. Political decision-makers are also aware of the situation. Although, it is not about lack of knowledge, but about the companies' willingness to correct defects. (SuPer, 2019.)

According to SuPer, there has been misconduct in several companies. Nurses have a duty to report maladministration and a right not to be subjected to any punitive measures. However, they are afraid to report any misconduct, because employers have threatened them with warnings or even layoffs. SuPer has also launched a campaign supporting its' members to report a "ghost nurse". Using a ghost nurse seems to be a common policy in private care homes. It means that work schedules are planned to leave a significant number of hours without an employee and filled out later if the hours are completed. Thus, it seems that there is no staff shortage. (SuPer, 2019.)

2.3 GDPR and MyData

GDPR stands for General Data Protection Regulation. It is a new law regulating the processing of personal data, which was applied in all EU countries as of May 25th, 2018. GDPR gives an individual a better protection of his/her personal information and more ways to manage his/her data processed by companies and public administration. The aim of the new legislation is to improve the protection of personal data and privacy, respond to new data protection issues related to digitalization and globalization, harmonize data protection regulation in all EU countries and promote the development of the digital internal market. (Tietosuojavaltuutetun toimisto.)

An individual has a right to know what personal information an organization has about him/her and how and for what purpose that information is processed. One

can request the correction of inaccurate and incomplete personal information and limit or oppose the data processing and also request the deletion of personal data. An individual also has the right to transfer his/her data to another organization and not be subjected to unjustified automated decision-making. Personal information is all information related to an identified or identifiable person for example: name, home or email address, phone number, ID card number, car registration number, locating information, IP address and patient Information. (Tietosuojavaltuutetun toimisto.)

According to data protection principles personal data must be treated in a lawful, correct and transparent manner for the individual. The necessary amount for the purpose of processing the personal data can be collected and processed for a specific, and legitimate purpose and be treated confidentially and safely. The data must be updated as necessary, deleting or correcting any inaccurate information, and be kept in a form which is only identifiable by the data subject. These principles must be respected at all stages and the controller must be able to prove this. (Tietosuojavaltuutetun toimisto.)

MyData refers to human-centered ways of managing information. Individuals have control over the data collected of themselves and they have the right to obtain information about themselves and to pass it on and authorize the use of it in other services. The goal for organizations is to provide the collected information back to the individual. The challenge of privacy and fragmentation is solved by placing the individual in question at the center of managing their personal information. MyData is believed to generate new businesses and services by utilizing information that has been emitted with consent. (Valtiovarainministeriö.)

The following table in Figure 10, available in a Google presentation (Knuutila, 2017), gives an overview of all the information that is collected of an individual by different organizations.

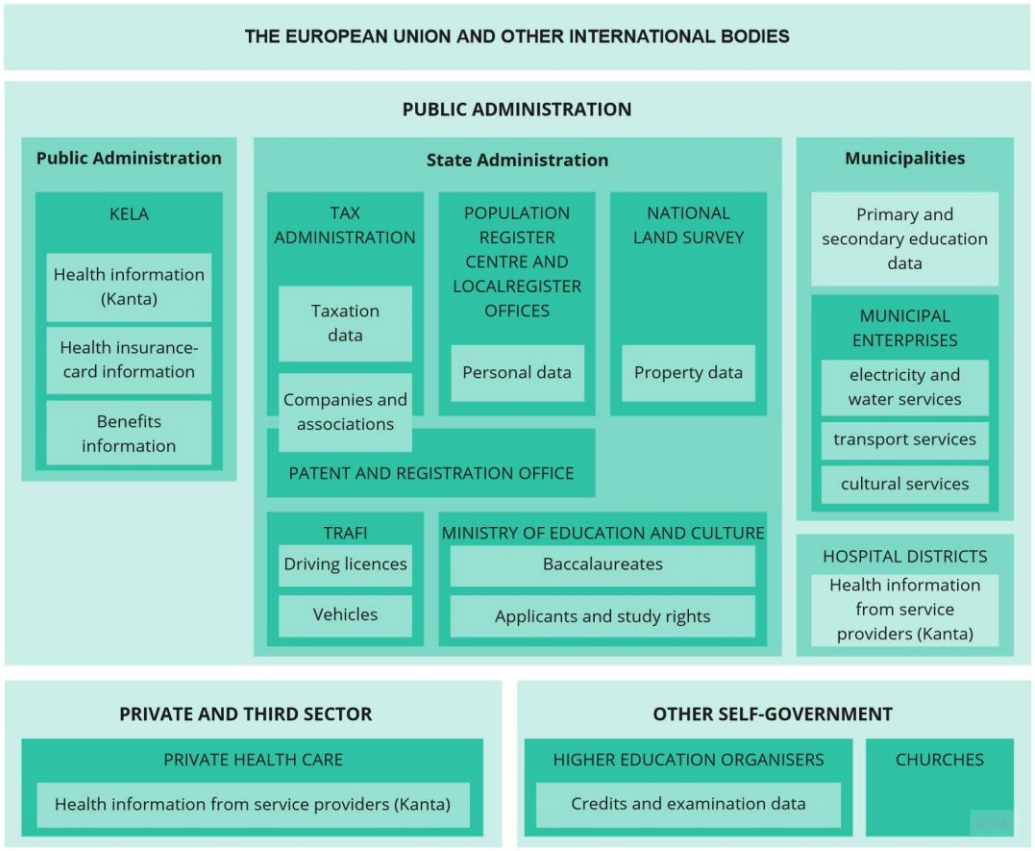

Figure 10. Examples of personal data collected by different organizations (Knuutila, 2017).

Principles of MyData

In his presentation Knuutila (2017) defines the principles of MyData as follows.

Human-centeredness: Individuals are in control and their privacy is secured. They have the right and practical opportunity to manage their own personal data.

Data usability: Personal information is available to people in machine-readable form and is sufficiently up-to-date via interfaces.

Open business environment: Managing and storing of MyData is possible to diversify and services can be changed, but the whole is interoperable and logical.

3 INTRODUCTION TO DESIGN THINKING AND SERVICE DESIGN

According to Luchs et al., design thinking can be defined as a productive and inventive problem-solving approach or, more effectively, as a well-organized and collaborative approach for recognizing and creatively interpreting problems. The term design thinking simply means to address problems and try to find possible solutions. The characteristic of the design thinking approach is that it is deliberately nonlinear. Design thinking experts, whether in the arts or industry, investigate and solve problems by an iteration process. In other words, to find the final solution, they create potential solutions quickly, generate simple ideas, and then iterate on these primary solutions — acquainted by notable external feedback. (Luchs et al., 2015, 1, 2.)

Service design is the practice of devising and executing innovation in order to develop/create a service's feature to reach the requirements of the users of that service. It is a holistic, user-centric method to produce services that are valuable, profitable, pleasing, practical and useful. (Bowden, 2018.)

According to Kuure et al., service design has proved itself as a discipline that allows industries to design and perform their services with a human-centered strategy. It provides contextual and cultural knowledge that gives possibilities for new service solutions, enhancing the user experience and involvement and as a result, more customer satisfaction. (Kuure et al., 2017, 19, 23.)

3.1 Design thinking

In general, when the problem, or opportunity, is not properly determined, an innovative approach or thought is required, context or environment is changed and there is a lack of information, design thinking methods are the best practice to use (Curedale, 2016, 23). Within a business including new enterprise production, business model design, and process development, design thinking methods have been applied successfully in various forms.

Framework of design thinking

Luchs et al. describe that design thinking, as a methodical and collaborative method for distinguishing and creatively solving problems, consists of two major phases: recognizing problems and solving problems. The key elements of the following framework, as shown by the two stages of design thinking represented in Figure 11 are Identify and Solve. (Luchs et al., 2015, 4, 5.)

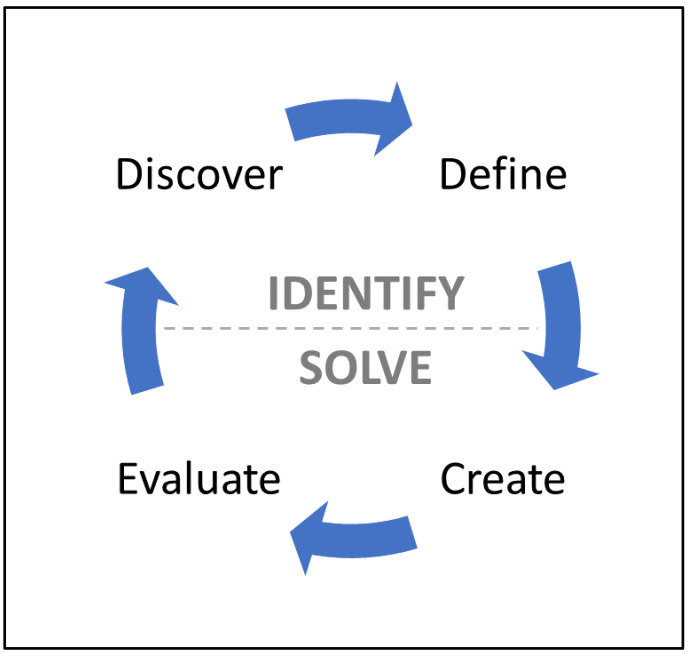

Figure 11. Design thinking framework (Luchs et al., 2015, 4).

Discover

According to Design Methods for Developing Services article, the beginning of a project is a phase of discovery, collecting inspiration and insights, recognizing customer requirements and generating and developing primary views. The first part of the design thinking model includes the start of the project. The goal of this phase is to look at the world in a different and new way, notifying new things and investigating inspiration. Designers collect insights, forming and generating an assumption about what they perceive, determining what is new and attractive, and what will incite new ideas. Some specific methods such as market research, user research, managing and planning, and design research groups are used during this stage. (Design Council, 8.)

Hence, the objectives of the discovery phase include identifying the problem, opportunity or needs to be approached through design, determining the solution area and developing a deep information resource with inspiration and thoughts.

Define

According to Interaction Design Foundation, during the Define stage, designers try to put together the knowledge they have built and collected during the Discovery stage. This is where observations will be analyzed and integrated in order to describe the main problems that have distinguished up to this point. (Interaction Design Foundation, 2019.)

The goal here is to produce a clear creative outline that builds the primary design objection to the organization. Key methods during the define phase are user personas, brainstorming and design brief. In general, the objectives of the define phase are to analyze the result of the discovery phase, synthesize conclusions into a unified number of possibilities and define a precise summary for achievements by all the stakeholders (Design Council, 8).

Create

In the third stage, solutions are produced, prototyped, tested and iterated. This process of analysis and failure assists designers to enhance and improve their ideas. The goal is to produce as many diverse thoughts as feasible and visualize them.

According to Lewrick, Michael, et al., in this phase, the primary goal is the step-by-step raise the creativity per iteration. Depending on the problem description, a broad brainstorming session on potential ideas can be organized in the beginning. Key activities and objectives in this phase are brainstorming, prototyping, benchmarking, multi-disciplinary working (Lewrick et al., 2018, 42).

The objectives of this phase include developing the primary outline toward a product or service for building, designing service elements in particular and as part of a holistic experience and iteratively examining thoughts and ideas with

end clients. In general, during the create phase, using tools and methods such as service blueprint, experience prototyping, and business model canvas could be applicable to visualize the thoughts. (Design Council, 9.)

Evaluate

Griffin, Abbie, et al state that in the Evaluate phase, two types of activities will be conducted. The first is to get feedback from possible users by sharing prototypes. It is essential to notice that to get the most benefit from feedback, the prototype should help the user to simulate an experience rather than use as a prop for presentation. After gathering adequate feedback by the team, the process of integrating and combining the feedback will start. (Luchs et al., 2015, 7.)

In other words, the Evaluate phase is about exploring and reviewing the concepts to decide how well they reach the requirements. According to Cambridge University's' Inclusive Design Toolkit, to make sure that needs are actually met is very important otherwise the team will be in a risk of choosing concepts based on their own favor in look and functionality. This might not result to set of concepts that can work for the broader target group. (University of Cambridge.)

3.2 Service design

According to Kuure et al., service design has proved itself as a discipline that allows industries to design and perform their services with a human-centered strategy. It provides contextual and cultural knowledge that gives possibilities for new service solutions, enhancing the user experience and involvement and as a result, more customer satisfaction. (Kuure et al., 2017, 19, 23.)

Stickdorn et al. have collected five principles of design thinking which have been universally cited so far. According to their book, for any service design action to be growing, there are five core strategies that form the foundation of service design. (Stickdorn et al., 2011, 18—26.)

1. User-centric

To identify the feeling and perception of the customer in the broader context, service designers put the customers in the center of the service which helps to understand customer's requirements deeper. Consequently, service design applies empathic methods such as interviews, observations, and field research to collect insights to get user's true impulses, social context, and attitudes. It is necessary to map out and evaluate the customer's demands, experiences and actions before co-creating a solution to be examined iteratively.

2. Co-creation

Co-creation is the process of connecting stakeholders, in the solution's design, creation, and development. Usually, multidisciplinary teams apply the development, creation, and testing of these services which is called co-creation. The benefit of having multidisciplinary teams is that it provides diverse expertise, information, and experiences, which creates the enriched solution. It creates a connection between the professional groups as well as clients in a way that everyone will be able to input their viewpoints and skills.

3. Iterative process

One of the most important aspects of the service design, is not to avoid making mistakes but learning from them. This goal can be obtained by prototyping and experimenting on end users and stakeholders. Time and money can be largely saved, if the experience is tested by a service designer before developing it.

4. Visual communication

Service designers usually use visual tools such as sketches, pictures or prototypes to deliver their message. It can be more illustrative and expressive to use drawings instead of text or words. Visual tools can be more simple, comprehensive and tangible. For the implementation stage, a clear communication among stakeholders is necessary.

5. Holistic services

If services look at the whole customer journey and recognize each touch point of the journey, then a holistic view of a service can be created. Some tools, such as service blueprints, user journeys, and scenarios, provide the holistic user experiences and touch points. This includes not only creating the functionality,

safety, and dependability of the service but the entire client journey as it is encountered by the users, consisting of both tangible and intangible attributes.

3.3 Service design and elderly care

Service design and development helps businesses to distinguish the right services, organize them in a manageable hierarchy of complex services and arrange them together for maintaining a business process (Papazoglou et al., 2006, 2).

The world is changing, and technology is developing every day. Therefore, it is essential to involve all the stakeholders in the development process to ensure that the end product meets their needs. This will help to enhance the creative process, develop a better service, improve project management and improve extended effects. (Steen et al., 2011, 57).

About less than a decade ago patients would automatically ask a medical expert to solve their health concerns. Now, with the development of technology and the availability of data, the patient's way to achieve their health care has changed. Moreover, nowadays patients are not passive recipients of service and they are the most important part and resource in the value creation process. As a result, today and in the future, innovation in the design of a service is necessary to reach the patients' requirements because the interaction of the users with the healthcare experts has changed.

Service Design innovations for active aging seniors can lead to social innovations and best practices that help face the challenge of an aging population. It is crucial for the service design process to notice the rapid changes in technologies and trends in customer needs and accordingly adapt to them. In this thesis, it has been tried to make few steps toward this goal by studying the current requirements of elderlies in home care and also, the possible technologies that might have the potential to fulfill these needs.

4 STAKEHOLDER MAP AND BUSINESS MODEL CANVAS

Stakeholder map and business model canvas are visual tools representing an organizations' current status and highlighting problem areas, thus helping the organization detect development needs, focus on the essential issues and plan actions. (Stickdorn, 2011, 150, 212.)

4.1 Stakeholder map

According to Smartsheet, the stakeholders include all the involved people in a project - the people who affect and influence the project, as well as those who will be affected by the project. Moreover, stakeholders can be people at high levels such as a company CEO, university president, or the founder of an agency. People who are not involved in a project regularly can also be stakeholders such as members of the public, residents near the site of a construction project, and so on. People who work closely on projects like key clients and liaisons, managers, and team members are also considered stakeholders. (Smartsheet.)

Thus, it is important to do a stakeholder analysis and mapping exercise in order to investigate involved stakeholders. When a project starts, then map the stakeholders according to their involvement, emotional and financial investment, and other criteria related to the project. This will aid project and program managers to know the key stakeholders in each area and their requirements very quickly. (Smartsheet.)

According to Andersen Bjørn the author of "Business process improvement toolbox" book, all the stakeholders hold certain expectations toward the organization. Identifying these expectations and translating them into more tangible measures can help to anticipate and predict their reactions toward the project as it progresses. This allows project managers and project to organize developments that will more likely gain their support. When requirements are determined and fulfilled, the basis for satisfaction will be firmly established. (Andersen, 2007, 12.)

In other words, Stakeholder Mapping is the best method to understand and analyze the key stakeholders and their role in an organization. Stakeholder mapping is a collaborative process of research, debate, and discussion that draws from multiple perspectives to determine a key list of stakeholders across the entire stakeholder spectrum.

Mapping can be classified into four phases: (BSR, 2011.)

1. Identifying: finding relevant groups, organizations, and people.
2. Analyzing: understanding stakeholder viewpoints and concerns.
3. Mapping: visualizing connections to objectives and other stakeholders.
4. Prioritizing: prioritizing stakeholder connection and identifying problems.

In order to identify stakeholders, some methods such as brainstorming with the project group can be applied. After identifying all the stakeholders involved in the project, they can be aligned according to their level of interest and involvement such as interest, influence, financial state, emotional state on a simple chart. (BSR, 2011.)

To map and understand future changes in the home care system in Finland, a stakeholder map has been designed based on online research from the Finnish Ministry of Social Affairs and Health shown in Figure 12, where all the interested parties are identified, such as people who affect and influence the project, as well as those who will be influenced by it.

According to Professional Academy, internal stakeholders are usually members of the business (Professional Academy). The following are internal stakeholders of this research:

Internal:

1. Elderlies
2. Relatives
3. Caregivers
4. Medical staff

According to Professional Academy, when stakeholders have an economic or contractual connection with the organization, they are called connected stakeholders or primary stakeholders (Professional Academy). The following are the connected stakeholders of this research:

Connected:

1. Hospitals
2. Public and private home care services
3. Universities and vocational schools
4. Kela and social services
5. Technology companies

When stakeholders are not related to the organization directly, they are called external or secondary stakeholders and these stakeholders will be interested in the organization's projects or they might be somehow influenced by the organization's actions (Professional Academy). Key external stakeholders of this project are:

External:

1. State government
2. Ministry of social affairs and health
3. Municipalities
4. Society
5. Creative industries
6. Insurance companies

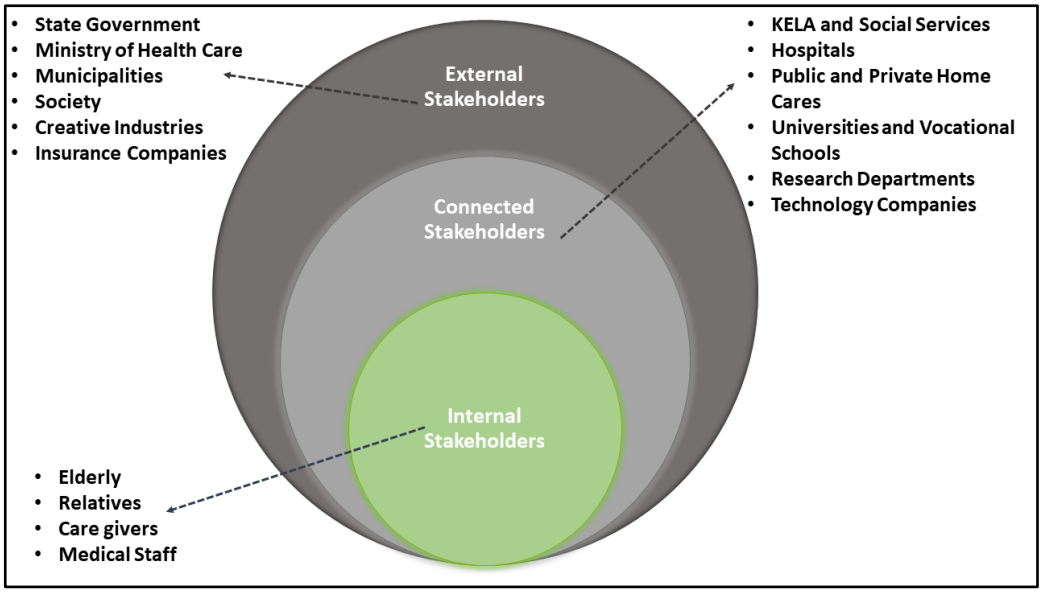

Figure 12. Stakeholder map.

4.2 Business model canvas

According to Osterwalder et al., the business model canvas implements a strategy through organizational arrangements and methods quite like a blueprint (Osterwalder et al., 2010, 15). Osterwalder et al., the authors of Business Model Generation, believe a business model is a tool to describe the logic of making money by businesses through nine basic structured boxes (Osterwalder et al., 2010, 16—17). In other words, a business model canvas describes the basis of how an organization creates, delivers, and captures value. The business model canvas is deployed for the organization as an important tool to ensure the development of the operation and analyzes the current situation of the organization.

The nine business model building blocks determine the foundation and a big picture of a business which Osterwalder et al. describes as the business model canvas. The abstract of these nine blocks is described as follows (Spremute Digitali).

Customer segments is the part where the most important customer segments, that an organization serves or intends to approach, are defined.

Key propositions block shows the products or services, which create value for the customer in order to solve their problems.

Channels block describe the ways that a company communicates with its customers in order to deliver them the key propositions.

Customer relationships defines the type of established relationship of a company with its customers. Customer relationships may be built for example by customer acquisition and customer retention.

Revenue streams segment shows the money an organization makes from each customer segment and other revenue sources.

Key resources section represents the most important resources and assets which a company needs to execute its business model successfully.

Key activities describe the most essential activities of a company that makes it work successfully.

Key partnerships are the network of suppliers and co-operators that help a company execute the business model as described.

Cost structure block includes all the costs which are derived from the operation of a company.

The business model canvas was created according to the conducted nurse interviews, elderly survey and online research about the topic. It describes the rational process of how a public home care service in Finland creates, delivers, and captures value. The business model canvas, available in Figure 13, was illustrated in March 2019 with Miro, an online whiteboard[3] (Miro.)

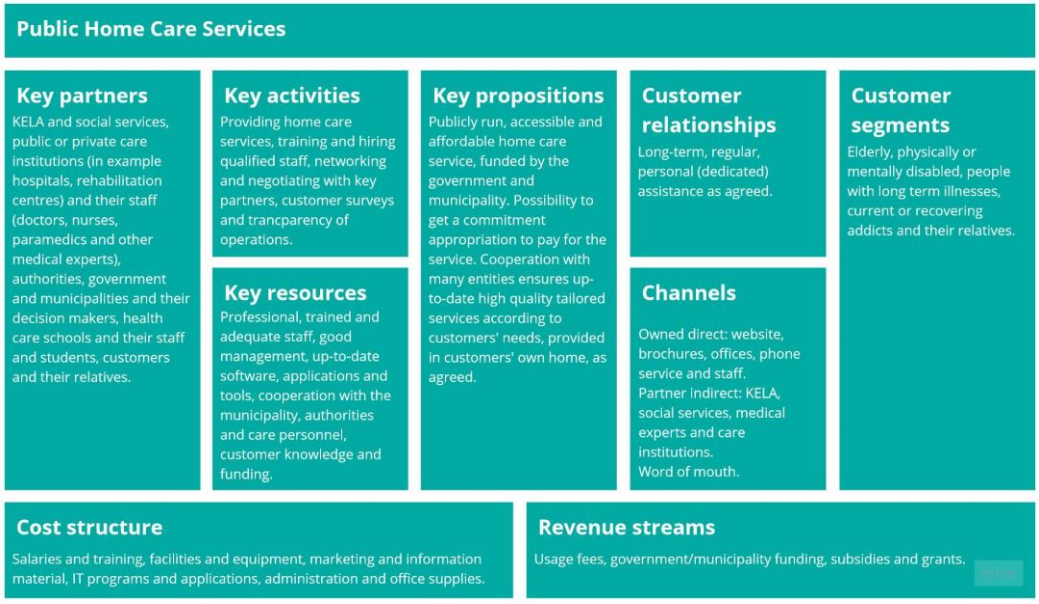

Figure 13. Business model canvas of a public home care service provider.

[3] Miro is an online visual collaboration platform which helps companies to create, collaborate, and centralize communication for their teamwork across the organization (Miro).

5 INSIGHTS AND IDEATION

In this study, qualitative and quantitative research methodologies have been used, in order to get perspectives from the users. These methods are one of the fundamental aspects of service design approaches. A combination of ethnography methods such as observation and probing were applied, due to the nature of the research as a study of a service design case.

To analyze the demographics of the survey respondents and their attitudes toward the service, quantitative data was used. Moreover, a semi-structured form of an interview was used to gather background information about the service and its user's behavior toward the service.

An interview becomes a semi-structure when an interviewer tries to ask questions in a verbal interchange manner to gather information from an interviewee. The semi-structured interviews are held in a conversational manner. It offers the participants an opportunity to investigate concerns they feel are important, while the interviewer provides a list of planned questions. (Clifford et al., 2016, 143.) In this chapter the theory, implementation and summaries of the results of each method will be presented.

5.1 Survey

Surveys are a common method for gathering information, typically from a large number of respondents. Surveys are used to collect information about people's characteristics, thoughts, feelings, perceptions, behaviors, or attitudes. (Martin et al., 2012, 172.)

According to Adi Bhat, a Questionnaire is a research tool that can get information from a respondent as a set of questions. Close-ended and open-ended questions in a survey can be used to get the participant's thoughts. The Statistical Society of London, in 1838 developed the Questionnaires. A Questionnaire can be seen as a multi-purpose tool which can be used in both qualitative as well as quantitative research purpose. Despite the questionnaire,

survey always consists of a questionnaire. A Questionnaire can be used in many purposes such as measuring customer satisfaction in using a product, evaluating company's communication and such. (Bhat.)

Every questionnaire should be uniform, it means every participant have the same questions. This is important in data collection and statistical analysis of that data. Also, in a questionnaire, questions form sections such as selecting questions, warm-up questions, development questions, skip questions, challenging questions and organized questions. Theses sections from a structural flow in order to increase the number of answers. (Bhat.)

Questionnaires can be either structured or unstructured. In order to collect quantitative data, structured questionnaires are used. In this format of questionnaire every question is planned and designed to gather specific data. While the aim of unstructured questionnaires is to collect qualitative data. Unstructured questionnaires consist mostly of open-ended questions and follow some basic structure in order to give freedom to respondents to answer the questions. (Bhat.)

Questions in a questionnaire can be open-ended questions, dichotomous questions (“yes/no” close-ended question), multiple-choice questions, scaling questions and pictorial questions. (Bhat.)

Types of questionnaires based on distribution

According to Adi Bhat, questionnaires can be administered or distributed in the following form as it can be seen in the Figure 14. (Bhat.)

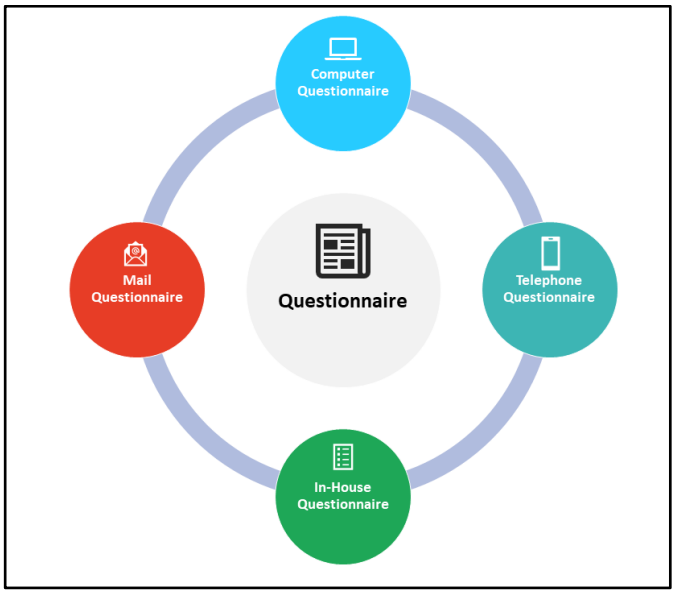

Figure 14. Types of questionnaires based on distribution (Bhat).

Computer questionnaire: In this type, a questionnaire is sent via email or other online tools to respondents in order to complete the form. Cost-effective and time-efficient are some of the good aspects of this method without putting any pressure on respondents to fill the form. Because they can answer the question in their free time, answers can be even more accurate. However, as a disadvantage, respondents can easily ignore these questionnaires.

Telephone questionnaire: In telephone questionnaire method, to collect the answers, the researcher calls the respondent. Getting a quick response is an advantage of this method because the respondent is on call and prepared to speak. Though, the phone cost and hesitating to give enough information by respondents are some of the disadvantages of this method.

In-House questionnaire: If the researcher visits the respondents in their home to get the answer, the method is called in-house questionnaire. Gathering In-depth information and allowing the respondent to be in comfortable environments are some of the advantages of this method. Due to the traveling cost for every visit, this method is considered expensive.

Mail questionnaire: In this type, the researcher sends the physical questionnaire form to a respondent in order to be filled in and sent back. As

respondents can fill the form in their leisure time, the answers are usually truthfully and entirely. However, this method is expensive, time-consuming and the number of responses might not be sufficient.

Questionnaire analysis

In order to collect information in a standardized way, online web-based and paper-based questionnaire have been used. According to Dillman, one of the three most important improvements in survey technology in the twentieth century is the electronic survey. Telephone and random sampling are the other two. (Dillman, 2000, 352.)

The most generally employed research method in health services research and the social sciences is a survey (Mathers et al., 2007, 5). In this research, an online questionnaire (Appendix 1) was chosen to save the time of sending back and forth the survey forms, collect more answers from a more diverse population and also, reduce the workload of the researchers as the answers are automatically collected and saved in an electronic form for additional editing. The other reason for choosing an online questionnaire was that this method is cost-effective and efficient.

The survey had the following objectives; first, to discover the knowledge and attitudes of the elderly toward the technology. The second aim was to understand the elderly's challenges in their daily life. Furthermore, to understand their feelings about social care services and collect their possible improvement ideas about current care services.

The survey was launched twice, first on 13th of November 2018 and the second time on 16th of March 2019. The survey was created with Google Forms tool. The first round was launched in Aurala organization[4] for their elderly clients and the second time it was launched on social media to get more insights. The survey had two pages. The purpose of the first page was to get the background information of the respondents as well as their daily challenges. The second page

[4] Aurala is a social action center and a meeting place provided by two non-profit associations, Aurala Settlement and Aurala Youth. The registered association Aurala Settlement maintains a civic college and a day care center, organizes activities for seniors, as well as integration training and Finnish language teaching for immigrants. (Aurala.)

was about understanding the elderly's attitudes and knowledge about technology containing both closed and open questions. The survey ended with questions about asking if respondents using home-care services and their feelings about the service they receive. It also contained some space for ideation and improvement points.

The most respondents of the survey were the citizens of Turku, but the availability of the online questionnaire also allowed people outside of Turku to participate in the conducted survey. As the second-round survey was available online in social media (Facebook) for everyone. In total 140 answers were received which about 88% of them were women and most of them were in their sixties. As it is shown in Figure 15, the respondents were classified according to their year of birth.

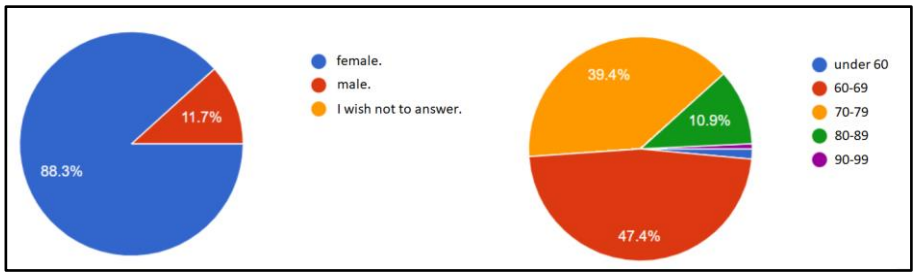

Figure 15. The demographics of the survey respondents.

Even though, almost more than half of the respondents were living alone as it is shown in Figure 16 but about 67% of them have family or friends who can reach their home quickly, any time of day or night if they have an urgent need that occurs between caregiver visits.

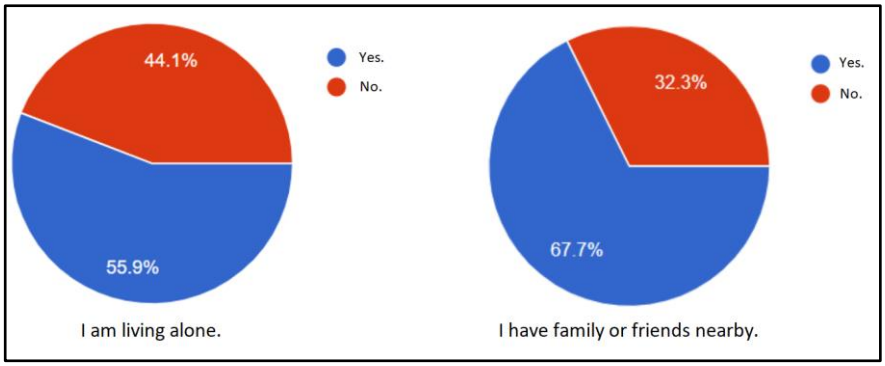

Figure 16. Living arrangements.

In the case of emergency, about 84% of the respondents preferred to contact their relatives first and the hospital with 48% vote is in the next place. The result can be seen in Figure 17.

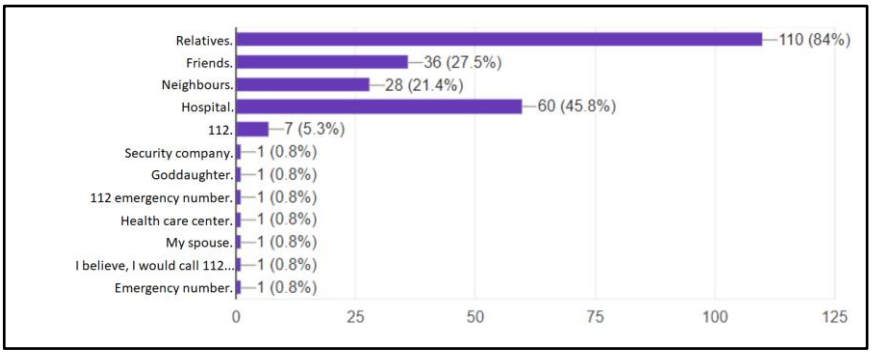

Figure 17. Contact in case of an emergency.

The survey results in Figure 18 showed that declining health is the most prominent concern and a challenge in the elders' lives. According to the survey the elderlies were also concerned about their ability to move around freely which translates to loss of independence and being dependent on others, financial issues (for example high accommodation costs), loss of a spouse and loneliness and lack of things to do. On the positive note, some elderlies commented that there is not enough time for all their activities.

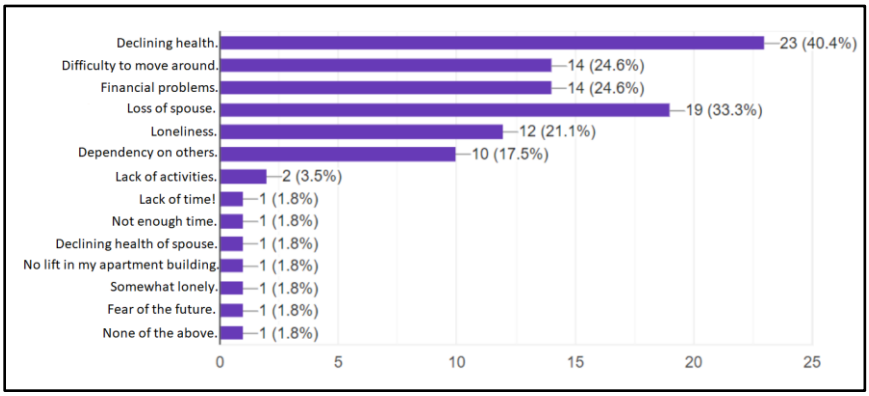

Figure 18. Daily challenges.

The research says that about 90% of the respondents can take care of themselves and they are still able to get around without any help. Moreover, surveys confirm that about 70% of the elderlies were not concerned about taking their medications (Figure 19).

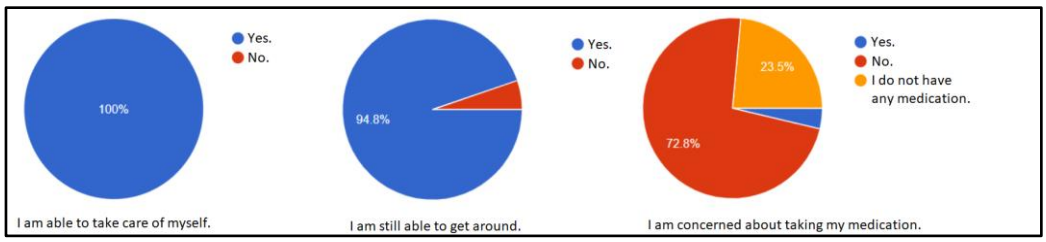

Figure 19. Capability in daily life.

Despite the wrong image of the society which believes that the elders are not familiar with new technology compared to the young generation, the result of the survey showed that about 98% of the surveyed seniors were familiar with using current technologies such as laptops, computers, smartphones, tablets, email, home appliances and internet. (Figure 20 and Figure 21). However, it is necessary to consider that about half of the respondents were in the age group 60-67 which could be still part of working age population. That might help them to get familiar with digital technologies. Statistics Finland also acknowledged that in 2017 about seventy-five percent of people aged 65 to 74 were web users and 37 percent among those aged 75 to 89. (Statistics Finland, 2017.)

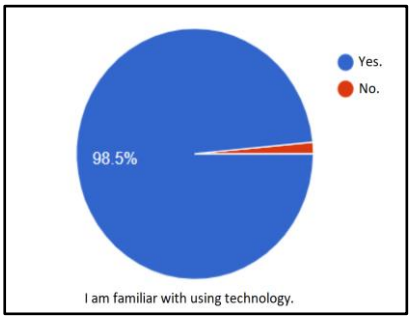

Figure 20.Technology use.

Technology	Number of answers
PC (Personal Computer)	119
Smartphone	90
Tablet or iPad	49
Mobile Phone	36
Home appliances	4
Internet	3
Camera	3
Car	3
TV	2
Radio	2
Navigation device	1
Safety bracelet application	1
Scanner	1
Digital box	1
Chromecast	1
Surveillance cameras	1
Solar panels	1
Smart Watch	1

Figure 21. Technology use by device.

According to the results, none of the respondents have used home care services (Figure 22). So, the answer to the second question are mistakes except one, where the respondent pointed out that they would like to get more information about the availability of home care services. The services are not marketed in any way and becoming a home care service customer many times requires a referral from a doctor or a nurse. The one respondent, asking for more information about home care service availability, also mentioned that elderly care

services should not be so expensive and that the care should be of better quality. This comment presumably refers to the latest news about elderly care in private companies. For example, according to Yle news, police are investigating about 30 accusations of elder care failure across Finland which some of them may have caused injury or death. (Yle, 2019.)

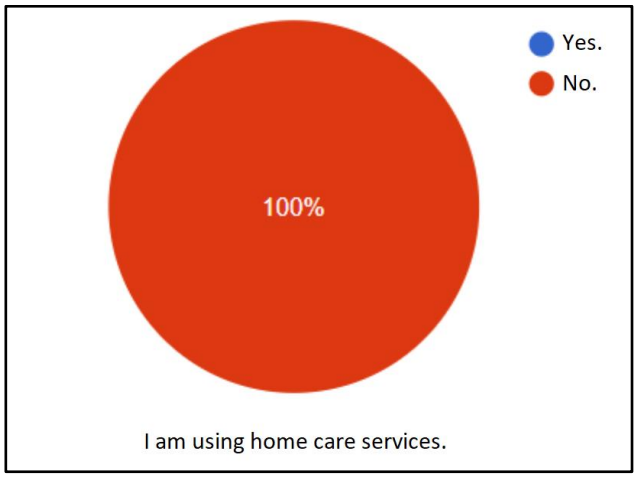

Figure 22. Home care customers.

The survey produced a variety of ideas (Figure 23 and Appendix 2) to improve current services. The respondents wished for smaller easy access apartments (preferably in an apartment building), which are affordable and effortless to maintain. Also, affordable housekeeping and caretaker services to help with daily chores, as well as support with the housing costs. Some pointed out that their house or apartment required renovation to meet the current housing standards for example cooling systems and fire alarms, kept up by the housing association. One respondent wished for a network connection to his/her spouse at home, to be able to check how he/she is doing and also someone wished help to take care of his/her spouse while he/she is having a day off. In one response communality and networking with neighbors and friends was raised as an important asset to ensure help when needed.

Figure 23. Ideas and improvement points collected through the survey.

5.2 Interview (in-depth)

Conducted with customers in their own environment or in the context of the service, depth interviews are an effective way to generate insights into customers' perceptions, behaviors, and needs and to uncover their values and opinions (Polaine et al., 2013, 50).

In-depth interviews are a valuable qualitative data gathering method that can be used for a variety of purposes such as problem findings. When a researcher wants to ask open-ended questions to obtain holistic information from comparatively few people, the in-depth interviews are used while surveys are more quantitative and are conducted with a larger group. (Guion et al., 2001, 1.)

In order to be able to observe people's emotions and body language while asking the questions, the in-depth interview was chosen. This method is useful in a way that the interviewer will be able to guide the interview if necessary, and not just asking interviewees to answer some predefined questions. Moreover, a more in-depth understanding of their thoughts was another reason to choose this method. Each interview took about ten minutes and for this project four nurses were interviewed during the autumn of 2018 and all of them were working in the public sector when the interviews were conducted.

To execute the interviews, the team designed a semi-structured interview, supported by a set of questions available in Appendix 3, which lead the conversation and made it more fluent. One of the nurses was interviewed by phone, one in Turku based privately owned elderly residential home and two in Cafe Pullapuoti, situated also in Turku. The answers and comments are facts, provided by professionals, which helped researchers to evaluate the current situation of elderly-care from the nurses and elder's perspective.

The nurse interviews proved to be very important for this study. As it turned out, many elderly care customers are physically in very bad condition, have memory disorders or they are no longer a legal personality and therefore could not have been interviewed. Those who answered a questionnaire or participated in an interview, were still in such good condition, able to take care of themselves and had no particular problems with their care.

Results

To understand the routine and workflow of a practical nurse in home care during a shift, the nurse interviews were conducted during the autumn of 2018. According to the nurses, at the beginning of the week, all working journeys of the nurses will start from the offices. The nurses get the weekly medicines of the elderlies and also the schedules and elderlies list from the office. Then according to the medical priority, the nurses will visit approximately 5 elderlies during the morning shifts. It means that the elderlies who are suffering from some illness have a higher priority to receive the service because they must receive medicine from the nurse. Then, during a visit the nurse usually helps the elderly with medication, bathing, warming food, feeding who need assistance, measuring blood pressure and chatting with them. If the elderlies want, the nurse can organize a weekly trip to a church, marketplace or theater.

According to the nurses, the afternoon and evening shifts are busier than the morning shifts based on the number of the elderlies they visit. Because, during the morning shift, the nurse has to spend more time with each elderly to do the time-consuming tasks such as taking the elderly for a shower. After visiting elderlies during a shift nurse usually goes back to the office to write reports about

the day. Nurses use their smartphone or tablet to check-in and check-out from the elderly's home.

Time management and physical difficulties and the elderly's behavior were the most concerns mentioned by the nurses during the interviews. Sometimes the elderlies refuse to collaborate with the nurse, and they do not want to eat food or take his/her medication. In these cases, the nurse calls the office and caregiver team comes to give medication to the elderly to make him/her calm.

Creating a nurse persona based on the interview

A user persona is a fictional character created to represent the goals, behavior, and frustration of a group of users (Junior et al., 2005,1). The personas are examples which are built after conducting observation and interviews of potential users, and personas are based on fictional characters which were representing traits of an existing social group (Wang, 2014, 2). Hence, the personas show the characteristics of the groups they describe, from their social and demographic features to their own requirements, aspirations, customs and cultural histories. (Service design tools.)

In other words, Persona can be done for business customers as well as consumers. Persona card help to describe the business in terms of its situation, character, and strategic priorities. It is essential to define and illustrate key actors in the business such as end user and employee in order to create a feeling and character for the relationships that describe the business. (Reason et al., 2015, 129.)

While designing a customer profile, the specifics of the people should be considered. It is important to start with their background and context before continuing in how they felt about the represented company. In order to understand what they value, studying about their journey and zoom into their particular experiences that they had (irritating or delightful) is necessary. (Reason et al, 2015, 130.)

Two personas were created to describe the needs, thoughts, and goals of nurses and elderlies; the main target group of Finnish home care services. The nurse persona was created based on the interviews, presented in chapter 5.2,

which led to a typical nurse persona available in Figure 24. The other persona, in Figure 25, representing the elderly user, was designed by using information from the creational elderly persona workshop, analyzed by utilizing the affinity diagram tool. In chapter 5.5 the workshop and the affinity diagram will be described.

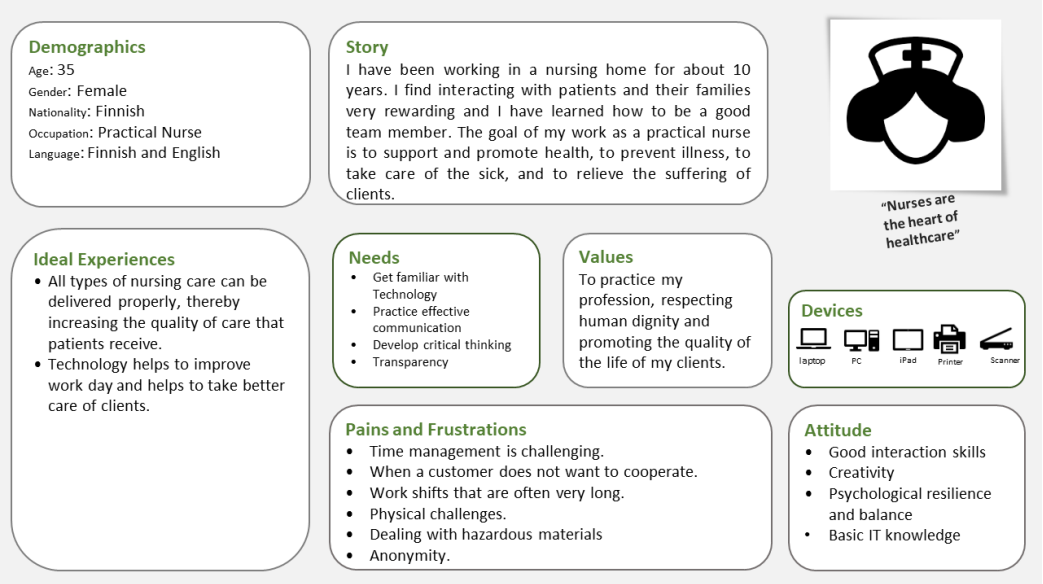

Figure 24. Nurse persona.

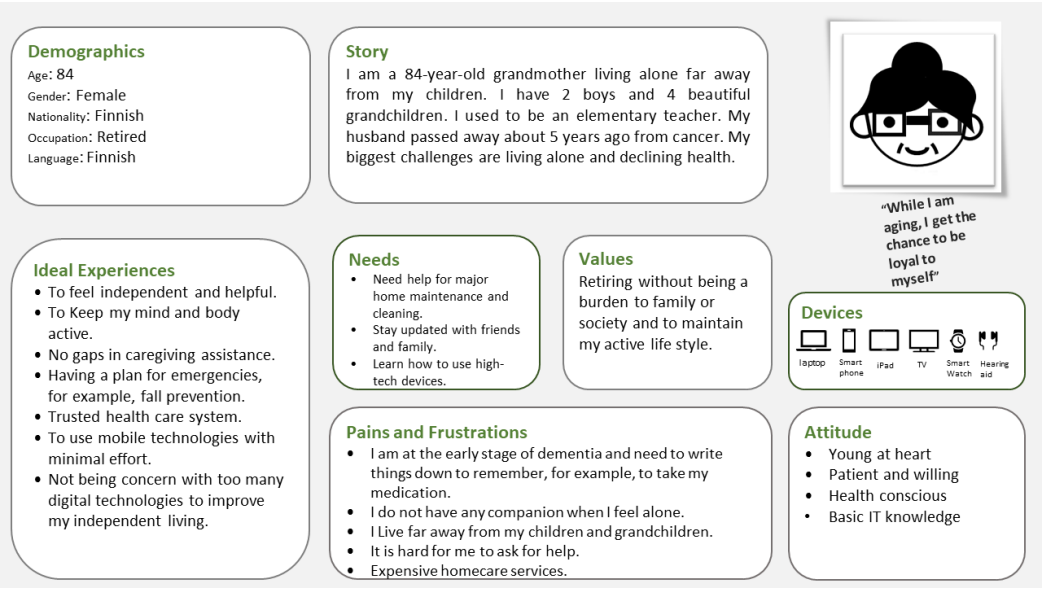

Figure 25. Elderly persona.

5.3 Observation (fly-on-the-wall)

The most important key to all service design approaches is the customer insight and also, to understand their needs, experiences, behaviors, and motivations. Customer insight can gain from the prior experience, information about customer habits, or observation and testimony as it is shown in Figure 26. Studying the details of the lived experience and the interactions people have with service touch-points and interfaces makes the service design methods differ from traditional research. Customer insight is an enlightening understanding of specific customers' attitudes and to gain this insight, observation could be used. (Reason et al., 2015, 131.)

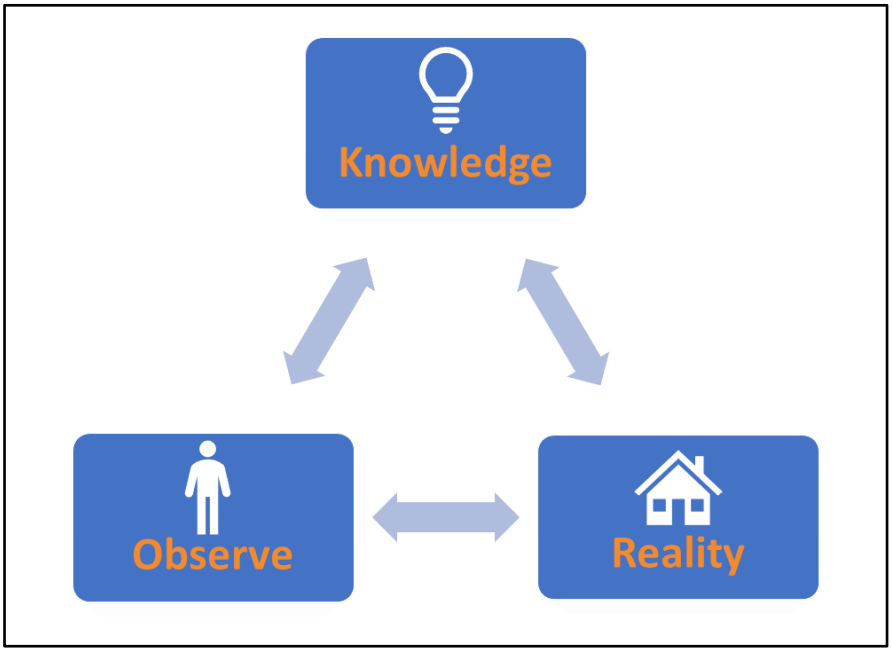

Figure 26. Observation process made according to Interaction Design Foundation.

Observing users while they are interacting with a product or a service can be an excellent method to identify the usability of a product or service and customer experience. Conducting observations is relatively easy as it does not require much of training and it can be done relatively fast – depending on the sample size of users the researcher intends to observe. By performing observation, the researcher can get an overall understanding of system routine and workflow. (Interaction Design Foundation.)

Fly-on-the-wall observation method allows the researcher to unobtrusively gather information by looking and listening without direct participation or interference with the people or behaviors being observed (Martin et al., 2012, 90).

One of the advantages of this method is that researchers are able to observe secretly the participants' behavior and gather their insights in a specific situation. However, the researcher should stay completely unnoticed through the observation period in order to not bias the participant in any way. Thus, no probing or following the participants is one of the disadvantages of this method. (Think Design.)

The focus of the research was to identify the nurses' role in elderly care and how the system is currently working. Moreover, to understand how the interaction with the elderly is, and what kind of activities are done at the moment. Due to the confidentiality held in healthcare services the observation was conducted flexibly, without predetermined criteria and without categories or codes.

To conduct the observation a private elderly residential home in Turku was visited by researchers to observe the current optimal situation in the elderly care and a non-structured observation was performed based on the Fly-on-the-wall method. However, it is necessary to notice that the result gained from the method is not the whole picture of the current system working in Finland. Due to the confidentiality of the visit, observers were not allowed to take photos during the visit. Thus, to show the feeling and atmosphere of the venue a mood board, as Appendix 4, of elderly residential home has been made with Canva[5], an online graphic design tool.

A mood board is a method to illustrate a mood, a character, and an environment by providing a specific feeling about a service by images or elements to improve inspiration and communication during the design process. When some values in the service are difficult to explain by words, the mood board is the best method to use. (Lucero, 2009, 39—40.)

[5] Canva is a free online graphics design website to make for example presentations, social media graphics with ready layouts (Canva).

Results

The observation was done on the 12th of September 2018, in the late afternoon, and the observation tour was guided by a nurse. According to the nurse, the elderly residential home offers cozy apartments and various senior residents are happily living there. The nurse continued that all apartments are rentable, designed to meet the needs of senior citizens and they include a ventilated flat, modern kitchen, non-smoking sanitary facilities, and a safety phone throughout the apartment by speakers. The size of the apartments varies from 24 and a half square meters to 87 square meters and some of them have a balcony or a terrace. The nurse also mentioned that seniors have the feeling that they are living in their own home and they are able to decorate it with their own taste with familiar furniture and goods. The researchers also got the same feeling while visiting inside one of the apartments with the nurse.

While walking with the nurse in the communal areas, the nice feeling of elderlies, while spending time with other residents or enjoying the atmosphere of the premises, could be seen. Moreover, the quality of the seniors' everyday life is enhanced by the houses' own library, restaurants, gyms, sauna and an indoor swimming pool. According to the observation, this facility also houses the services of a hairdresser, a physiotherapist and a pedicurist. Good outdoor activities, nearby services and transport links complement the cozy courtyards of the apartments. For observants, an all-season-green garden inside the building brought a stunning feeling.

According to the nurse, all residents receive a service package according to their own personality and needs. The content of the packages varies, but all packages include security phone, cleaning, daily lunch, and diverse hobbies and cultural activities. The nurse also stated that nursing and rehabilitation services are offered individually. If elderlies desire, the packages can be supplemented with additional services.

During the visit, the home care staff looked professional and friendly which helps to enhance the enjoyable residence stay. According to the nurse, the staff offers services based on their customers' requirements. Also, staff for elderly care services support Finnish and Swedish speaking customers.

In general, the observants got a positive feeling during the observation period, because elderly residents seemed happy and joyful there. But unfortunately, according to the nurse, it is not affordable for all the elderly to stay there, as it is a private nursing home with higher costs compared to a public nursing home.

5.4 Desk research in assistive technology for elderly care

Desk research or secondary research is the research method which is mainly acquired by collecting data from existing resources, therefore, it is often regarded as a low-cost method. However, the researcher should have the proper skills of how to perform the research in order to achieve the main objectives of it. Desk research, as a quick and low-cost method, is usually performed in the early stages of research. It can effectively gather the basic data for running a benchmarking in the research process. (Management Study Guide.)

In this desk research, several effective factors in elderly care such as the use of digital technologies, the population of the aging society who require 24-hour care, Assistive technologies such as sensor and so on will be discussed and explored. These factors will be described in more detail in the following paragraphs.

The use of digital technologies is increasing in elderly care. A report by Zickuhr (2010) states that approximately more than one-half of American grown-ups aged 65 and older use the internet or email and 70% of older adults use the internet regularly (Zickuhr, 2010). Also, the conducted survey by the researchers showed that most of the elderly use the internet and email. So, the influence of digital technologies on care service system is a sign to root technological innovations in the home care services. Moreover, technology aid devices may help municipalities to improve productivity in elderly-care services and accordingly create more customer satisfaction.

According to the National Institute for Health and Welfare, the population of the aging society and those who require 24-hour care will grow noticeably in Finland in the next decades. These men and women experience care basically in four environments: their homes, assisted-living facilities, hospitals, and long-term care organizations like nursing homes or skilled-nursing facilities. Clinical or financial

issues usually transfer patients from one care environment to another. (THL, 2018.)

The transmission from homes to assisted-living facilities is typically caused by a continuous decay in cognition or physical ability, from homes or assisted-living facilities to hospitals by issues such as wounds or heart attacks, and from homes, assisted-living facilities, or acute-care institutions to long-term-care organizations by changing in an economic or clinical breaking point for instance, bankruptcy or dementia or other permanent illness. (Kayyali et al., 2011.)

Elderly face many challenges inside and outside of their home, for instance, turning on electronics (for example, stove), understanding fire alarm, remembering to take medication, forgetting to eat and drink, falling down, unable to get help by pressing the alarm button, loneliness, not finding the direction to home, forgetting traffic laws, unable to take care of him/herself and so on (Perälä).

The older people need to perform a series of activities to be able to live independently. These key activities are called the Activities of Daily Living (ADLs) and include eating, bathing, dressing, toileting, transferring, walking, and managing continence. The other category of activities necessary for functioning in society is called Instrumental ADLs (IADLs) and include cooking, driving, using the telephone or computer, shopping, keeping track of finances, managing medication, doing laundry, and housekeeping. With planning wisely, home technologies such as sensors, apps, and even robots may provide ease to the elderly's lives and it can cause a major change in their daily routines. In addition, these home technologies can reshape home care services by offering more cost and time efficient health-related treatment and also, by providing solutions that support autonomous living and enhanced quality of life for seniors (National Science & Technology Council, 2019, 3).

The lack of technological solutions created mainly for the elderly can be solved by utilizing a more holistic strategy, creating an elastic environment to accept new changes, and finally combining technology with components that are already part of these people’s habits. For instance, helping elders to overcome their daily challenges such as pathfinding. (Lazzarin, 2016.)

Technologies such as sensors, mobile devices are offering new possibilities for home care services especially for elders who are living alone to age better in place. Many service providers can employ these technologies to prolong the elderly's well-being. These Technologies are essential to help the elderly to extend their independent living in a cost-effective and safe way (Deloitte, 2016). However, Deloitte 2016 Survey of US Health Care Consumers shows that consumers use technology for health monitoring purpose less than other categories. (Figure 27.)

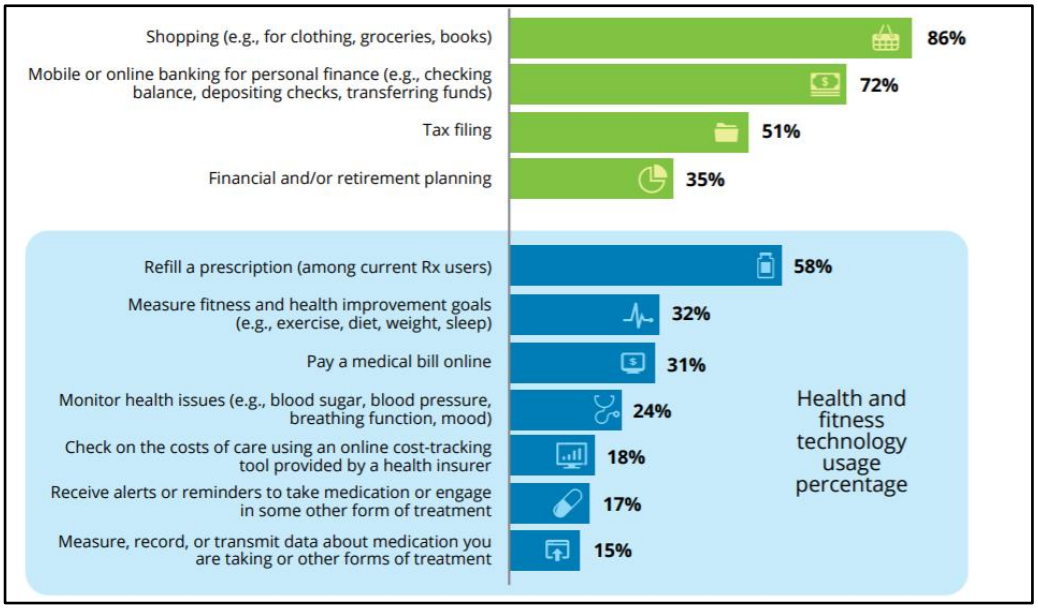

Figure 27. Consumer use of technologies for health and fitness purposes (Deloitte, 2016).

The purpose of assistive technologies such as technology-based home care is to prevent or decrease the need for institutional care, reduce the financial and emotional burden for individuals on society. In other words, with the help of technology-based home care, some chronic diseases can be treated by monitoring and interventions in an elderly's home instead of in the expensive institutional environments.

The most important benefit given by technology-based home care (such as automated monitoring tools) could be to prevent or to postpone the transfer of clients to dangerous or long-term-care environments. However, it is important to note that technologies applied in home care may not address all the possible elements carrying such changes. (Kayyali et al., 2011.)

Technology-enabled home care can help to monitor the medical condition in three criteria: first, it should be chronic meaning that it continues for a long time or constantly recurring. This gives the possibility to reevaluate, learn and adjust the course of possible actions based on the continuously collected data. Second, it must be preventable or there must be procedures to handle it. Thus, by repeating a step-by-step procedure, the situation can be handled. And finally, it should not demand continuous observation and human attention. (Kayyali et al., 2011.)

Some important diseases such as diabetes, hypertension, congestive heart failure, chronic obstructive pulmonary disease, and fracture prevention are good targets for current and future technological advances in home care (Kayyali et al., 2011). And last but not the least, as technology is growing continuously and rapidly in all industries, and not just in elderly care market, but the essential demand for actual, human interaction should never be omitted.

As the post-war generation enters retirement age, 27 percent of the Finnish population will be seniors over 60 and this number will rise rapidly (This is Finland, 2016). Therefore, to understand how technology is changing the elderly care, desk research was done based on online research of the actual market situation.

Issues such as lack of mobility, memory loss (caused by aging or diseases), physical health such as poor vision or hearing, loneliness, social isolation and nutrition might make seniors requiring more care and assistance. (Berdanier et al., 2007, 352). For so many years, elderly have been taken care of by a doctor, for example, elders who require medication needs or a caregiver who takes care of their daily needs such as relative or nurses (National council for aging care.)

IoMT technologies in elderly care

To tackle the issues elders are facing in their daily lives, digital technologies, and specifically the Internet of Medical Things (IoMT), have huge potential to help. When all of the medical devices and applications are connected with healthcare IT systems by online computer networks, it is called IoMT. (TechTarget, 2015.)

Reenita Das had classified the current IoMT technologies in groups which will be described next in detail (Das, 2017).

Vitals-tracking wearables

For the majority of senior's non-communicable diseases, including cardiac ailments, diabetes, and hypertension is an important issue. For instance, a heart monitor device for the cardiac patients which can monitor diseases such as arrhythmia and then inform doctors to adverse events in real time and help deter further difficulties is a significant accomplishment. According to Reenita Das, InfoBionic's MoMe Kardia device does exactly that. Other monitoring tools like Cortrium's C3 Holter monitor and Uber Diagnostic's CardioTrack, are also available. Moreover, Regular activity monitoring and heart rate monitoring can be performed by one of the several available user-wearable devices and smartwatches. (Das, 2017.)

Medication adherence tools

One of the challenges that seniors are facing in their daily lives is to remember to take several medications during a day. Accordingly, missing one can lead to worsening of the medical condition, and in some severe cases even can cause more serious results requiring hospitalization. Various IOMT tools can help to conquer these challenges by reminding customers when to take their medication. AdhereTech, Amiko.IO, MyUBox, MedMinder and Vitality GlowCaps are some examples of these products which help the elderly to tackle this difficulty. (Das, 2017.)

Virtual home assistants

For seniors who live alone, and they require daily assistance as well as companionship, virtual assistants such as Catalia Health Mabu robot or Intuition Robotics ElliQ robot can serve this purpose well. These devices in addition to offering interaction with seniors via voice and touchscreens, they can also help them stay in touch with their family, friends, and caregivers digitally via social media platforms and video chat. Besides, these devices can help the elderly by reminding them to take their medications and their care providers' medical notes.

Robots and voice-interactive digital assistants (for example, Amazon Echo or the healthcare-specific version produced by Lenovo Health in cooperation with Orbita Health) are the other types of virtual assistant tools. (Das, 2017.)

Portable diagnostics devices

One of the side effects of ageing is requiring doing biomarkers test more often than others in order to check up overall well-being condition. Thus, portable diagnostics devices can be very beneficial as a matter of cost reduction and performing such tests in the comfort of their homes. The Scanadu Urine Kit for biomarker analysis or the Cue device that can test Vitamin D levels. However, in the future, more devices could be available, which means seniors can perform diagnostic tests more frequently, as a result, diagnosing diseases and treatment would be sooner, which all lead to saving avoidable health care costs and having a longer healthier life for elderly. (Das, 2017.)

Personal emergency response systems

Currently, several products already exist and assist many needs of seniors, inside and outside of their homes, such as fall detection, emergency assistance and navigation guidance (for example dementia patients) or even border edge breach alerts (for example Alzheimer's patients). These products are provided by many companies, ranging from healthcare areas such as Philips to smaller businesses and startups like Everon, Qmedic, Lively, Motech, MobileHelp, Jupl and UnaliWear. There are also some other products which offer more than fall detection, for example, ActiveProtective's smart belt, which detects falls and uses airbags to prevent fall-related injuries and employs Bluetooth technology to send a signal to chosen emergency contacts. (Das, 2017.)

Disability assistance tools

For seniors who are suffering from disabilities, there are various smart products available in the market such as Opn smart hearing aids by Oticon with features such as direct Bluetooth connectivity to a smartphone for making a phone call or for streaming music with the ability to set volume and change programs on television with a smartphone app. Sensory- and cognitive-impaired elders can also use Nominet's PIPS tool in order to organize and perform their daily routines.

Until the reminded task is done by the seniors and the button is pressed, customizable colored buttons placed in seniors' homes flash. This tool can be used as a reminder for the daily tasks such as brushing teeth or taking medication. (Das, 2017.)

Smart implants

Reenita Das also listed some Smart Implant tools such as Pacemakers s for sharing data with physicians via smartphone' app (Medtronic MyCareLink), Sensors that are planted in orthopedic implants to deliver performance post-surgery (OrthoSensor) or Glucose Sensors that tell diabetics' glucose levels to smartphones or other individuals (such as products in development by GlySens, Senseonics, Echo Therapeutics or Google's smart lens). By assuring that medical intervention is inquired immediately when needed, these devices will aid in a better managing seniors' condition. (Das, 2017.)

Smart senior homes

With the help of technologies such as sensors or wrist-worn wearables, the medical staff is able to track senior's location as well as their daily activities such as bathing, walking, sleeping and so on. One example is Tempo wearable device by CarePredict which enables seniors to ask help by pressing one button and will soon also add two-way audio communication with care staff. But it is essential to note that the true power and potential of the technology is in machine learning and predictive analytics from seniors' daily routines and the result can show care providers the need for immediate medical intervention. The Mimo-Care solution is a similar example that can address three types of alerts to care staff for following seniors condition including red alert (potential fall or night walking), orange alert (differences in daily manners, such as not eating properly) and yellow alert (for domestic problems such as forgetting to turn off the stove). (Das, 2017.)

Family caregiver remote monitoring tools

These products will help families to track elderly's daily routine remotely without contacting them directly. As similar examples, 3rings, Evermind, and Sonamba will report family members when the connected device is turned on. For example,

if the elderly turns on the coffee machine, family members will get the notification. With the help of these technologies, any changes in daily activities will be recognized so relatives can reach seniors to check that seniors are doing well. Moreover, these technologies bring a new opportunity to constantly, but non-interrupting observe the elders and to provide immediate care and medical support when they need it. (Das, 2017.)

Even though the Internet of Things[6] is a simple concept but it is changing the way that whole medical ecosystem – caregivers, patients, payers, and providers are connected to each other (Ranger, 2018). It provides an experience of a new level of engagement which is a result of constantly monitoring patients remotely and accordingly creating transparency and insights about elder's condition such as their diet and cognitive condition (National Council for Aging Care).

Even though there are different solutions available in the market for elderly needs, but they cannot form a total solution. Because they are not fully integrated, and they are closed systems controlled by a specific vendor. Thus, if an elderly decides to use them, they need to deal with several products and technologies. Also making a holistic view of the elderly health and life is not that easy due to the mentioned issues above.

5.5 Creational brainstorming with nurse students held in Salo

On the 19th of September 2018 a workshop was held at Salon Seudun Koulutuskuntayhtymä for a group of 22 nurse students during their home care course class. Most of the students had prior experience in working at the home care system which was a good base to generate expected outcome during the workshop. The aim of the workshop was to generate ideas within the context of elderly care, with an emphasis on the following key themes: Finding problems and bottlenecks in the current healthcare situation from a nurses' perspective and create elderly personas with the students. The workshop lasted 3 hours and it

[6] "*The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, collecting and sharing data." (Ranger, 2018.)*

generated many ideas which will be presented next in more details. In order to facilitate the workshop, 6-3-5 method as well as brainstorming method were used.

5.5.1 Method 6-3-5

The "6-3-5" method was originally developed in the late 1968 by Professor Bernd Rohrbach and was identified and used as a creative technique for generating ideas since then. It was created as an alternative brainstorming method that produces a large number of ideas, 108 in only 30 minutes. (Wodehouse et al., 2012, 2—3.)

In order to execute the 6-3-5 methods, the participants are asked to develop and write down three ideas within a defined time frame of three to five minutes before passing their ideas to their neighbor. In the next step, each team member has to develop ideas based on the ones given through her/his predecessor. This can be done by correcting and improving existing ideas or generating even new ideas inspired by the given ones. This procedure proceeds until each team member gets his initial sheet of ideas. As an example, for 6 participants it should happen after five rounds. (Schroeer et al., 2010, 592.)

In this project, the 6-3-5 method was used with a group of 22 nurse students, while they were divided in two groups. They were asked to write down any ideas and thoughts of what they thought was a problem working in the home care environment. The template used during the workshop in the Appendix 5 and sample answers in the Appendix 6.

Results

In general, the method worked very well with inexperienced participants in order to help them with creative brainstorming and generate new ideas. Facilitating the workshop was quite effortless. The pre-planned, colorful templates (Appendix 5), as well as pens were given to the participants by researchers. To set a time limit by which the worksheets were to be done, a smartphone was used by the Facilitators. Each of the participants wrote down 3 ideas, according to the asked question. Once the time was up (each round lasting from 2 to 5 minutes), the

template passed on to the neighboring participant, clockwise. Then each team member developed the 3 new ideas or suggest improvements to given ideas from the neighbor participant. This continues until the worksheets were completed, ideally producing 108 ideas in 6 worksheets.

The participants were also treated with some refreshments to keep them alert and active (although in the feedback it was mentioned that it was unnecessary). This task took 45 minutes, including instructions, answering rounds and a summary. As usual, some students generated more ideas than they had time to write and some provided less than the required three during one round. However, the method proved to be quite effective.

The workshop generated a sufficient amount of answers and surprisingly variable results and a good amount of new information, which the research team had not anticipated. To analyze these answers, a tree mapping method has been used, which is described next and the results presented in Figure 27.

5.5.2 Tree mapping

To analyze the gathered answers from the 6-3-5 workshop, Tree Mapping method was employed. Tree maps were created as an alternative to visualize large data in order to easily present them, especially in a limited space, so in other words, a Tree map can visualize a large amount of information in a limited space (Fourney, 2004, 4).

This method was invented by Professor Ben Shneiderman in 1992, tree maps display hierarchical data as rectangles. A rectangle has an area proportional to a specified dimension of the data and with colors, another dimension is shown. When the color and size dimensions are correlated, patterns, such as if a certain color is particularly relevant, are visible. Tree maps also make efficient use of space. (University of Maryland, 2003.)

Results

Before making a tree map (Figure 28), the results from the 6-3-5 workshop were listed and gathered in Appendix 7, and similar answers placed under the

conjunctive header. These headers were then placed into four branches according to the presumably source of the problem. The numbers in each branch describe the frequency of the answers. The branches and their sub-branches are described below.

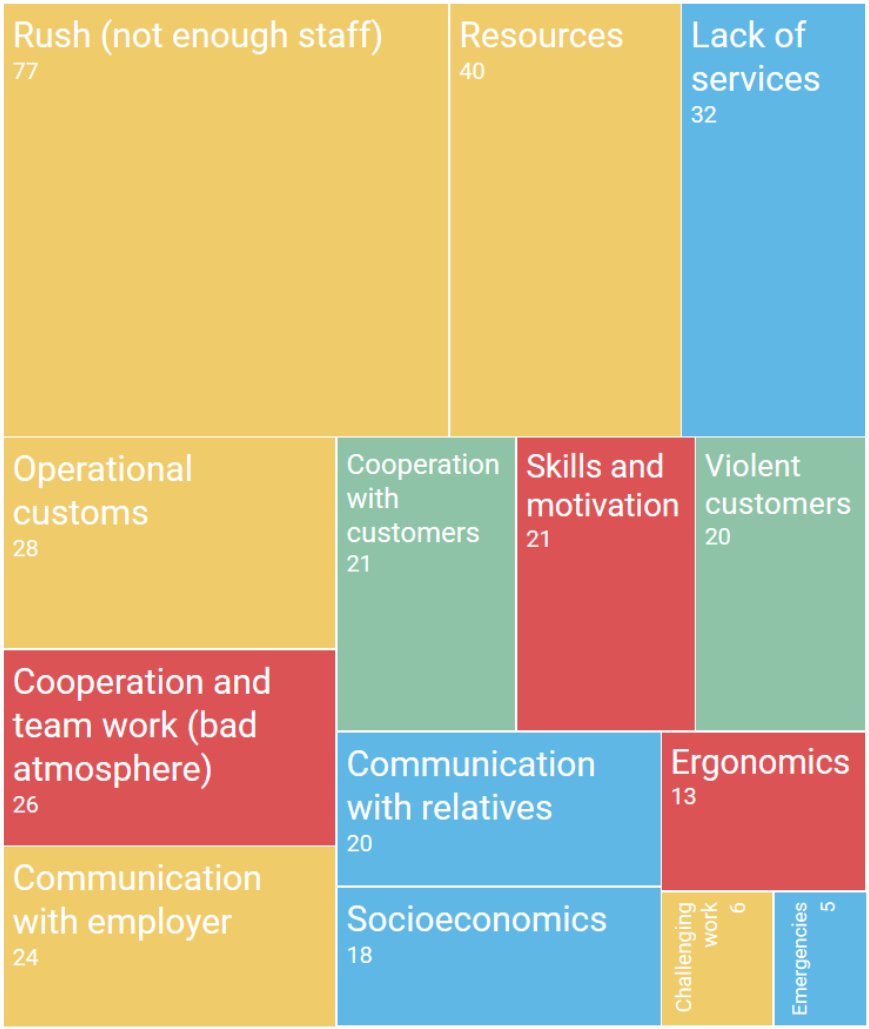

Figure 28. 6-3-5 results (treemap was created with Infogram in October 2018).

Employer branch - yellow branch with 175 answers of the total 351

Problems in this branch are a direct or indirect result of employer actions or defaults. This branch contains five sub-branches: rush (caused by for example lack of staff and tight schedules) (77), resources (for instance, inadequate training, frequent turnover of staff and insufficient utilities) (40), operational customs (for example, poor planning and lack of flexibility) (28), communication

(the staff is not provided with necessary information) (24) and challenging work (difficult and volatile tasks, demanding customers and so on) (6).

Employee branch - red branch with 60 answers of the total 351

Problems in employee branch are mostly results of employee actions and failures. This branch has three sub-branches and they are titled as cooperation and teamwork (in general bad atmosphere between staff members) (26), skills and motivation (for example inadequate language or working skills, neglecting customers or lack of initiative and motivation) (21) and lastly ergonomics (wrong working methods and not using the proper utilities provided) (13). Although these problems are results of employee actions or defaults, many of them could be addressed and eliminated with adequate training and better management and supervision by the employer when the resources are sufficient.

Customer branch - green branch with 41 answers of the total 351

This branch contains only two sub-branches. Cooperation (21) and violent customers (20). Problems with the customers seemed to be the least of worries and in total generated forty-one answers out of three hundred and fifty-one. Apparently, the workshop participants understand that their customers are old, unwell, in pain, forgetful and so on. Therefore, they may react reluctantly or even violently when encountering a nurse invading their space, although just trying to help.

Conditions branch - blue branch with 75 answers of the total 351

Conditions are something in which the employer, employee or customer cannot affect, but which have a significant impact on nurse's work. Conditions branch contains four sub-branches. Lack of services (for instance, physical therapy) (32), communication with relatives (relatives' unreasonable expectations) (20), socioeconomics (poor financial situation and the health and social services reform) (18) and emergencies (accidents and force majeure) (5). Lack of services means that customers do not get services which could improve their conditions and thus diminish the need for home care. Instead, the customers become passive which leads to problems with memory and moving around. Also, relatives were experienced as a difficulty because they have unreasonable expectations

and instructions that are not in the customers' information. The relatives may also ask the nurse to do something that has not been agreed upon or is not their responsibility.

From all of the branches, the employer branch is the largest. This suggests that there is a desperate need for improvements. Although, lack of funding resulting in a deficit in staff is not directly dependent on the employer or management, but on the financier, for example, government. Problems in home care seems to be a nationwide issue and require immediate attention. According to a report by Super (Finland's practical nurse union), many nurses feel that for instance, their workload is unbearable, their work is not appreciated and that they are working with dysfunctional and dated tools. (SuPer, 2018.)

5.5.3 Elderly persona workshop

Due to confidentiality and trade secrets, the researchers were not able to get any audience to officially visit a nursing home, a home care establishment or a home care service customers' home, during the research period. Therefore, a persona workshop was organized on the 19th of September 2018 at Salon Seudun Koulutuskuntayhtymä with practical nurse students. The aim of the workshop was to gather information about elderly, who are receiving home care services at their own home or live in a nursing home, to understand their insights. As it was mentioned before, most of the nurse students in Salo had some prior work experience at home care with elderly as customers. Thus, gathered information reflected their experience about the customers they had encountered during their career in home care and in nursing homes.

According to Stickdorn et al., when facilitating any co-creative workshop, the participants' knowledge constitutes to the quality of the results. For example, the personas' expressiveness and accuracy depends on the participants knowledge about the group in question. In addition to this, it is important to conduct comprehensive qualitative research before the workshop. In other words, the more valuable data is brought to a co-creative workshop, the more representative the outcome will be. (Stickdorn et al., 2011, 40.)

This persona workshop was a combination of an interview, brainstorming and roleplay done in pairs. The participants worked with a fellow student sitting next to them. Pre-made persona cards with given topics (Appendix 8) were given to the participants and they were asked to interview each other to fill in the template. The other participant was the interviewer and the other was asked to dive into to the role of an elderly, preferably to draw influence from encounters with elderly customers to get more realistic answers. The pairs were given fifteen to twenty minutes to complete one interview and then they switched roles. Each topic was introduced shortly, telling what type of information the interviewer sought after, so they could steer the interview in case the interviewee strayed from the question.

Results

Usually brainstorming is used to generate new and innovative ideas, but combined with roleplay, the method worked very well even when the goal was to gather quite objective data. Also, the method proved to be productive, because the researchers were new to the topic and did not know what kind of answers to expect and therefore did not know what kind of specific questions they should ask.

Just like the 6-3-5 method, pre-planned templates and pens were given to the participants (the nurse students). Each block of information was explained in turns, and a timeframe given. The timing was not as exact as with the 6-3-5 method, because the length of the answers to be produced could not be predicted.

This task took about 45 minutes in total, including instructions, interview rounds and a summary when few participants read their story, generated through the interview. Again, some participants were more productive and creative with their answers and had used their experience and filled any gaps with imagination. The researchers had not anticipated such abundant, versatile and warm-hearted answers and felt that these answers gave a glimpse to the elderly life. Some sample answers can be seen in Appendix 9.

5.5.4 Affinity diagram

"*Affinity diagramming is a process used to externalize and meaningfully cluster observations and insights from research, keeping design teams grounded in data as they design.*" (Martin et al., 2012, 12.)

In order to classify and analyze the results gathered from Persona Workshop, the affinity diagram is applied. Affinity diagrams were created in the 1950s by Japanese Jiro Kawakita, also known as K-J Method. This tool is part of Seven Management and Planning Tools, used in Total Quality Control History: Affinity Diagram (KJ method), Interrelationship diagram, Tree diagram, Prioritization Matrix, Matrix diagram or quality table, Process decision program chart and Activity network diagram. (Mihai, 2019.)

Affinity diagram is usually used to arrange large amounts of the idea into groups with a common issue or relationship (Figure 29). In other words, this tool helps to cluster and classify large amounts of data and discover their relationship in order to analyze them. This method may reveal important unknown relationships. (Weprin, 2016.)

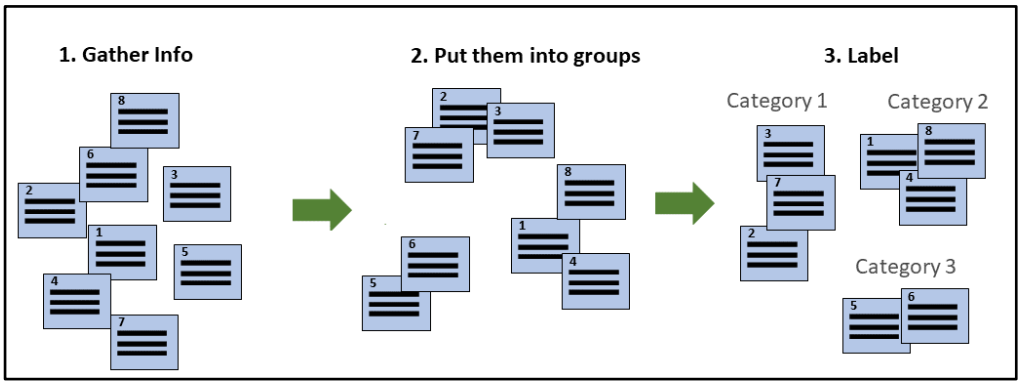

Figure 29. Affinity diagram steps made according to Mihai (2019).

In this research project, the affinity diagram tool was used to organize and structure the information gathered from the workshops with nurses and social care students who are dealing with seniors. The nurses took turns to represent "the elderly people" like a user as it can be seen in the Appendix 10. Their

responses are based on real cases and stories collected from their professional career, and their professional experience with elderly individuals.

The gathered data from persona workshop was partitioned into nine sections as can be seen in the designed affinity diagram available in Appendix 11. These sections include health and condition, marital status, family and relatives, needs and wishes, problems and concerns, values, age, devices in use, attitudes and activities and interests. Based on the similarity and commonality, the findings were categorized in the relevant section. As it was mentioned before, this knowledge was used to make the elderly persona, which is available in Figure 25.

5.6 Customer journey mapping of the current situation of the services

A customer journey map is a visualization of all experiences a customer has with a certain product or service over time (Richardson, 2010, 1). This tool helps an organization to become more customer centered. Because the journey map carefully shows only the experiences of a customer and thereby helps a project team to slip into the shoes of a customer. It makes intangible interactions visible and facilitates a common understanding of a certain experience between all team members. (Stickdorn et al., 2018, 44, 45.)

Customer journey mapping is originated as a market research tool in order to study consumers' motivations and behaviors (Crosier et al., 2012, 1). Companies should have an understanding of the quality of a user's experience at an end-to-end level to deliver great services. By mapping any user's interactions with the company (called touchpoints) on a map, customer journey maps create better knowledge of a customer's end-to-end experience when using a service. (Bernard et al., 2017, 1.) To address these issues, customer journey mapping and service blueprinting are two parallel methods that can be used to understand both sides of a service; what the person experiences, and what happens outside of their view.

In other words, Customer journeys are used to explain the experience from the customer's aspect. Unlike process mapping, customer's behaviors while interacting with service is really important. In order to get deeper into customer experience, and understand their requirements at the granular level, Customer journeys are used. This tool helps to redesign journeys to facilitate better results. A customer journey illustrates the actions and steps that users undergo while they use a service. Considering the fact that there could be many different Customer journeys, this tool also focuses on specific parts of the experience such as an onboarding journey or specific use of the service such as a routine visit. To create a customer journey, it is necessary to feel the experience from the customer prospect. These understanding and knowledge can then be gained via direct shadowing or interviews with customers. (Reason et al., 2015, 133.)

There are five steps to map the customer journey including collecting internal ideas, develop initial proposals, research customer manners, requirements, and thoughts, analyze customer research and map the customer journey. (Temkin, 2010, 3—4.)

In this project, two customer journey maps as visualization tools were used (Figure 30 and Figure 31) to get a better understanding of the customers. The idea was to map the relationship between a customer and the service over time and across all channels that the customer interacts with the offered service.

Elderly journey map of the current process

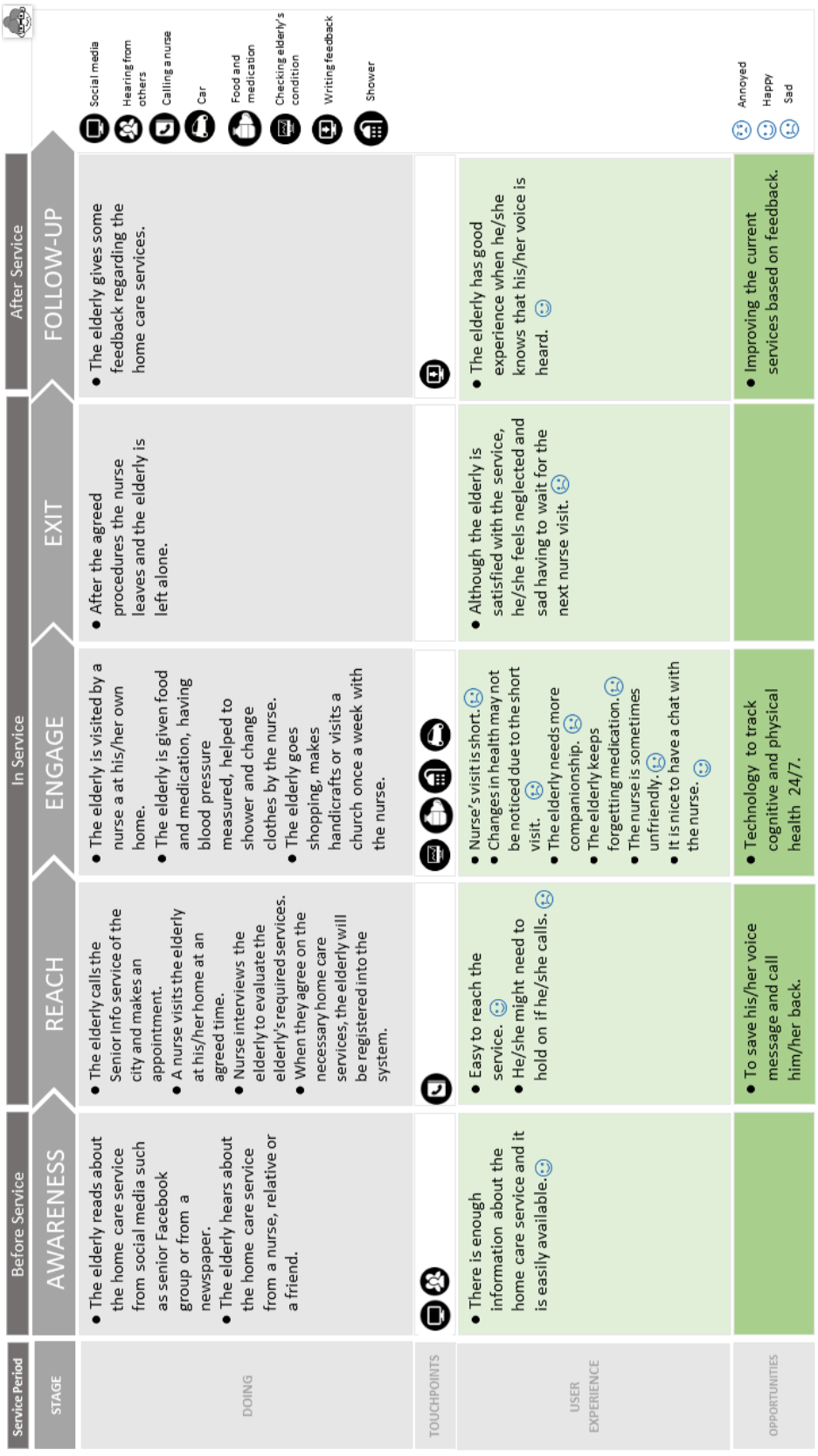

Figure 30. Elderly journey map.

Nurse journey map of the current process

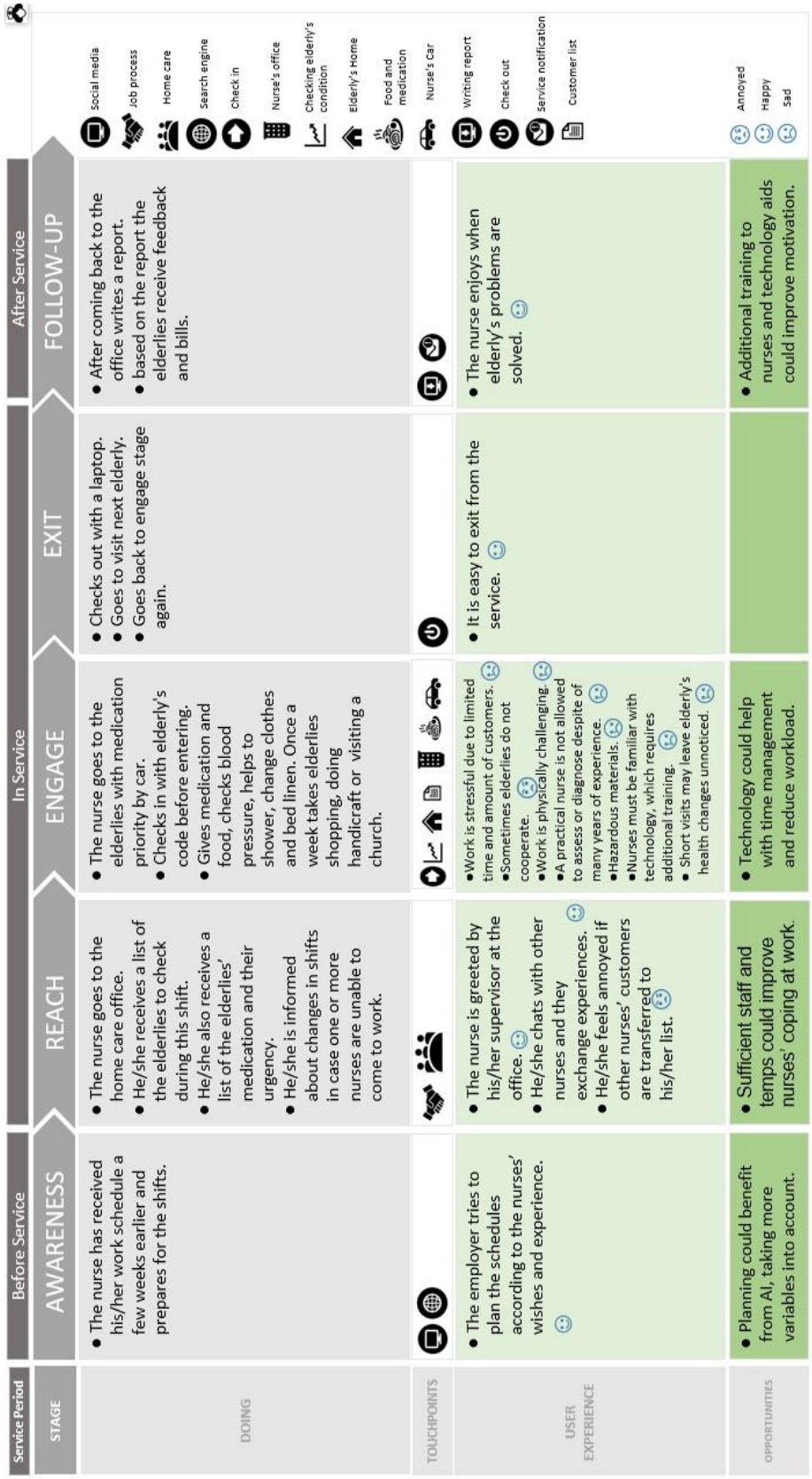

Figure 31. Nurse journey map

The depicted journey maps above describe the services in the public sector, and they are based on the interviews conducted with nurses, who work in public home care services. As it was described in the elderly and nurse customer journey maps, the elderly calls the Senior Info service of the city to start the home care application process. A nurse will visit the elderly at home at an agreed time to evaluate the elderly's required services. When forming the agreement, the nurse and the elderly discuss the necessary home care services including the treatment plan and individual services. As part of the plan the elderly might receive help with daily chores such as eating, bathing, getting dressed, going for walks and taking medication. Depending on the elderly's condition, it might also include a trip to a shopping center or a church occasionally with a nurse.

When the home care service commences, nurses' shifts are planned based on the elderlies' medication priority. For example, the elderlies with diabetes, or other condition requiring medication, will be visited first. To conduct the service, nurses use their portable devices to check-in to the system by entering the elderly's code. They execute the services based on the agreed plan with each elderly. They repeat this process until they have visited all the elderlies that they have in their schedule for the day. After going back to the office, the nurses write a daily report for each elderly that they have visited and based on their report the elderly's care is revised and the elderly will be invoiced.

5.7 Service blueprint of current situation of the services

Service blueprints were first introduced by Lynn Shostack, a banking executive, back in 1982 in the Harvard Business Review. According to Shostack, a service blueprint is a basic tool that shows the backstage process of the customer journey. (Shostack, 1984, 134.) To Define each particular phase of a service in detail, service blueprint is the best tool to choose. This usually creates a representational aspect of both the user, service provider and other sensible sides with a good level of details from customer contact to backstage processes. (Stickdorn et al., 2018, 54.)

Sarah Gibbons also explains that in order to visualize the relationship between different components such as customers, touchpoints, process and so on, a service blueprint is an ideal tool. The service blueprint is similar to the customer journey map, but blueprints are helpful in complicated scenarios which many service-related offerings. It is important to notice that service blueprints should be always adjusted with a business aim: decreasing redundancies, enhancing the employee experience, or gathering siloed processes. (Gibbons, 2017.)

Key elements of a service blueprint are customer actions, frontstage actions, backstage actions, processes and physical evidence which will be described next. The service blueprint is arranged to specifically link customer experiences with both front stage and backstage employee processes as well as support processes. "Frontstage" indicates the to the people and processes, which the user has a direct connection to. "Backstage" describes people and processes that the user cannot see. Furthermore, a service blueprint depicts physical evidence that appears at particular levels. (Stickdorn et al., 2018, 54.)

Customer actions

Customer actions are all taken steps by customers during the service delivery phase. In a service blueprint, all the customer's actions are illustrated in sequence while the customer is reaching a particular goal. To depict customer actions, methods such as research or observing customer journey while interacting with the services are used (CropLife, 2009).

In this project, customer actions include nurse visiting in elderly's home, giving medication to the elderly, writing a report about the visit, elderly talking with the nurse, taking the medication and so on.

Frontstage actions

Frontstage actions happen when the actions are visible to the customer. There are two types of face to face activities: human-to-human or human-to-computer (self-service technology). Whenever customer and staff (or self-service technology) have an interaction, customers judge the quality of the service and decide about future purchases. (IPFS, 2017.) Nurse interviews the elderly in

order to register him/her into the care system, checks the elderly's condition (for example taking blood pressure) and helps the elderly to take a shower. These are examples of frontstage actions in this project.

Backstage actions

When activities occur behind the scenes in order to help onstage activities, they are called backstage actions. These actions can be done either by a backstage staff or by a frontstage worker in a way that actions cannot be seen by the customer.

Ordering and buying medication, maintaining the reporting app, registering elderly into the nursing care system, prioritizing and scheduling the next visit according to the elder's condition are some of the examples of the backstage actions in this project.

Processes

Anything that helps the service provider or employee in performing the service are considered processes (Interaction Design Foundation, 2019). Processes for this project include visiting an elderly, recording elder's health condition, analyzing elder's conditions based on the gathered data by nurses and such.

Physical evidence (touchpoints)

Physical evidence or touchpoint includes things or places that anyone in the service has an interaction with and they are usually at the top of the Blueprint. In this project, evidence includes the personal computer, medication, elderly's home, phone and such.

In a service blueprint, every organized key element is classified into a group by three lines:

Line of interaction: to describe the direct interaction between the client and the business, the line of interaction is used.

Line of visibility: to differentiate visible service actions (customer's view) from invisible one, the line of visibility is used. All of the frontstage (visible) actions are located above this line, while backstage actions (not visible) are shown below this line.

Line of internal interaction: to classified contact employees and employees who do not directly interact with customers/users, the line of internal interaction will be used. (Gibbons, 2017.)

To identify missing and or failing service aspects in the current homecare system, two service blueprints were designed. Below, in Figure 32, a service blueprint for the user-elderly and in Figure 33, a service blueprint for the user-nurse are displayed. This opens innovation opportunities for technology development to help promote seniors' healthy and independent living in the future.

Elderly service blueprint of the current situation

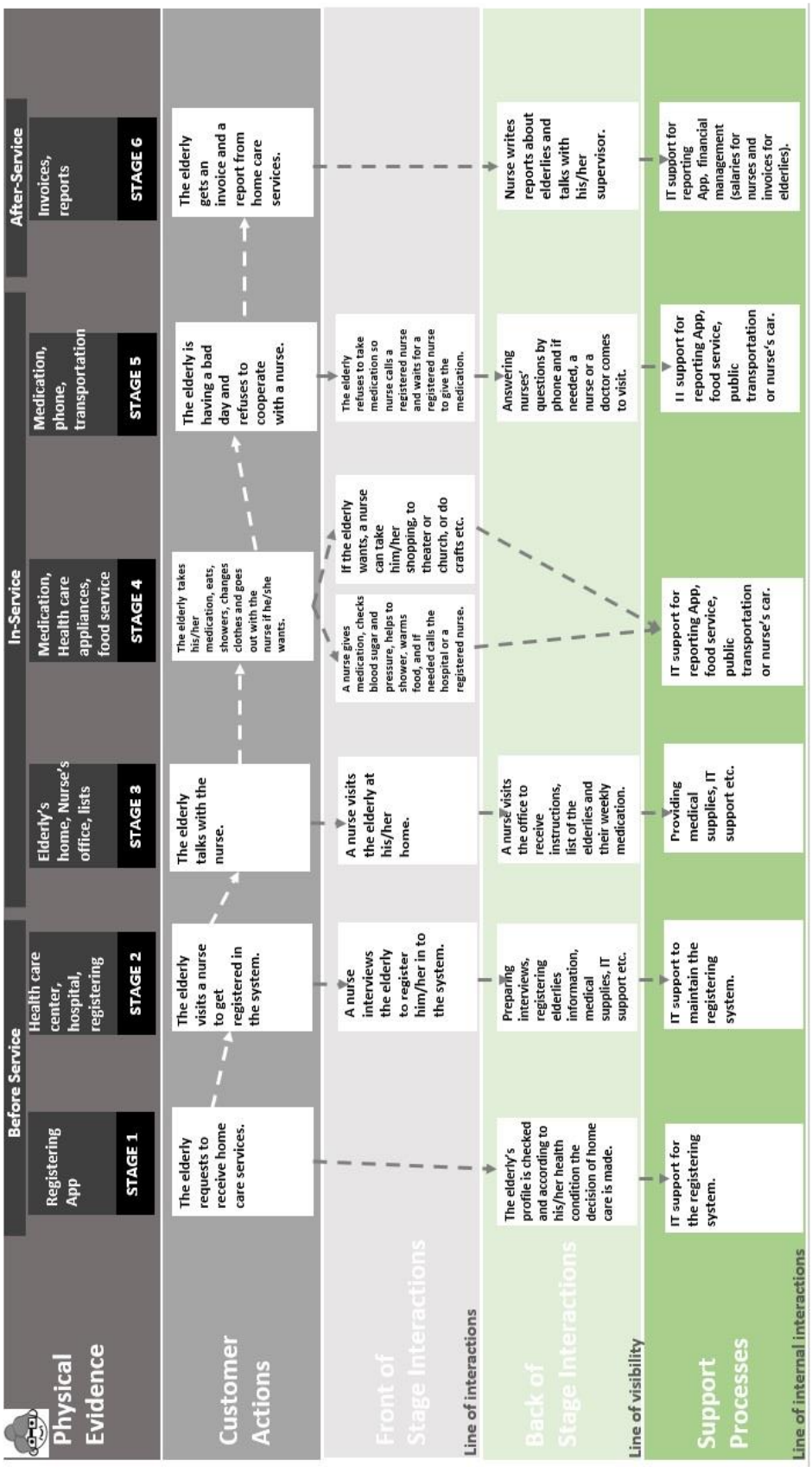

Figure 32. Elderly blueprint.

Nurse service blueprint of the current situation

Figure 33. Nurse blueprint.

As it is elaborated in the blueprints above, during a shift, a caregiver goes to the elderly's home and observes their situation, but due to the short visit and changing shifts, it is highly possible that a caregiver does not notice the changes in elderlies' functionality. When they notice the changes, it can be too late for early intervention and in the worst case, the elderly need to transit to the next stage, for instance from their home and home care to nursing home and after that hospital.

As an opportunity, a communicative technology such as monitoring tools can help to monitor the elderly's functionality and well-being (physical and cognitive capabilities). With this tool, changes in their abilities can be detected much earlier than when the observation is done once in a while by a person. By gathering for example sensor data from the elderly's environment, their daily routines and forms of life can be detected and analyzed.

The insights can be provided for different user groups, such as the elderly who are the data subjects, their children, caregivers, relatives, and medical doctors. By deferring this transition, the caring cost will be reduced noticeably, and the elderly will be living in the preferred environment with a higher quality of life.

5.8 Service scenarios

It is important to understand the feasible and desired future situation for both the business and the customer in any kind of changes including radical innovation or incremental improvement. Moreover, it is important to be precise about the choices for the future in order to make proper decisions. Service scenarios are a valuable method in creating a clear understanding of future options and future objectives. Scenarios help to concentrate on describing the future customer experience and how it will reshape business and services. Service scenarios describe the story about customer's actions through all or parts of the service. Scenarios are like stories with a clearly defined setting, actors (customers, staff, brands and so on), and motivations. This context creates a starting point for developing a future story. (Reason et al, 2015, 139.)

In this research, in order to describe how the customers' needs could be met in the future with the help of technology, a customer journey map (Figure 35) and a service blueprint (Figure 36) was created which will be presented in chapter 6. This helps to illustrate new and improved services and customer experiences for home care services.

6 THE IMPORTANCE OF ASSISTIVE TECHNOLOGY IN ELDERLY CARE

As it was discussed before in chapter 2, the senior population will dramatically increase over the next decades which will affect public expenses such as health care costs. Hence, it is necessary to be prepared for the consequences of the aging trend and accordingly find proper solutions. In this chapter, the consequences of the aging trend and also, solutions such as assistive technologies which help older people live longer at their home, will be presented.

Anything which supports people to stay independent, maintain their health or compensate for a disability is called assistive technology. This covers daily assistants like walking aids or wheelchairs, more advanced digital technology like robots and the internet of things. (National Institute for Health Research, 2018, 5.)

6.1 Raising awareness

It is important to consider the social and economic impact of an aging population. According to the 2018 Ageing Report, EU's population is anticipated to grow from five hundred and eleven million (in 2016) to five hundred and twenty million by the year 2070. Regardless, the working-age population (people aged 15 to 64) will decline significantly from three hundred and thirty-three million (in 2016) to two hundred and ninety-two million by the year 2070. This change is due to weakened fertility, elongated life expectancy, and migration. The article also states that in the EU, the dependency ratio of old age (aged sixty-five and over relative to people aged fifteen to sixty-four) is anticipated to rise from 29.6% (in 2016) to 51.2% by the year 2070. Thus, the population of older adults will dramatically grow during the following decades. As a result, healthcare costs will increase and would have a noticeable effect on public expenses. The 2018 Ageing Report also indicates that the public expenditure for long term care (LTC) is projected to multiply between 2010 and 2060 for almost all EU nations. (European Commission, 2018.)

Thus, there is a need to decrease these expenses mentioned above, to keep the benefits, provided for the elderly by municipalities and private service providers, restrained. The demand for assistance and special care rise when people get older, so they will use hospital services or home care more often with greater costs for the elderlies and their relatives and also municipalities. Accordingly, there is a constant need for more resources to support the elderlies.

It is important to consider the consequences of the aging trend and to be prepared for them. The ideal achievement is to help the elderlies live comfortably, independently and also more actively, while keeping them away from costly care and thereby acting productively and efficiently in the society. Therefore, the aim of this research is to gather insights and requirements of caregivers, elderlies and their relatives to understand the elders' everyday challenges, so that improvements could be developed.

In other words, to be prepared for the aging trend in the near future, it is crucial to create some structural changes to assure that elders are not isolated and that they continue to have an active life in society, because isolation can lead to both physical and mental health problems (Join-In Project, 2014). Otherwise elderlies live alone and also die alone progressively.

According to the News Now Staff, Leena Kaasinen from the Union of Finnish Practical Nurses says that elderly is left alone at home because of the wrong beliefs of the society, which is all that elderly want is to stay at home (News Now Finland, 2017). Tilvis et al. also state that about one third of the elderly suffer from loneliness in Finland (Tilvis et al, 2011, 1).

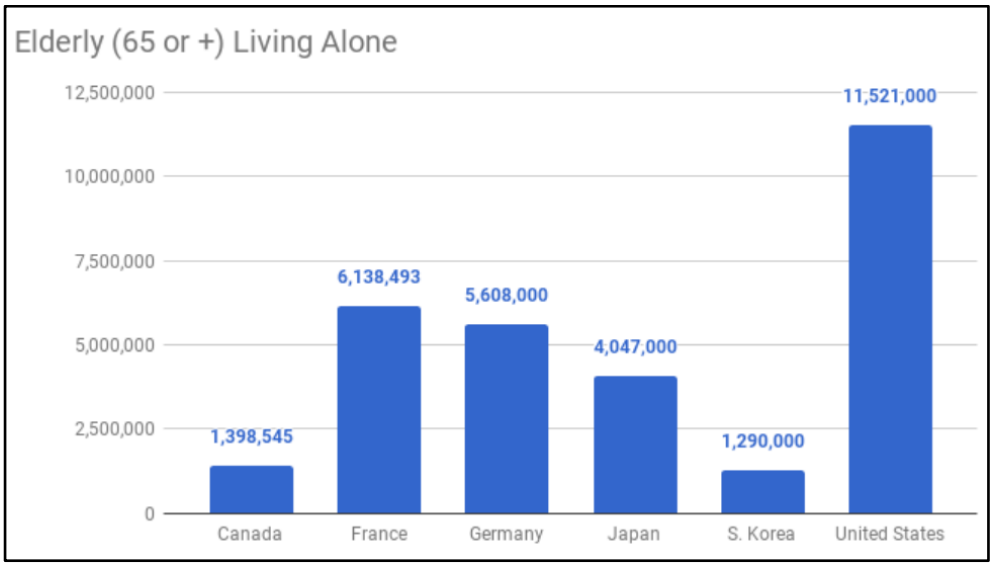

Figure 34. Elderly over 65 living alone (Naran, 2018).

According to Naran, the social isolation of elders who are living alone is even worse in Japan and Korea (Figure 34) because their bodies are found days and sometimes months or years after they have passed away. This phenomenon is called “lonely deaths”. (Naran, 2018.) Social isolation and loneliness in elderly population may be caused by lack of social activity, low self-confidence or physical disability (Join-In Project, 2014).

These issues mentioned above need to be tackled to mitigate the risks of elderly life. Therefore, solutions should be thought and devised to monitor the elderly's cognitive and physical health condition on a daily basis without invading their privacy too much. Considering the fact that humans always need to communicate with other humans, and that the current technology is not yet ready to fully replace care medical staff in elderly care, but surely smart continuous tracking technologies such as Smart Home can bring the opportunity to empower both seniors and caregivers.

The authors of Living-Environment-for-Ageing-Well state that the benefit of Smart Living, include a low-cost, simple silver-age-friendly user interface, real-time communication between relevant stakeholders, interference-free flexibility and the mobility of devices. In order to implement a smart living home, elderly can use digital interfaces such as personal computers, smartphones, tablets, wearables and pendants like smartwatches. (AIOTI, 2017.)

6.2 Improved user experience

The way people engage with their health is changing by advancing technologies. Nowadays, patients and caregivers are using online technologies to search for information, share their experience, know different medical treatment opportunities, ranking providers and improve predicting diagnoses.

However, the younger generation are using advancing technology more than senior citizens (Anderson & Perrin, 2017). Jokisuu el al., state that age, education, and place of living are important elements in encouraging elderlies to use technology such as ICT (Jokisuu et al., 2007, 3). Because, some needlessly, confused and complicated user interfaces can be big obstacles to older users. For the elderly audience, some concerns regarding the technology, such as doing something wrong or spending money without a benefit returned, could create stress and difficulty. (Calouste Gulbenkian Foundation, 2010.)

Using service design to improve elderly care

Service design can bring tremendous possibilities of developing new systems, processes, products to enhance wellbeing as a service, to reduce unnecessary hospital admissions and increase customer satisfaction. This helps people with short or lasting health issues to stay in their own homes.

As it was mentioned before the number of elders is growing fast. The aging process is affected by the combination of birth rate and a higher life expectancy. This situation leads to reduced labor forces whereas expenses in health continue to grow steadily.

According to Mira Alhonsuo, applying service design processes is essential when developing healthcare services because its human-centered approach addresses very sensitive subjects. Service design can help to break down the complexity of multi-level processes and ecosystems while bringing people together in a co-design environment. (Alhonsuo, 2016, 47.)

Service design methods are really helpful to find a way to go deeper into the home care routines, expectations, decision points, difficulties, concerns,

motivations and fulfillment from different angles by listening, observing, studying all the involved stakeholders' story and their actual needs before producing any solutions or modifying the current service delivery models.

To look beyond the technical requirements, the information systems and services need interdisciplinary efforts. This study also argues that to take a value-inspired design perspective, service design approaches are needed to promote aging-in-place and adjust the values of both the elderly people and their caregivers. (Liu et al., 2016, 12.)

The conducted interviews and the questionnaire result analysis prove the urge to understand the basic human values beyond the knowledge of specific functional requirements for the design of elderly care services in order to take most advantage of the service design process in a patient-centered care system.

By understanding elders' needs, their environments and the complexity of the interactions between the elderly and the caregivers, better services can be created, and projects such as in-home monitoring of the elderly will be feasible. This way by investigating the requirements of all the customer groups, their values can be aligned and implemented. (Liu et al., 2016, 12.)

6.3 Future home care service scenario

Based on the research of the current home care services and the desk research introduced in chapter 5.4, a customer journey map, from the elderly's point of view, and a service blueprint have been created to investigate, how future home care services could meet their customers' needs.

Based on the desk research done during this research, available technologies in the market are not truly integrated and designed to support the needs of the elderlies, or they are unknown or not mass produced for the market. Also, it is important to consider the fact that the elderlies, dealing with the new technologies coming into their daily lives, are affected by challenges of learning new skills, considering their possible physical, visual and cognitive limitations.

Considering the facts mentioned above, initially the researchers proposed to redesign and reconstruct the home care service as a digital-first service which is supported by physical caregiving and technology. With the help of technologies such as continuous monitoring tools, lack of resources like trained caregivers and nurses, could also be mitigated.

As it was mentioned before in chapter 5.2, at the moment, a caregiver goes to the elderly's home and checks his/her situation, but due to the short visit and changing caregiver in different shifts, changes in elderly's functionality cannot be noticed. With the help of monitoring technology, these changes can be seen, and the elderly might not need to be transited, for instance from their home and home care to a nursing home and after that to a hospital. Also, the current system does not support monitoring 24/7, and therefore informing about a problem or an emergency depends largely on the elderly's own capacity to call for assistance.

Therefore, a communicative technology such as monitoring tools (Figure 35 and Figure 36) can aid to monitor the elderly's functionality and well-being (physical and cognitive capabilities). With this tool, changes in their condition and abilities can be identified much sooner than during an examination done once in a while by a nurse. Moreover, the smart home system can collect, combine, process, interpret, communicate, and present data so that people are involved and empowered in their own healthcare with lessened trouble for care providers (National Science & Technology Council, 2019, 30.). Even though monitoring technology might be appealing for improving safety, the implementation should be user-friendly, communications kept easy, and the system must be as invisible as possible. (National Science & Technology Council, 2019, 24.).

In the future customer journey and service blueprint the smart home system is implemented and it is working with and alongside a wearable device, which is monitoring the elderly's condition, and the home care service. This ensures early intervention in case of health or cognitive problems and may delay the elderlies transfer to more intensive and costly care. Monitoring also frees families and loved ones from worrying about the elderlies. Also, other assistive technology, for example cleaning and cooking robots, are implemented in the future customer journey and service blueprint.

The tasks that home care nurses perform are similar to the current situation, described in a customer journey map in chapter 5.6 and service blueprint in chapter 5.7. But due to the technology assisted monitoring, the nurses have less tasks checking in with the elderlies and some of the tasks could also be done only on demand. This would free nurse resources to urgencies and emergencies and ease the workload, caused by the lack of trained staff, and also reduce the care service costs.

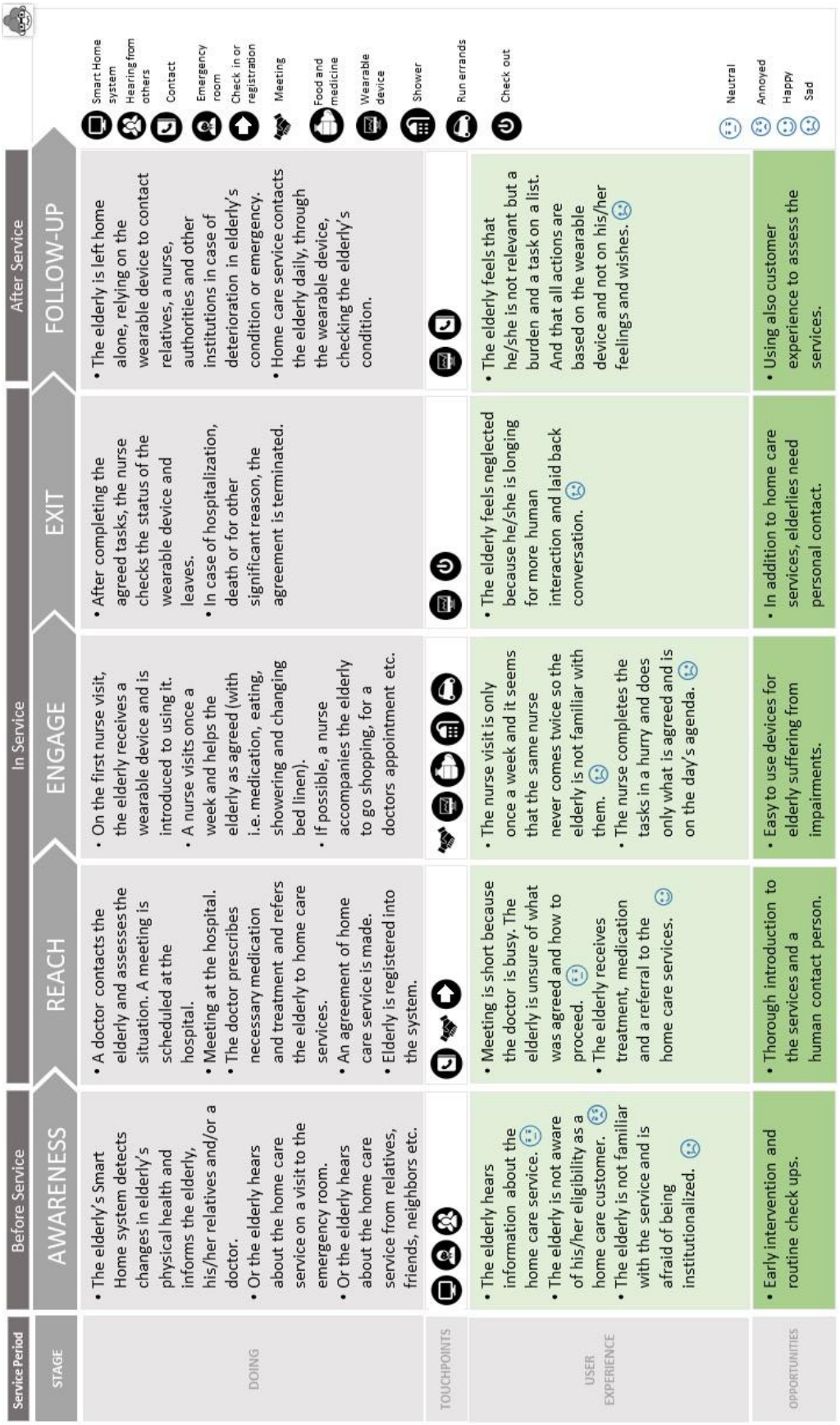

Figure 35. Future customer journey map.

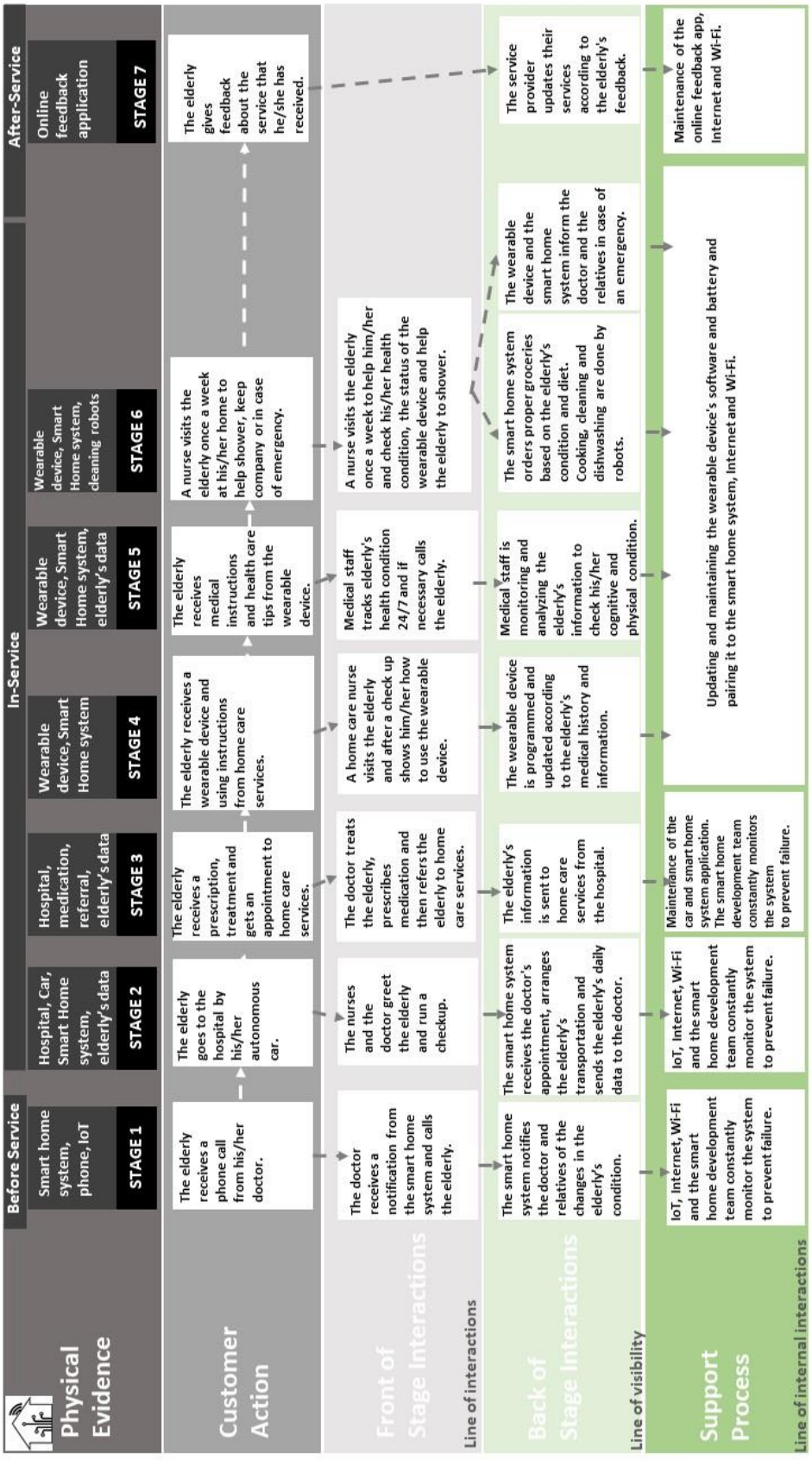

Figure 36. Future service blueprint.

Although technology can monitor the elderlies 24/7, assist nurses and free them to even more important tasks, on the other hand it leaves the elderlies, who are in good condition, to their own means for longer periods of time. This may affect the elderlies' own feeling of safety and lead to fears, loneliness, isolation and depression. This is an issue which is yet to be solved, because technology cannot yet replace a real human and human interaction. Also constantly changing nurses may affect the elderlies negatively and a connection and trust between the cared and the caregiver cannot develop.

As with constantly changing nurses, also with technology assisted care, elderlies may face problems and develop resistance against it. Especially elderlies with memory disorders and problems with perceiving and learning things may find it difficult to trust and understand a machine. As described in the future customer journey map, in Figure 35, the elderly may also feel that his/her feelings and sensations do not matter and that all decision about his/her care is done according to the monitoring technology. This may result in elderlies not trusting the care and the decisions made regarding it.

7 CONCLUSIONS AND RECOMMENDATIONS

In this research background information and current situation of home care was examined. Section 7.1 and 7.2 of this chapter, answer the first research question which asks about the issues in the current caregiving process. The answers to the second and third research questions regarding the possible improvements and the role of technology to fulfil them, will be given in section 7.3.

7.1 Findings based on the background research

The demographic aging, which has been discussed throughout this research, will be a great challenge during the coming decades around Europe. In Finland, the number of pensioners will grow dramatically as the working-age population is decreasing. This causes shortage in competent and adequate staff and lack of care units. The situation will be even worse in rural areas, as migration to larger cities and their suburbs reduces the working-age population.

Incompetent and inadequate staffing leads to problems such as decreased work and customer safety in general. Malpractices have already been reported and people have expressed their concern about the state of elderly care and the safety of their loved ones. To be able to take a good care of our aging population, without increasing the health care costs to unsustainable level, procreation and immigration are vital. It is necessary to ensure high quality elderly care services and to maintain the infrastructure. With this task, technology and its' development will also be as equally and increasingly important.

There is a demand for more hospitals and elderly care homes and the anticipatory social and health care reform was intended to take care of this. Ironically, smaller health care units have been merged to larger districts, concurrently paring down services. So, to be able to provide the services mentioned above, this means more health care costs and increasing the already ponderous government debt. Private service providers will suffer from tightening regulations, funding and subsidies, along with the public complaints from customers and their relatives, about the defective services.

Although the problems with insufficient staffing et cetera are actual, also the absence of technology in elderly care is a lost opportunity. Information and communication technology (ICT) is and will be an important part of the healthcare system, which can improve and enhance communication and collaboration among members of the healthcare teams, families, and service providers in order to address all the elderlies' requirements.

7.2 Results gained with service design methods

The survey, conducted during this research, showed that 98,5% of the elderly, who answered the questionnaire, are familiar with current technology, such as a smartphone and a computer or a tablet, and they use this technology in their daily lives. Technology is no longer considered as scary and difficult, but actually as an asset and an enabler with everyday tasks. Younger generations are naturally technology oriented and likely to use it increasingly in the future, as technology will also be incorporated in new and innovative ways.

Despite the fact that the elderlies are familiar with technology, they do have issues which technology, at this point, cannot solve. According to the survey some of the elderlies were concerned about their ability to move around freely. This reduces the sense of independence and intensifies the feeling of being dependent on others, for example of relatives and caregivers. Also, financial issues, such as high accommodation costs, loss of a spouse and loneliness raised concerns. Many of the respondents wished for more affordable and attainable care services of better quality and were apprehensive about the costs and the care they will receive when they are no longer able to take care of themselves.

The workshop with health care students provided information about the current situation of the caregivers. The issues that mostly raised concerns were time management, workload and tight schedules, difficult customers and relatives' unreasonable expectations. These results from the workshop were analyzed by using the tree mapping method and according to this analysis, most problems are originated from the employer actions. Although, the lack of skilled staff, which leads to rush and wearing workload, often is a result of insufficient funding and

not necessarily dependent on the employer or management, but the financier, for example the government or a private investor. Similar results were obtained also with nurse interviews.

These problems in home care services are a nationwide issue and require immediate attention. The need for improvements and a change in attitudes are essential. Thus, it should be taken under consideration, how the society wants to take care of its most vulnerable members and what is considered important and appropriate.

The results of conducted desk research by the team shows that although there are many related technologies available in the market today, but they are not truly integrated and designed to support the needs of the elderlies or they are unknown or not mass produced in the market. This fragmentation of digital platforms and services can cause user difficulty and frustration.

7.3 Recommendations and improvement points

It is recommended to create services for older people in a co-design process. In general, before implementing any solutions, it is necessary to understand the stakeholders needs and requirements. This helps to create services based on the real needs of the users and not based on assumptions. Applying service design tools and methods helps achieving an in-depth understanding of user's actions and their requirements about technology. Therefore, this can facilitate the creation of new solutions. By utilizing a co-design process in service creation for elderly, the real aspect and idea can be delivered to the technology development process by and from people who have experienced the reality of being old and also, have faced daily life challenges. Moreover, receiving feedback this way is much easier. Benefits of co-design in service design projects can be seen in Appendix 12.

In order to help elderlies to use new technologies with ease, special training and support are necessary, because commonly elderlies might resist adopting new technologies, due to the lack of true understanding of it. Moreover, technologies such as monitoring technology could be more appealing by following a user-

friendly implementation with simple interactions. Otherwise, a poor implementation might cause a lack of self-confidence in the elderly users and thus, an impulse to discontinue using the technology. It is also important to consider the medical staff and caregivers as users while studying user adoption.

Addressing the ethical concerns in technologies, such as communicative devices, is very crucial. Thus, it is necessary to educate older people how to use different advanced technologies, so they know how to manage their personal data and privacy.

Applying universal design principles helps to create products and environments that meet the elderlies' requirements by a variety of features. It helps to consider possible disabilities such as losses in vision, hearing, or memory before designing new technology for the elderlies. Also, considering more common concerns such as supporting elderlies' native languages (languages other than English), are significantly important.

Technology, in the form of mobile or internet-based sensing/monitoring devices, is necessary to monitor elderly's functionality and well-being 24/7. With these devices, changes in their abilities can be detected much earlier than when the observation is done occasionally by a human observer. By gathering sensor data from the elderlies' environment, their daily routines and forms of life can be detected and analyzed. The insights extracted from the gathered data, can be provided to different user groups, such as the elderlies who are the data subjects, their children, caregivers, relatives, and medical practitioners.

These types of supporting circles around the elderlies will help to defer their transition into more intensive care facilities, and care costs will be reduced noticeably. Additionally, the elderlies will live in their preferred environments with a higher quality of life. The other important benefits of the gathered data from sensing devices are to bring more transparency to the current traditional caring system and compensating the lack of medical staff.

Implementing and utilizing technologies, such as the Internet of Medical Things (IoMT) and assistive technology, can promote the elderlies independent living, their mental and physical health and the quality of life. Moreover, these technologies can help to reduce caregivers' workload, which can lead to services with a higher quality. Technology-based services should be able to be integrated

with other services and the data should be portable between services to make it possible to create a holistic view of the elders' well-being, health and functionality.

Finally, technology should not override the importance of human interactions and they should not be neglected while designing services in elderly care, in order to prevent elderlies' social isolation, which might lead to mental and physical health problems. It should be taken under consideration, that when relying on technology and reducing nurse visits, relatives, municipalities and service providers should organize social activities for the elderlies to ensure that they are not left alone and that they can fulfill the need to be social. Caregivers and medical staff should detect any signs of social isolation problems with elderlies, so that proper interventions can be provided.

In order to tackle the challenges mentioned above, sustainable solutions should be found for healthier lifestyles to avoid costly and long-term illnesses. By keeping elderlies active both physically and mentally, social isolation can be prevented, and they will be able to live independently as long as possible.

8 ANALYSIS OF THE PROCESS

In the beginning of this research process, the project was a commission for an unnamed startup company. The initial aim was to research problems faced by elderly living alone and how technology, designed by the commissioner, could assist and diminish or even delete those problems. The process was intended to follow the double diamond model, described by the British Design Council, with four phases: discover, define, develop and deliver. Half way through the project it was evident, that by following the commissioners schedule, this research would not be finished in time. Therefore, the commissioner was left out and the process was continued as a theoretical research.

Moreover, despite all the efforts done, the researchers could not get any chance to officially visit elderly care homes or home care offices and their customers' homes, so they decided to change the approach of the thesis to a more theoretical and research-based one.

8.1 Limitations and validity

In this study, there are two major limitations that also affect the validity and could be addressed in future research. The study focuses on problems which elderly and home care nurses encounter in everyday life. To gather insight of these problems, home care nurses were interviewed and a survey to elderly was conducted in paper form and also as an online survey. The paper version of the survey was launched in a communal college, where elderly attend various activities and a link to the online version was launched in social media.

The first limitation is of the researchers and is limited access to data. The nurses were eager to participate in interviews, but it seemed as if they were instructed by their employer not to address certain issues for example lack of staff and defective care. Also, when a permission to visit home care offices or shadow home care nurses at work was asked, all the requests were denied. The researcher's backgrounds act as a limitation as well. Any experience and knowledge of health care and elderly care, which the researchers do not have,

would have helped with the research and might have affected positively on accessing data.

The second limitation is methodological and an issue of survey sample. The survey was launched in a place where elderly need to get on their own and also the social media launch required ability and willingness to use technology. So, the people who responded were not truly a random sample, but a sample of fit and modern pensioners. Also, the sample size is questionable. According to a sample size calculator by the Survey System, the sample size needed would have been six hundred (600) persons (confidence level of 95%, confidence interval of four and a million and a quarter (1.250.000) population aged sixty-five (65) or older) (Creative Research Systems). So, the one hundred and forty (140) respondents hardly provide a valid result.

This comes down to limited access to data as well. The elderly in need of regular care may physically or mentally be constrained and unable to answer a survey or participate in an interview. However, those elders were the ones whose input this research could have utilized.

8.2 Process and results

In the discovery phase the research focused on background information such as Finland's' demographics and Finnish health care system. In the define phase, the objective was to gather insights, from elderly and their caregivers, by applying service design methods to understand the current home care process and the points in which technology could be utilized. The scope was in Finnish elderly living alone at home or at care service homes and included medical staff and relatives, all mentioned above acting as stakeholders.

Although it is indisputable that elderly care is going through hardship and changes are necessary, this research would have needed wider insight to make a strong conclusion. As it was discussed in limitations, the research result itself does not give a solid foundation for claims about the state of the elderly, but it gives reference of what is to be expected and where the answers may lie.

As the research did not continue as a commission, develop and deliver phases, of the double diamond model, concerning the commissioners' technology were left out and the focus was on pointing out development issues and making suggestions.

8.3 Shaping future together

When considering the best option to fulfill elderly care, many aspects are to be taken into consideration. Is the elderly in good enough condition to live at home? What is their own will? How could the care be executed in the most efficient, cost-effective and human-centered way as possible? Many challenges, faced by the elderly, could be made easier with the support of technology or equipment. So far, the interest to develop such devices or systems has been scarce and applications to track healthy individuals' sleeping and heart rate is considered more important, just because they are able to use it and can afford it.

As stated in the introduction, the challenges of aging societies such as Finland, where technology innovation can improve the lives of the elderly and mitigate risks and difficulties, will open new areas of opportunity. However, in the light of the recent news the researchers hope that this possibility is not misused by pricing the services too high, only to serve the investors. The quality of the care of our elderly should be in common interest and the government should ensure that its' citizens are taken care of with dignity from cradle to grave.

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http://united-fellowship-chapel.com/indoor-garden-design/

https://care24.co.in/elder-care

http://www.eastbaysmartsenior.com/two-weeks-in-the-life-of-joann-sullivan-why-i-love-my-work-so-much/

APPENDICES

APPENDIX 1. Online elderly questionnaire

1. I am a
   - ❖ a woman
   - ❖ a man
   - ❖ I would not like to answer this

2. I am
   - ❖ 60-65
   - ❖ 65-70
   - ❖ 70-75
   - ❖ 75-80
   - ❖ 85-90
   - ❖ 90-95
   - ❖ Other

3. I am living alone
   - ❖ Yes
   - ❖ No

4. If you are living alone please mention some challenges you are facing in your daily life
   - ❖ Declining health
   - ❖ Transport problems
   - ❖ Shortage of money
   - ❖ Losing spouse
   - ❖ Loneliness
   - ❖ Being dependent on others
   - ❖ lack of things to do
   - ❖ Other

5. Can your family or friends reach your home quickly, any time of day or night, if you have an urgent need that occurs between caregiver visits?
   - ❖ Yes
   - ❖ No

6. Whom I would contact in an emergency?

- ❖ Relatives
- ❖ Friends
- ❖ Neighbors
- ❖ Hospital
- ❖ Others

7. I am able to take care of myself
   - ❖ Yes
   - ❖ No

8. I am still able to get around
   - ❖ Yes
   - ❖ No

9. I am concerned about taking my medication.
   - ❖ Yes
   - ❖ No

10. I am familiar with using technology.
    - ❖ Yes
    - ❖ No

11. Please name what kind of technology are you using? for example a cellphone, laptop and etc.

12. I am using home-care services
    - ❖ Yes
    - ❖ No

13. If you are using home-care services, are you satisfied?
    - ❖ Yes
    - ❖ No

14. If you are using home-care services, what would you wish to change?

15. If you are using home-care services, what are you satisfied with?

16. If you have any wishes or ideas for improving your wellbeing condition while living alone please write them down here.

APPENDIX 2. Improvement ideas generated by the survey

- I would need a smaller, cheaper apartment for myself
- The age limit for VAT-free cleaning service should be lowered or it should be possible for caregivers regardless of age and income level. As a caregiver I hope to have a network connection that I could get in touch with the person at home even if he / she wouldn't be able to function. (SeniorSome project ended for some reason.)
- I do not have any specific hopes because I am a healthy, viable and well in every way.
- The use of a caretaker of houses to work. The idea is good.
- Our house has a few steps before the elevator level. I have wondered how I can manage in this apartment if my condition gets worse.
- I have lived in my apartment for 23 years, so all surfaces require updating.
- Climate change highlighted a new need last summer: effective cooling systems should be available for apartments. The installation and maintenance of fire alarms should also be one of housing companies' responsibilities.
- I'd love to move to an apartment building.
- It would be a good idea to get help (as you age) for gardening, snow plowing and just for everyday routines. At the moment, mostly for help and advice on using a computer.
- For example, cleaning services at a special price and a one-day companion for my husband, for whose treatment I am responsible of.
- At this point, happy with everything.
- There is need for renovation.
- More communality in an apartment building. Information about neighbors who could help if needed. You need to take good care of your own network of friends and know who could come to see you, bring medication or such if needed. I don't live alone, but if I did or if my husband was in such a condition that he could not help.
- I would need a good housekeepers' services a couple of hours a week, cleaning up, washing windows, helping with flowers, etc.
- Support for housing costs.
- Small renovations and house maintenance.
- There is none.
- No.
- Cleaning (service voucher).
- Over time, all aid tools will become topical if one can stay longer at their own home.

APPENDIX 3. Nurse interview questions

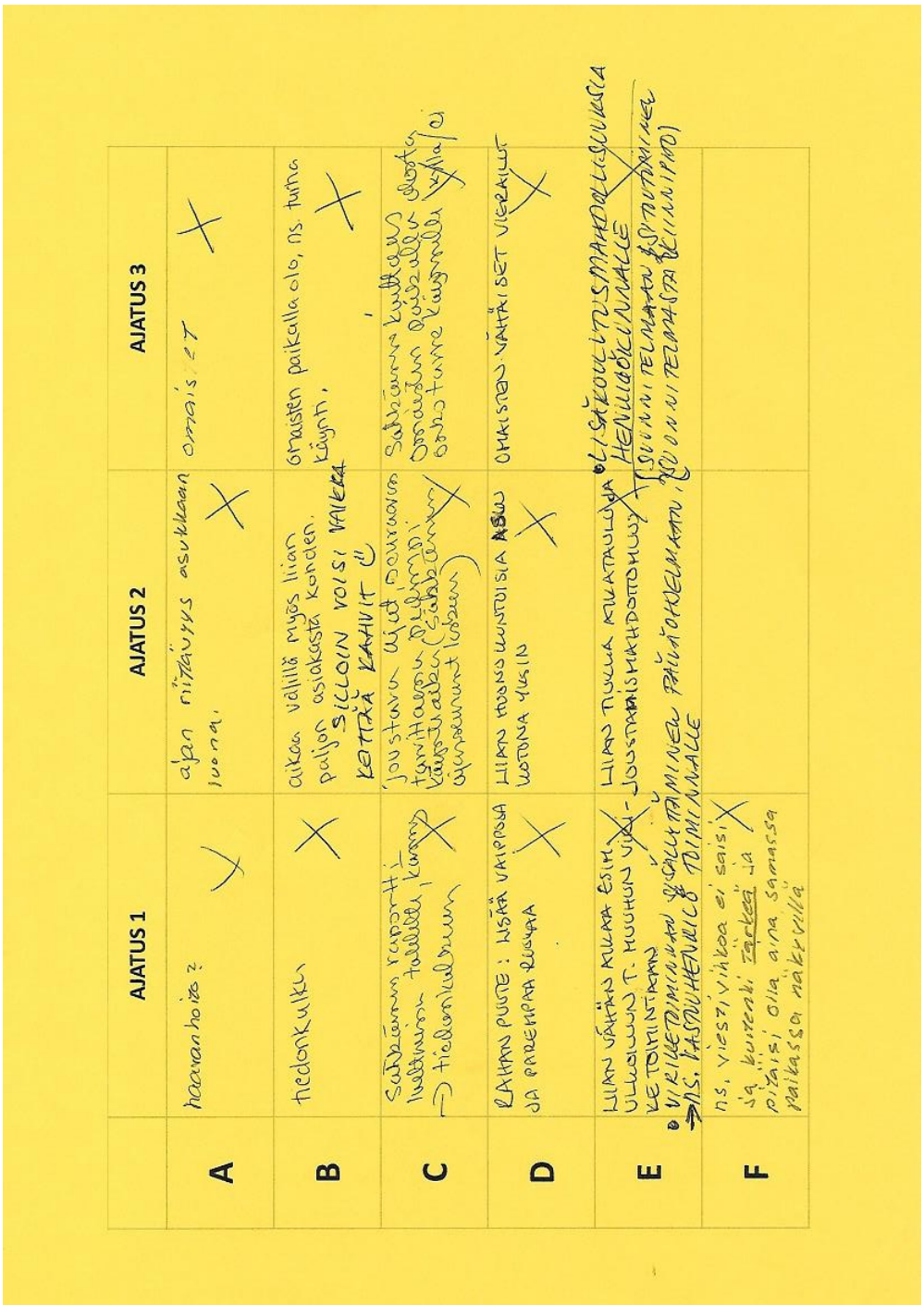
1. Basic information (name, age, occupation) and employer
2. When you refer to the people you take care of do you call them patients or customers?
3. What are the main differences between public and private home care service providers in your opinion? Have you worked in both?
4. How long is your normal shift?
5. How many and what type of customers do you meet during one shift?
6. What are the routines you do every day?
7. What are the incidents that deviate from your daily routines?
8. How often do you face emergency situations?
9. What kind of difficulties and challenges you are facing in your work?
10. How does technology help you with your work (currently and what do you think about in the future)?
11. Do customers use some kind of technology?
12. If yes, how do they respond to it?
13. Is there something that machines cannot do?
14. Is there something that machines could do, but is not yet utilized?
15. Is there something you wish that machines could do?

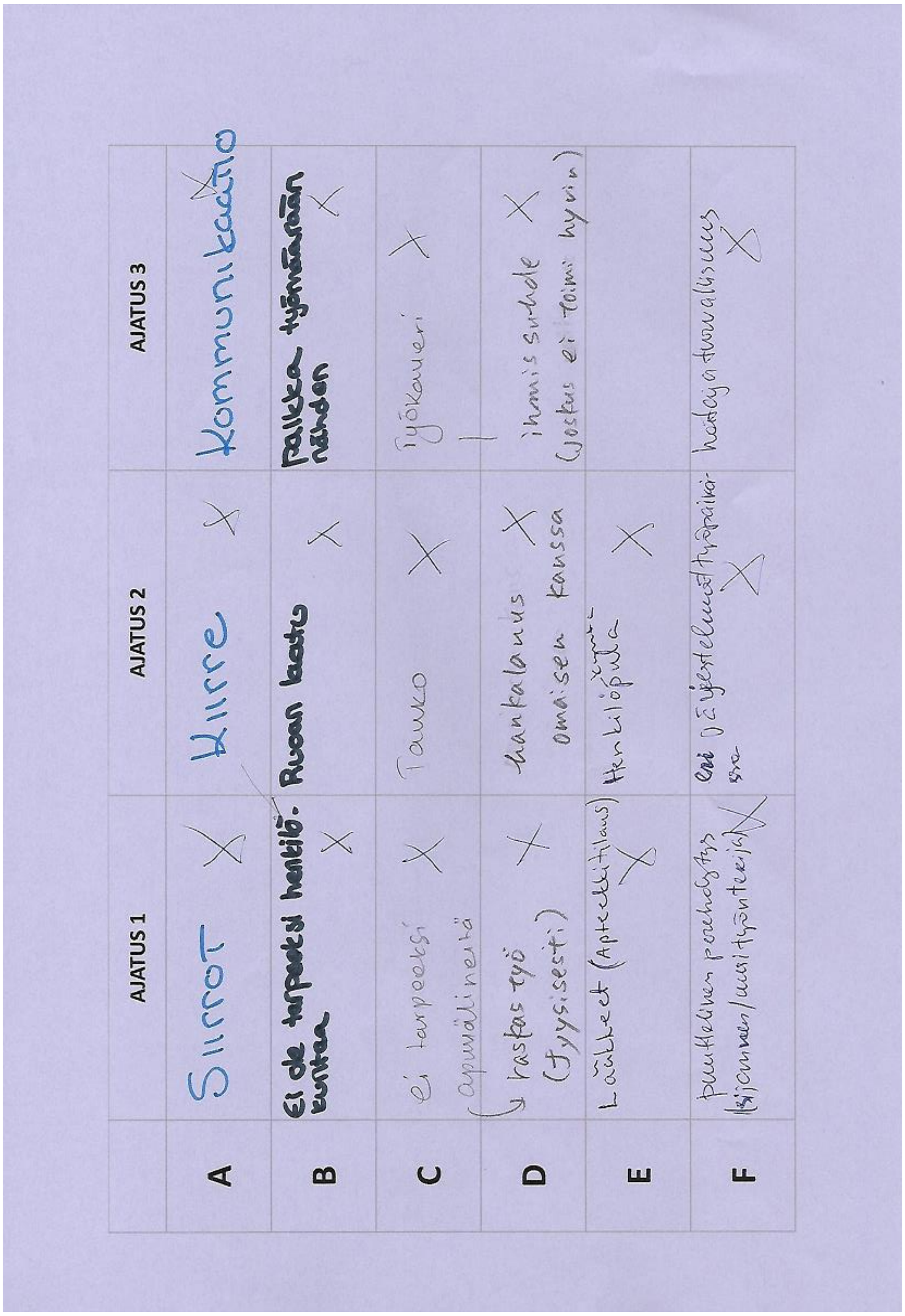
APPENDIX 4. Mood board elderly residential home

APPENDIX 5. 6-3-5 workshop template

	AJATUS 1	AJATUS 2	AJATUS 3
A			
B			
C			
D			
E			
F			

APPENDIX 6. 6-3-5 workshop sample answers





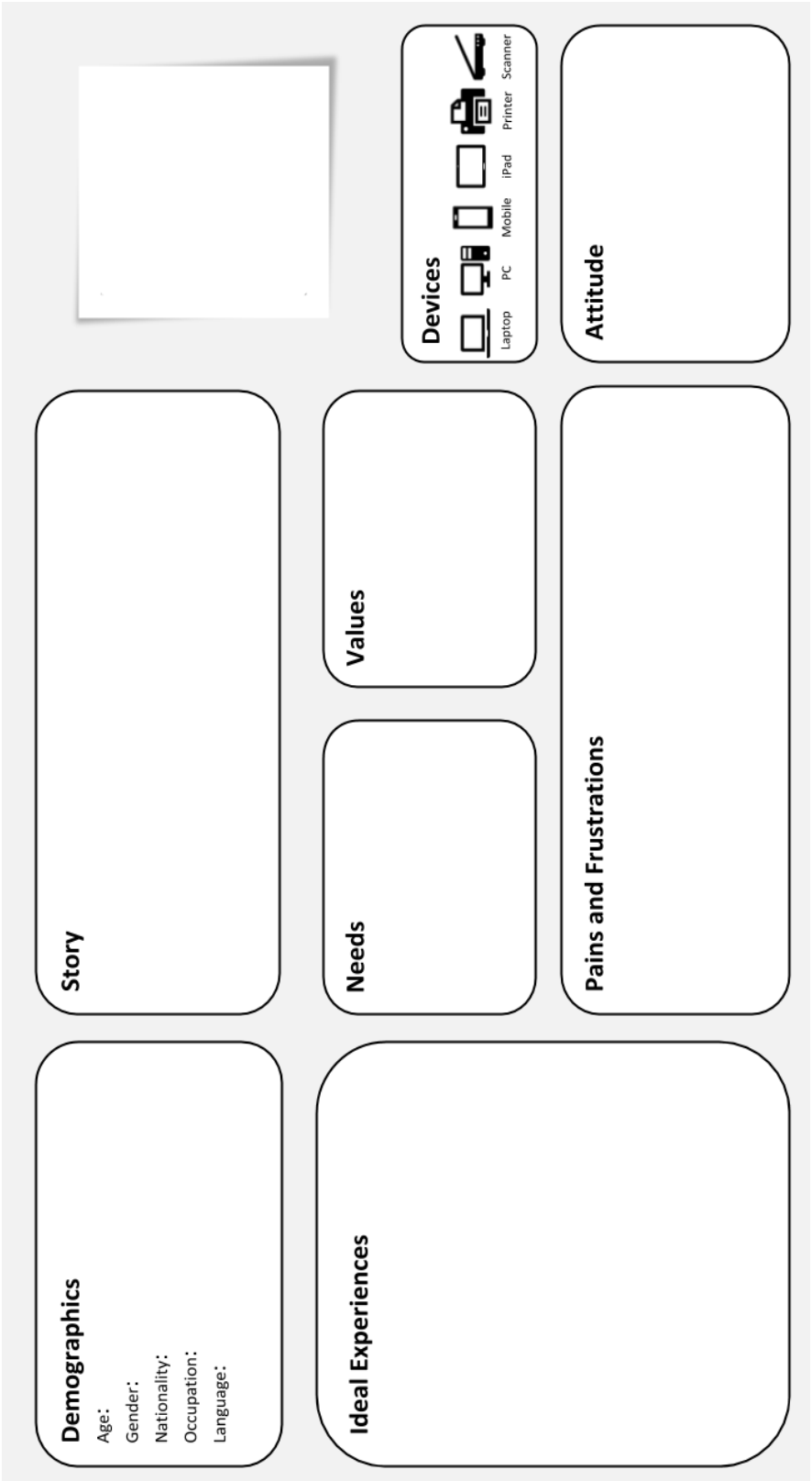
	AJATUS 1	AJATUS 2	AJATUS 3
A	Siirrot X	Kiirre X	Kommunikaatio X
B	Ei ole tarpeeksi henkilökuntaa X	Ruoan laatu X	palkka työmäärään nähden X
C	ei tarpeeksi apuvälineitä X	Tauko X	Työkaveri X
D	raskas työ (fyysisesti) X	hankaluus omaisen kanssa X	ihmis suhde (joskus ei toimi hyvin) X
E	Lääkkeet (Apteekkitilaus) X	Henkilöpula X	
F	puutteellinen perehdytys (sijainen/uusi työntekijä) X	ei järjestelmää työpaikassa X	hoitajan turvallisuus X

APPENDIX 7. 6-3-5 Problems in homecare workshop answers

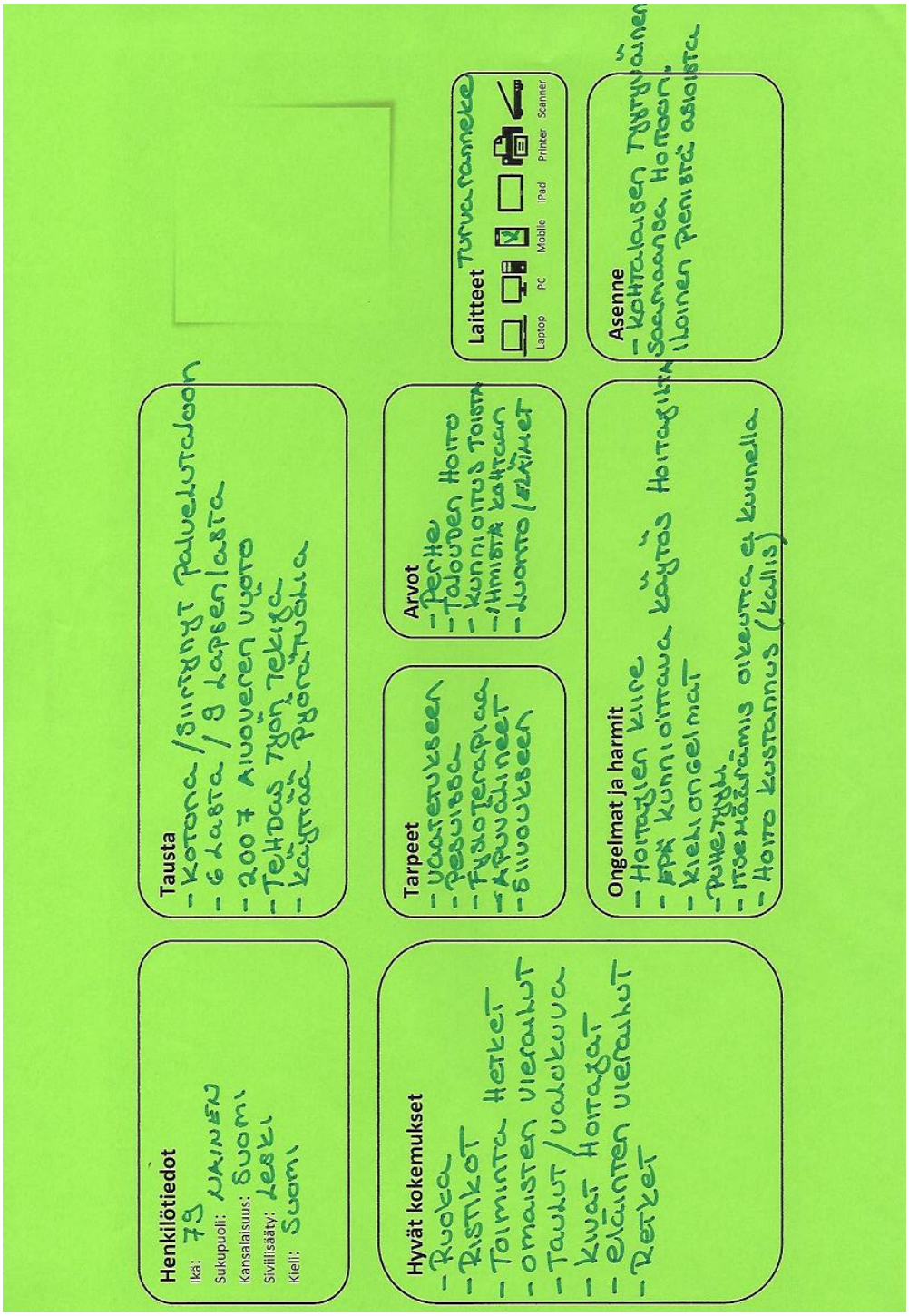
PROBLEM	NUMBER OF ANSWERS	TOTAL		employee
cooperation, team work	IIIIIIIII	9	CO-OP	employer
informing and communication	IIIIIIIIIIIIIIIIIIIIIIII	24	COMM	customer
not enough staff	IIIIIIIIIIIIIIIII	19	RUSH	conditions
not enough services for customers or not granted	II	2	LACK	
cooperation with relatives (fulfilling their requests)	IIIIIIIIIIIIIIII	17	COMM	
ergonomics	IIIIIIIIIIII	13	ERG	
safety (nurses)	IIIIIIIIIIIII	14	VIO	
rush	IIIIIIIIIIIIIIIIIIIIIII	23	RUSH	
bad atmosphere	IIIIIIIIIII	12	CP-OP	
customers wellbeing	I	1	LACK	
no time to help customers i.e. walk around to rehabilitate	IIIIIIIIII	11	RUSH	
nurses wellbeing	IIII	4	RES	
no time to take customers out	IIIII	5	RUSH	
reporting at customers home is away from customer time	I	1	OPER	
aggressive customers	IIIIII	6	VIO	
executing living will	II	2	CO-OP	
no resources for training	IIIIII	6	RES	
development of the system	I	1	RES	
transfers and turnover of staff	IIII	4	RES	
not enough utilities	IIIIIIIIIIII	14	RES	
different customs to report	IIII	4	SKIL	
not enough information about the customer	IIIIIIIIIII	12	OPER	
bad quality food for customers	IIIIII	6	SOCI	
no breaks	IIIII	5	RUSH	
low salary	IIIII	5	RES	
bad management	IIIIIIII	8	OPER	
some nurses have inadequate Finnish skills	I	1	SKIL	
customers are lonely (chatting and closeness)	IIIIIIIIIII	11	LACK	
customers have nothing to do	IIIIIIIIIII	12	LACK	

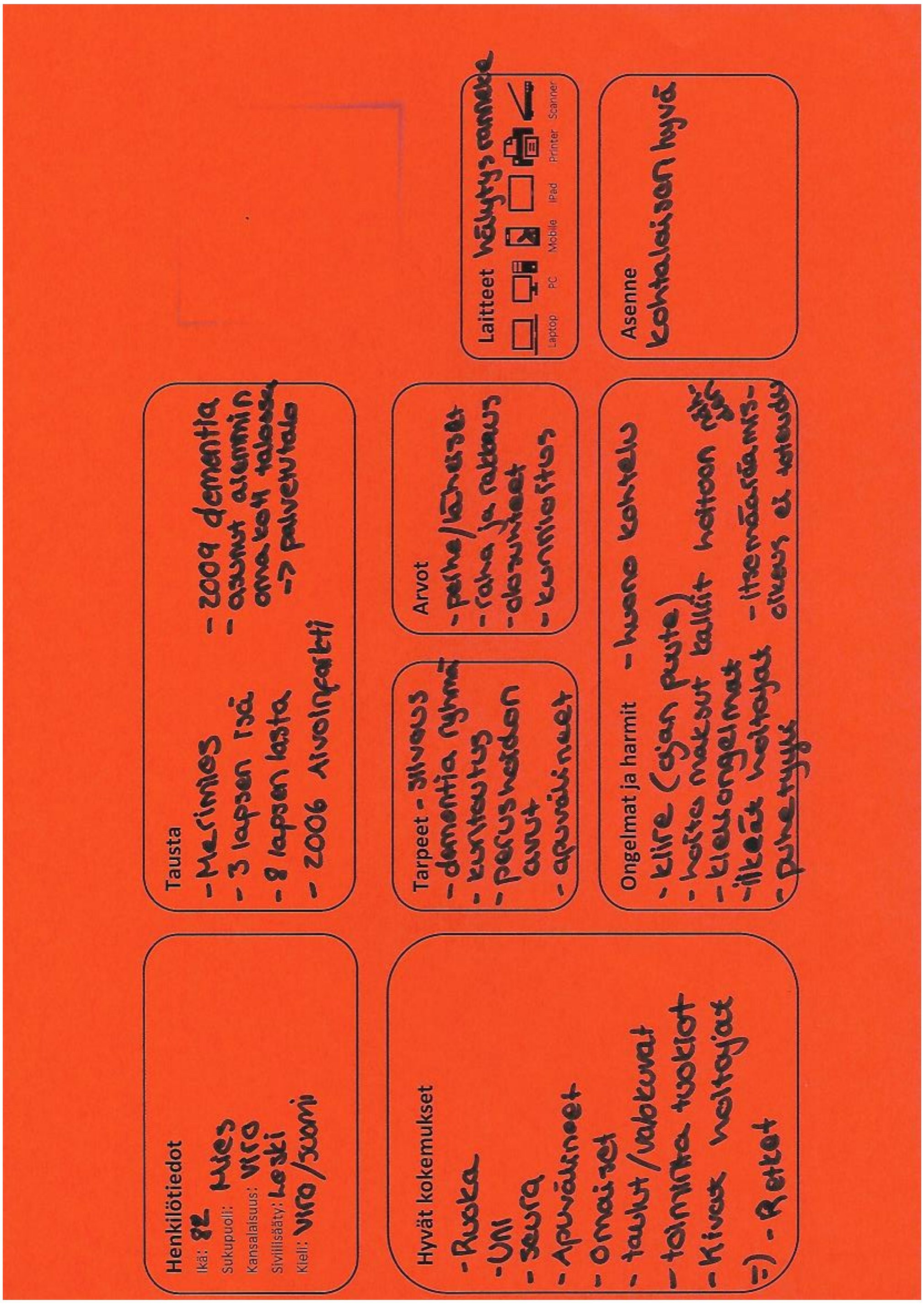
too much responsibilty, challenging work	II	2	CHAL
no motivation to work	II	2	SKIL
customer rights (self-determination)	III	3	SOCI
different ways of working	IIIII	5	CP-OP
different operational systems in different places	II	2	RES
temps don't get enough training and information	IIIIII	6	OPER
orders from farmacies	I	1	CHAL
no working in pairs even if it would benefit	IIII	4	RES
home care is expensive	II	2	SOCIO
close calls	I	1	EMER
customers safety	IIIII	5	SOCI
SOTE	II	2	SOCI
emergencies and unexpected events	IIII	4	EMER
neglecting customers (respect and equal treatment)	IIIIII	6	SKIL
doctor issues don't work	I	1	LACK
customer transportation (to shops, doctor etc.)	IIIIII	6	LACK
customers are showered only once a week (better hygiene)	IIII	4	RUSH
customisation of customers apartment	I	1	LACK
giving medication (changes and alcohol)	IIIIIIIIII	11	CO-OP
customer refuses to cooperate	III	3	CO-OP
customers cannot use modern technology	II	2	CO-OP
some nurses don't have initiative	IIIII	5	SKIL
customers sexual interest towards nurses	I	1	CO-OP
palliative care customers with physical pain	II	2	CHAL
supporting customers activeness	IIIII	5	RUSH
inadequate skills to use appliances (nurses)	I	1	SKIL
meal times (feeding, cleaning, takes time)	III	1	RUSH
thoroughness when working (nurses)	II	2	SKIL
No information is visit is needed (relatives present)	III	3	COMM
Treating wounds	I	1	CHAL
flexibility to divide time among customers	I	1	OPER
customers running away	II	2	CO-OP

APPENDIX 8. Persona template



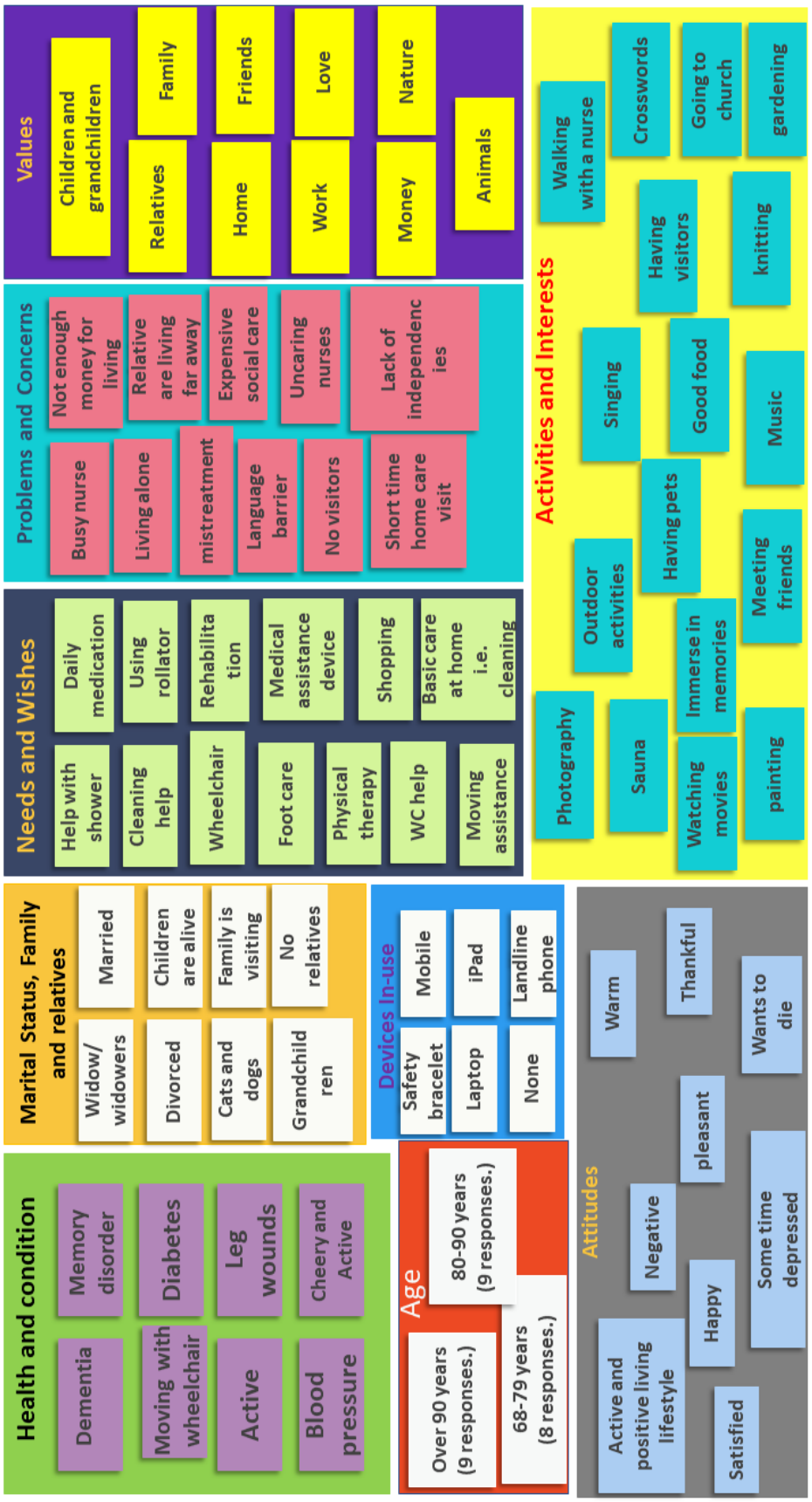
APPENDIX 9. Persona workshop sample answers




Henkilötiedot
Ikä: 82
Sukupuoli: Mies
Kansalaisuus: Viro
Siviilisääty: Leski
Kieli: Viro/Suomi
Tausta
- Merimies
- 3 lapsen isä
- 8 lapsen lasta
- 2006 Aivoinfarkti
- 2009 dementia
- asunut aiemmin omakoti talossa -> palvelutalo
Hyvät kokemukset
- Ruoka
- Uni
- Seura
- Apuvälineet
- Omaiset
- taulut/valokuvat
- toiminta tuokiot
- Kivat hoitajat
=) - Retket
Tarpeet - siivous
- dementia ryhmä
- kuntoutus
- perushoidon avut
- apuvälineet
Arvot
- perhe/läheiset
- raha ja rakkaus
- alkuperäisyys
- kunnioitus
Laitteet hälytysranneke
Laptop
PC
Mobile
IPad
Printer
Scanner
Ongelmat ja harmit
- huono kohtelu
- kiire (ajan puute)
- hoito maksut kalliit hoitoon nähden
- kieliongelmat
- ilkeät hoitajat
- itsemääräämisoikeus ei toteudu
- puhetyyli
Asenne
kohtalaisen hyvä

APPENDIX 10. Evidence persona workshop

APPENDIX 11. Affinity diagram



APPENDIX 12. Benefits of co-design in service design projects (Steen et al., 2011, 58.)