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# **CONCEPTUALIZATION OF THE DIGITAL SILVER HUB**

Master's thesis

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TALLINNA TEHNIKAÜLIKOOL  
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# **KONTSEPTUAALNE VAADE DIGITAL SILVER HUBI LOOMISEL**

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Tallinn 2020

## **Author's declaration of originality**

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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## **Abstract**

Silver economy addresses the requirements of the elderly nation with creative and technical approaches. The main objective of thesis is to create a concept of -Digital Silver Hub- which is an innovation ecosystem platform that would bring academics, software developers, funders and consumer organizations into a network and allow all innovation players to track and promote the adoption of new products / services that encourage elderly people to continue living a safe , healthy, and independent life. This present case is part of a larger set of research activities that will be conducted throughout the entire Baltic Sea Region (BSR) in the coming years. For the purpose of this thesis, main focus will be on creating a consolidated concept of the DSH. A hybrid approach is employed using the questionnaires and workshops to collect data. The main outcome creates an understanding of the main features, roles, responsibilities and business processes supported by DSH and how DSH can benefit elderly people to live a more independent and active life.

**Keywords:** Silver Economy, Silver Generation, Digital Silver Hub, ICT, Smart Specialization

This thesis is written in English and is 59 pages long, including 6 chapters, 16 figures and 10 tables.

## List of abbreviations and terms

Conceptualization	The action or process of forming a concept or idea of something
DSH	Digital Silver Hub
WP	Work Package
BSR	Baltic Sea Region
ICT	Information and Communication Technologies
IT	Information Technology
EU	European Union
MOOC	Massive Open Online Courses
PC	Personal Computers
SPES	Support Patients through E-Services Solutions
EDP	Entrepreneurial Discovery Process
WGI	The World Governance Indicators
UN	United Nations
OECD	Organisation for European Economic Co-operation
UNDP	United Nations Development Programme
WGI	Worldwide Governance Indicators
CI	collective intelligence
GDPR	General Data Protection Regulation
RIS3	Research and Innovation Strategy for Smart Specialisation
SRS	System Requirements Specification
SSD	System Design Document
NGO	non-governmental organizations
PPP	Public Private Partnership
NCD	non-communicable disease

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# 1 Introduction

The ageing of the population is associated with an increase in the length of human life, which promotes the development of products and services for the elderly consumers and ageing population. The definition of "silver economy" has contributed to growing interest in this context. The silver economy is generally commonly defined as "all types of goods and services for older adults and an ageing population, including extending the working life, volunteerism, and active citizenship of older people"(Klimczuk, 2016) or, in a relatively narrow context, a combination of appropriate situations for the availability of goods and services and the growing purchasing power of older customers. Age-friendly goods and services related to the usage of geotechnology and social technologies may be viewed as core elements of the silver economy. "Age-friendly approaches are complementary to the UN concept of "society for all ages" and the implementation of the Madrid International Plan of Action on Ageing (MIPAA)."(Klimczuk, 2016)

According to the World Health Organization, active ageing defined as "the process of optimizing opportunities for health, participation and security in order to enhance the quality of life as people age."(González et al., 2012) In specific, this approach draws "focus to the view of life course on ageing, the complexity of older adults and a systemic response to the determinants of ageing, including: cross-cutting influences of culture and gender; health and social system; behavioral factors; personal factors; physical environment; social environment; and economic factors."(Klimczuk, 2016) The need for policies to reduce health and social security costs associated with non-communicable diseases (NCDs) that are more common in elderly. (WHO 2002: 14, 42). Most NCDs may be prevented or postponed by encouraging fitness, chronic disease reduction, supporting healthier behaviors and wellbeing at work, decreasing the risk of disability, and encouraging independent living and "ageing in place." Each of these areas include the usage of appropriate goods and facilities for elderly persons and aged communities (Klimczuk, 2016).

Researches show that, "many elderly people, the "over 65," are also unable to take advantage of what the digital era provides, just 10 % of them are use the Internet. In fact, the use of the Internet would allow elderly people to have free or very inexpensive

communications, such as instant messaging and services such as online banking that could meet some of their real needs.” (Klimczuk, 2016) Many elderly citizens, struggling with eyesight, hearing or mobility issues, do not really feel like joining the wide environment of the information society. ICT can help older people enhance their quality of living, remain in good health and live longer comfortably. Indeed, creative ICT approaches are developing that will lead to finding a solution to issues with memory, eyesight, hearing and independence that are increasingly apparent as people get older. ICT also provides a way for seniors to remain involved in their jobs and in their societies (Klimczuk, 2016). The “increasing interest in learning and using ICT among elderly people can be placed within their gradual demand for social integration and adaptation to their vital situation. This desire for social engagement acts as a cause or situation that may decide successful aging as a construct linked to well-being, quality of life, and sensitivity to the feature of their age transition. The elderly’s demand for new learning can help “active aging as the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age” .In this regard, the benefits for the elderly in learning and using ICT have been amply described in the context of communication with family and friends, opportunities for ongoing learning, improvement of medical services and health issues, encouragement for autonomy and independence, and new options for leisure” (González et al., 2012)

ICT is a platform for addressing complicated issues such as government, community, innovation and energy. Nevertheless, ICT is a solution to the aging society issues. There is no convergence between both the information society and the super-aging population. In a daily life, the elderly who unable to access ICT, have been experiencing the difficulty. The "digital divide on ICT" would affect the detrimental side of elderly people's lives in the context of the information society and the aging population.(Iwasaki, 2013)

The current research is a part of a bigger project -Supporting the Smart Specialization Approach in the Silver Economy to Increase Regional Innovation Capacity and Sustainable Growth (OSIRIS)- which aims to Increase the capacity of innovation players to implement smart specialization strategies to regional development by investigating new innovation possibilities, encouraging the creation of innovative products and service technologies, enhancing and extending current 'hot spots' in innovation to satisfy unique requirements and addressing the problem in aging population in the BSR regions(Care & Systems, 2020).

Moreover, the Osiris project aims to respond to the challenges of meeting the needs of ageing populations that the governments of the Baltic Sea countries are currently facing. The project targets to enhance Silver Economy growth opportunities by improving the capacity of innovation actors to apply smart specialization approaches. For instance, it seeks to boost market uptake and scaling of use-drive technology innovations that accommodate age-specific needs and preferences and demonstrate a significant impact on the quality of life of the ageing population, including age-friendly living environments, health, safety, and leisure.

The OSIRIS aims to design an innovative cooperation model in the project region. In each participating country, OSIRIS partners will design and pilot an innovation ecosystem model, Digital Silver Hub (DSH). This platform connects researchers, product developers, financiers and user organizations into a network. It enables all innovation actors to screen and accelerate the uptake of innovative products and services which enable older adults to continue living a comfortable, independent and active life. The virtual collaborative platform DSH will integrate six regional Silver Hubs to support transnational cooperation, learning and knowledge diffusion in the Silver Economy market and further ensure exchange of new knowledge and business schemes across the borders. It will bring together partners representing businesses, governments (governmental entities) and academic actors (Care & Systems, 2020).

Smart specialisation is described by the European Commission as: “Conceived within the reformed Cohesion policy of the European Commission, Smart Specialisation is a place-based approach characterized by the identification of strategic areas for intervention based both on the analysis of the strengths and potential of the economy and on an EDP with wide stakeholder involvement. It is outward-looking and embraces a broad view of innovation including, but certainly not limited to technology-driven approaches, supported by effective monitoring mechanisms.” (Foray, 2018).

The European Commission has identified how Smart Specialization goals could be set by a country or region: “A Smart Specialisation should prioritize domains, areas and economic activities where regions or countries have a competitive advantage or have the potential to generate knowledge-driven growth and to bring about the economic transformation needed to tackle the major and most urgent challenges for the society and

the natural and built environment. The number and nature of these priorities will vary from region to region.”(Foray, 2018). Therefore, the focus for Estonia's Smart Specialization (RIS3) is ICT as a broad area, including e-government and data analysis, e-health and cybersecurity, to recognize a few main fields.

The research conducted by Valdmaa explains that, *“Estonia is well-known for ICT services; During the period of 2014–2020, Estonia has received the highest level of support from the EU as its GDP per capita was below 75% of the EU average.*

*The implementation of RIS3 in Estonia has followed a top-down logic with the national level being responsible for the development and implementation of the policies. The RIS3 growth areas were chosen based on a quantitative study of Estonian economy’s specialization and a qualitative collection of expert opinions meant to specify the potential of research and economy that were not necessarily based on a uniform understanding of the smart specialization logic. The Estonian RDI Strategy 2014–2020 defines the following RIS3 growth areas:*

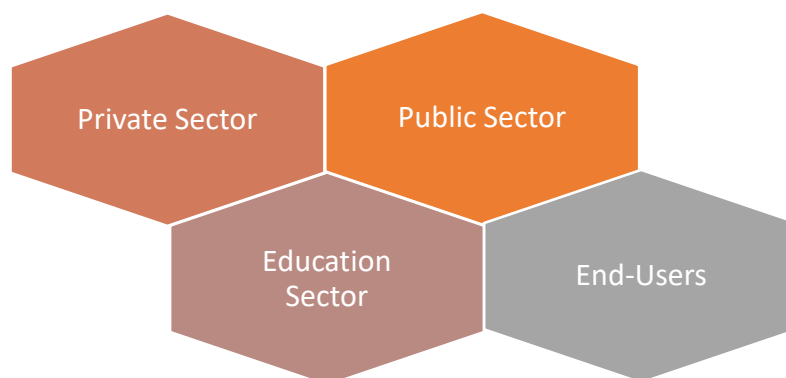
- *ICT horizontally through other sectors (industry 4.0, automation, robotics, cybersecurity, software development);*
- *Health technologies and services (biotechnologies, e-health, use of IT for developing medical services and products);*
- *Efficient use of resources (material technologies and industry, new technologies in construction and smart houses, chemistry, efficient and multifunctional use of oil shale)”(Valdmaa et al., 2020).*

The research by Pappel examines that *“The Estonian Information Society Strategy 2013 had already, at that time, determined electronic, service-based, and user centered objectives. The next Estonian Information Society Strategy 2020 addresses the same aspects by adding a more service-oriented and citizen-centric approach by placing the citizen at the center of the service provision process and concentrating more on the interoperability between different services. A secure and accessible service provision environment must exist for the public and private sectors, as well as citizens, along with the assurance of the knowledge and awareness of all three parties. According to the Survey of Electronic Records Management in the Public Sector Agencies of Estonia, considering the developments that had started back in 2003, this trend did not occur as expected in the local governments. An important hindering factor, in the implementation of systems and IT solutions, was linked to a lack of coordination and financing. There is*

*certain cooperation on setting new goals and principles, but the actual work on the development of a necessary IT platform and the relevant infrastructure in all local governments has been quite chaotic. Many central IT solutions have been created to solve specific cases but not to prevent further occurrences of the issue as such. The implementation of state-created IT solutions has been left for every local government to decide on.*”(Pappel et al., 2019)

By establishing the interregional collaborative platform, the DSH can serve the needs of aging populations and the silver economy around the BSR region, it is expected to accelerate innovation in the public service in a few ways. Firstly, one of its objectives is to bring together the various actors from the public and private sectors and the educational organization, each having a specific mission and purpose in creating innovation. This could also be called the innovative triple helix model. It is a framework that was first theorized by Henry Etzkowitz and Loet Leydesdorff in the 1990s, with the publication of “The Triple Helix, University-Industry-Government Relations: A laboratory for Knowledge-Based Economic Development”(Etzkowitz & Leydesdorff, 2000). Such tightly knit collection of interactions between the triple helix players takes place not only in one country or region, but across the BSR nation creating an international cooperation and co-creation network with countries with specific goals for Smart Specialization, strategic advantages and strengths(Butt et al., n.d.).

Secondly, knowledge sharing and knowledge management across the DSH platform between the triple helix actors should simplify the identification and management of knowledge sources and lower the rate for starting cooperation. But in the case of DSH, we will take input from the end user, therefore, it is targeted towards quadruple Helix actor shown in Figure 1.



**Figure 1:** Quadruple Helix Actors

Thirdly, the partner countries' international collaboration and mutual objectives will put these countries and their participants closer together and decrease the gaps in security, technology, innovation and development, as everyone face the same mutual demographic change challenge(Butt et al., n.d.).

Demographic transition is a trend that has a major effect on countries in the Baltic Sea Regions. Healthcare prices are expected to increase by 2025 and the financial burden on health budgets would be massive. Dependency proportion in Baltic countries for population over 60 years will increase from 1/4 to 1/2 by 2025 and family members will be most influenced by their efficiency, income and career availability(Care & Systems, 2020). Project regions in the BSR face various levels of problems associated with an ageing population and demographic transition. This provides the biggest potential in both the public and consumer marketplaces; DSH aims to increase the capacity of innovation stakeholders to implement smart specialization strategies to regional growth by identifying new entrepreneurship possibilities, fostering the creation of innovative products and service technologies, improving and expanding established 'hot spots' in innovation to address specific requirements and addressing the problems in aging population in the BSR region.

## **1.1 Objectives**

The key objective of this paper is to give conceptual overview of the DSH which should be input for requirements engineering and further development of a virtual collaborative platform known as the Digital Silver Hub which will act as a virtual environment where various stakeholders may cooperate in innovation processes using a methodology focused on information sharing, co-creation, co-productive strategies and participatory methods. The goal is to build a platform that connects organizations and academic institutions to produce new, innovative solutions to address ageing issues and exploit opportunities for the silver economy. It is also important to create the definition for the DSH in terms of its vision and mission statement. Fundamental understanding of what the platform should include as roles and features.

## 1.2 Problem Statement

Researches show that, “It is expected that an increasing number of older adults will use Internet-based services, health, education, finance, and others, as information and services are becoming increasingly decentralized and often available in the cloud. This community has also shown significant interest in learning how to use ICT, remain socially connected, obtain instant knowledge and conduct regular tasks such as shopping, traveling and banking. Moreover, the digital skills of this community are limited, since they are not included in the modern world of interaction that marks recent technological breakthroughs. There are a wide variety of technologies that have created a growing gap between the tools used by the young population and those used by the elderly” (Martínez-alcalá et al., 2018).

This landscape isn't the same for everybody though. Elderly people do not always have the same perspective of technology as other users do. Older people were not born in an ICT era but because of its high popularity, they have to use it. This view assumes that all people can be reached through the benefits and advances of potentially offering ICT applications, not only for those who are already ICT educated but mainly for elderly people who have missed the chance to enhance ICT experiences during their working or academic life. Moreover, the main concern is that technology has been implemented in many situations without taking into consideration the specific needs of older people and that they may not have previous training in this type of technology (Medicine et al., 2015).

In the other side, in general most elderly Europeans are open-minded about emerging technology and many are already obtained hands-on experience with ICT. At the same time, around one third of Europe's elderly citizens are at risk of being excluded from ICT and this does not only concern of old age group cohorts, as there is also a consistent north / south gradient in terms of the involvement of elderly people in ICT across the EU (Amaro & Gil, 2011).

For several, population great pyramid creates a daunting perspective for the coming decades. “Eurostat predicts that the number of over 65 years old in the EU's 27 member states will increase from 17% in 2010 to around 30% by 2060” (Ahtonen, 2012). Moreover, Ahtonen explains that “The proportion of working-age citizens will decrease as the proportional percentage of pensioners continues to rise. The European Commission predicts that age-related investment, such as health insurance and

*retirement, will rise to almost 30 % of GDP in the EU 27 by 2060. This is estimated that expenses would grow by 4.75 percentage points of GDP compared to nowadays, but there is no clear idea about where this money would come from. Add additional pressures created by the current economic crisis to the picture and the response could well be a gulp and a frightened sigh. Yet closing our eyes won't help the demographic crisis go away; nor will it turn overblown public budgets into stable sources of financing for ageing communities. EU Member States must commit to tackle this common challenge. By bringing about a change in attitude and transforming society, EU countries can prevent the collapse of welfare, health and financial systems and ensure that population pyramids are no longer seen as a threat but rather as a narrative for growth , success and social cohesion”(Ahtonen, 2012).*

*“In response to demographic change, more attention needs to be given to the structure of the social services, health and care sectors, financial systems, labor markets and education, as well as to migrants' integration. A big aspect of the solution would be encouraging healthy and active aging. The EU and its Member States will address the problem at the root of the challenge by taking the required action: providing elderly citizens sufficient social security and ensuring that the cost of tax and social contributions will not become unsustainable for the working population. Meeting these enormous challenges for society and the environment needs a common vision and commitment through community. It requires every key sector and actor to unite behind a common goal. Promoting health, using innovative products, services and processes, and providing people with incentives to continue working can all contribute to healthy and active ageing, but they will only have the desired impact if implemented together” (Ahtonen, 2012).*

### **1.3 Research Questions**

#### **RQ 1. How DSH can help elderly people with service provision?**

With respect to this RQ, I will find out and discuss the benefits of the DSH for BSRs, and how the DSH can serve elderly people to address their needs. To do so, it is of greatest priority to assess the various factors that need to be considered for platform implementation. The purpose is to observe how the DSH can help BSRs more efficiency. This will be done by gathering ideas and a broader prescriptive towards conceptualization



of the DSH from the DSH's partners by sending out a digital survey questionnaire to them. The purpose is to integrate the ideas of the project consortium (partners) and establish a consolidated concept which will help us to set a general scope and direction of the envisioned virtual collaborative platform.

## **RQ 2. What are the main features of the DSH?**

This research question is intended to define the main features of the DSH. The purpose is to understand what the platform should include as features and roles, who will be the main stakeholders. This will be done by conducting different workshops to have many open discussions with experts to introduce main features, vision and missions of the DSH. The research questions are connected with each other in order to identify the needed steps for the effective introduction of roles and responsibilities. Due to that the research question is branched out to the following.

### **Sub RQ 1. What are the different roles and responsibilities involved in the DSH?**

The purpose of this question is to first identify different roles and partners of the DSH in BSRs, and then find out each specific missions and responsibilities in order to build the platform. It is important to understand that how each role can participate and integrate in the project to build an efficient platform.

### **Sub RQ 2. What are the main user stories?**

The purpose of this question is to find out the main possible activities done by DSH called user stories to capture a description of features from end-user's perspective. The aim is to identify and describe the type of users to find out who they are, what they want from the DSH and why. By creating user stories, we can simplify description of requirements and features before implementing the platform.

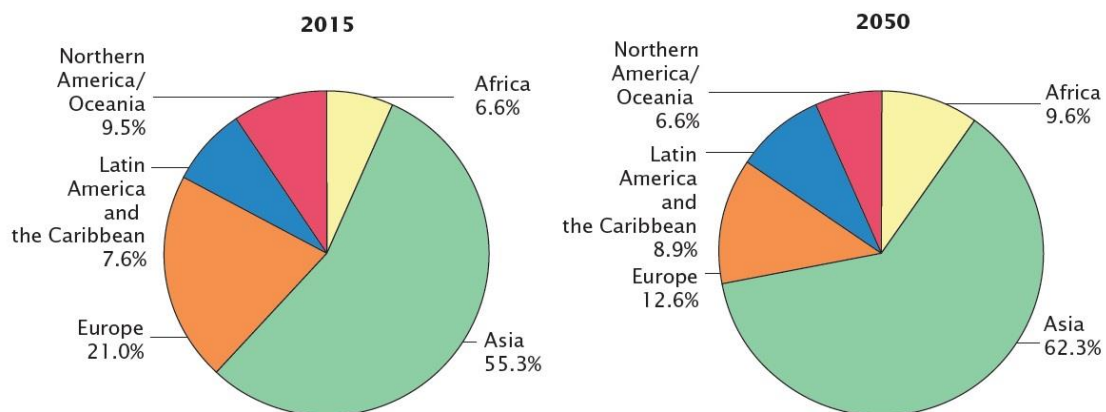
## 2 Theoretical Background

The section describes the body of information regarding the subject obtained from reading academic documents such as articles from peer-reviewed papers, governmental published studies, and etc. Reliable sources such as academic library, Google Scholar, and government websites where policy papers and documents are written have been searched and collected from the underlined sources.

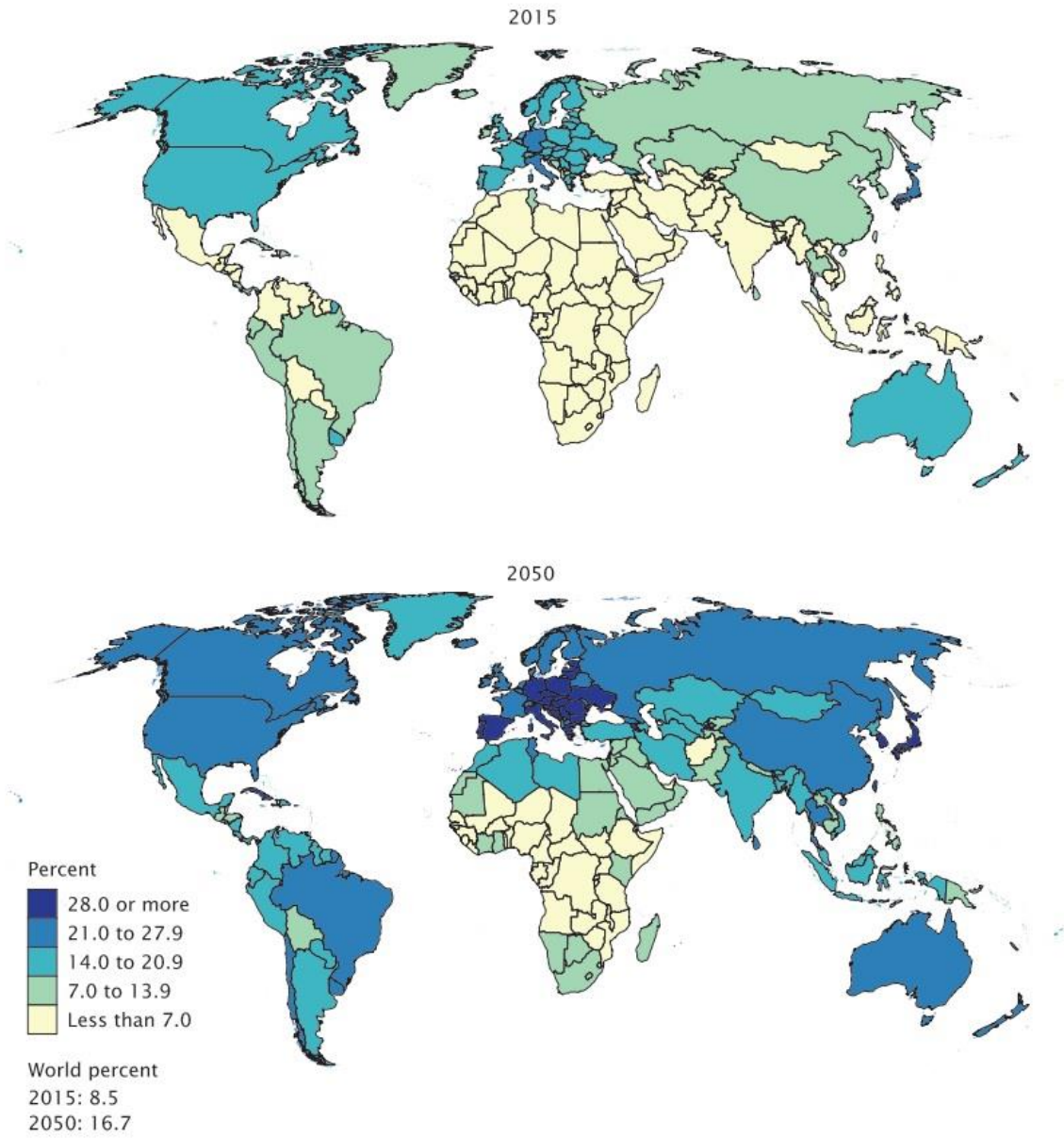
### 2.1 Literature Review

The purpose of the chapter below is to present the concepts / phenomenon with the research given: “Obstacles for ICT adoption in the elderly generation” and “ICT integration in elderly in Estonia”.

According to UN estimates, the world's population of the elderly is increasing at a rate of 2.6 percent each year, more than twice as high as the population as a whole. (United Nations, 2009).



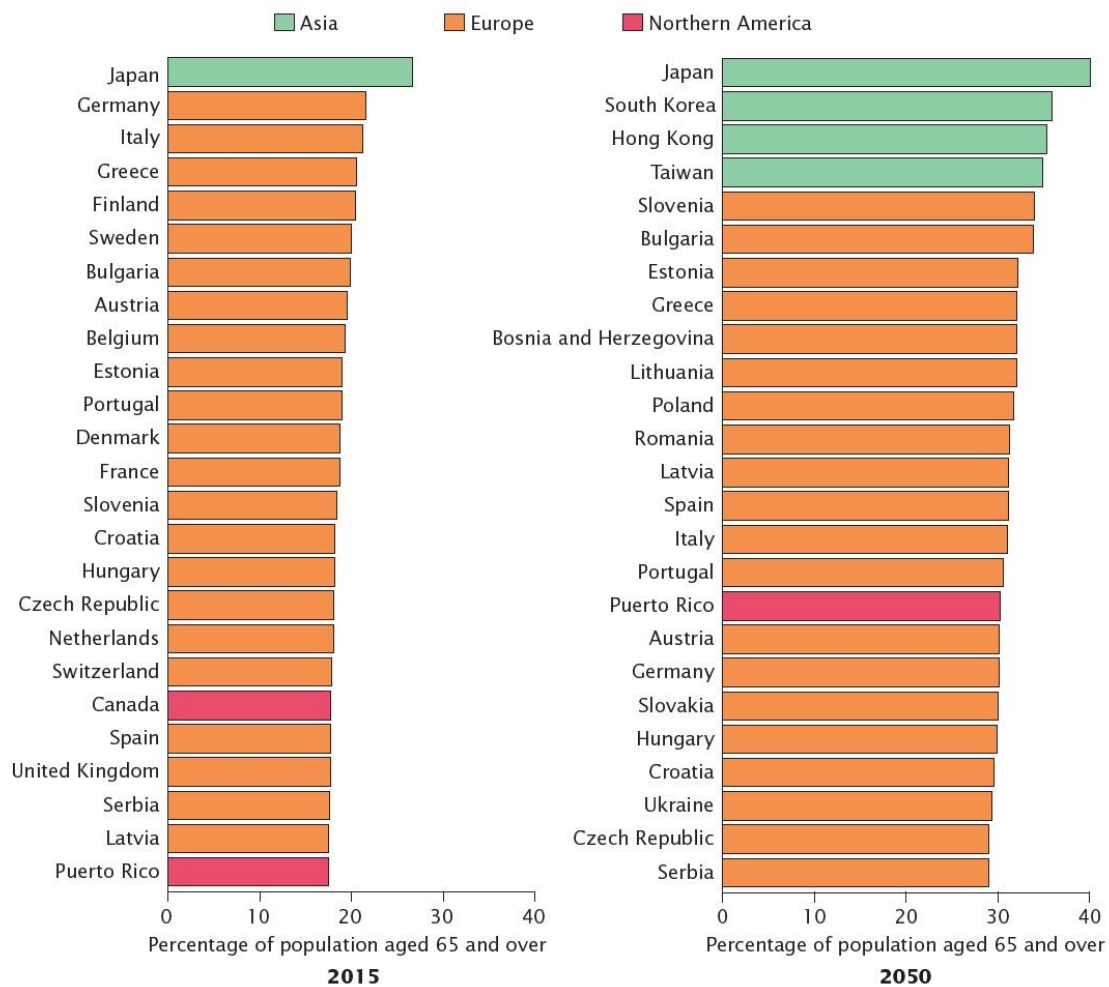
**Figure 2.** Percentage Distribution of Population Aged 65 and Over by Region: 2015 and 2050 (He et al., 2016)



**Figure 3.** Percentage of Population Aged 65 and Over: 2015 and 2050 2015 (He et al., 2016)

Region	Population (in millions)			Percentage of regional total population		
	2015	2030	2050	2015	2030	2050
Africa .....	40.6	70.3	150.5	3.5	4.4	6.7
Asia .....	341.4	587.3	975.3	7.9	12.1	18.8
Europe .....	129.6	169.1	196.8	17.4	22.8	27.8
Latin America and the Caribbean .....	47.0	82.5	139.2	7.6	11.8	18.6
Northern America .....	53.9	82.4	94.6	15.1	20.7	21.4
Oceania .....	4.6	7.0	9.5	12.5	16.2	19.5

**Table 1.** Population Aged 65 and Over by Region: 2015, 2030, and 2050 (He et al., 2016)



**Figure 4.** The World's 25 Oldest Countries and Areas: 2015 and 2050 (He et al., 2016)

Moreover, during the past century and the average life expectancy in Europe, “mostly over the last decades, has raised for males from 45.7 to 75.0 years, and for females from 49.6 to 79.9 years, while rising the birth rate at the same period (Table 2). The convergence of these two variables implies that the population of the European Union is rising aging and looking at long-term estimates will infer that this situation is expected to increase in the future.”(Amaro & Gil, 2011)

Year	Total population			Population aged 65 and over			Percentage aged 65 and over		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
2015.....	7,253.3	3,652.0	3,601.3	617.1	274.9	342.2	8.5	7.5	9.5
2030.....	8,315.8	4,176.7	4,139.1	998.7	445.2	553.4	12.0	10.7	13.4
2050.....	9,376.4	4,681.7	4,694.7	1,565.8	698.5	867.3	16.7	14.9	18.5

**Table 2.** World Total Population and Population Aged 65 and Over by Sex: 2015, 2030, and 2050 (He et al., 2016)

### **2.1.1 Obstacles for ICT adoption in the elderly generation**

The research by Selwyn examines that, "A significant move in recognizing the usage of ICT by older people is to obtain an image of the trends of access to ICT; in specific, the gradations of accessibility to various technologies. The study found that the most available technology to elderly adults are consumer market broadcasting and networking technology. Many older adults have access to landline phones, satellite television, video players and radios at home. Internet connectivity rates are lower and primarily from computers, Instead of the new Internet enabled technology such as modern television and smart phones. The most often reported place for exposure to computer-based technologies is at a relative's home. The second most frequent spot is the home of the respondents, preceded by libraries and friends' houses. The relative worth of relatives and friends has been emphasized with exposure to all computers under the age of five and peripherals such as printers and scanners. This 'association control' provided by others is an essential component of aging adults' exposure to the new devices, computer peripherals such as printers and scanners, multimedia technology such as satellite TV, DVD players, video cameras and games machines" (Selwyn et al., 2003).

Selwyn argues that "it is also important to rethink the state's attempts to promote the usage of ICT by older people and, in addition, to switch from encouraging collective ICT services to supporting expanded domestic ICT resources. Different community sites should be discussed, but the creation of community capital for loans into people's homes should be explored most notably. Most of all, greater rational standards for ICT usage need to be encouraged. The government and others should agree that ICT is not uniformly desirable to elderly persons or is widely required in its present forms. Before these conditions alter, it is nonsense to consider the widespread takeover of ICTs such as computers and the Internet by elderly people" (Selwyn et al., 2003).

The research by Klimova, indicates that, "while living conditions are continually increasing, the numbers of older people who wish to live a productive, fulfilled and quality life in the context of integration, socialization and independence has grown slowly yet significantly over the last ten years. This can be managed to achieve not only through continuous support from the members of their family, but recent trends show an important role for ICT in this process. Although age remains a major negative factor in the usage of ICT, it appears that more than 69.8% of the world's elderly population is digitally

removed, from which 41.7% live in Europe. The study has also shown that older generations, aged 58-77, are now even more aware of technology than they were ten years earlier. It is affected not only through gaining more knowledge by different kinds of community and national programs targeted at the elderly, but also through their desire to connect with their relatives, e.g. grandchildren, or to obtain the details that they need, for example, plan to go somewhere. Moreover, most of these elderly people have practically no difficulty accessing computers. As the research concluded 80% of their respondents had pretty straightforward access to computers. In fact, older citizens are not afraid of technology or hesitant to use ICT; rather, if they do not want to use computers, they simply do not wish to use them or are not interested in them” (Klimova et al., 2016).

As the review of the studies examined by Klimova indicates, “ if Older citizens are made conscious of the benefits of ICT, its advantages for their everyday activities, have proven that they can deal with it and are allowed to attend training in the usage of technology, so they are ready to use it in their daily lives. According to reports, 41% of elderly people over the age of 60 did not deny computers. In particular, the importance of the individual Internet functions depends on the age; And, the age allows the value of specific Internet features, such as getting the latest news, to decrease. Furthermore, the utilization of ICT helps older people to do many activities, such as career opportunities. Therefore, life experience, a spectrum of expertise and capacity, as well as the need to follow moral and ethical values are nowadays rather underrated, while a community of assertive and optimistic youth is asserted. A number of industrial sectors focus on the adult population 20-30 years old, and yet reports show that focus will soon be drawn to an elderly, which is already occurring in the case of mobile development or navigation systems. So, it is possible to believe the ideals the elderly people will generate and pass on to the whole community will eventually be valued more and more. Third Generation universities may be a tool for supporting older citizens in this regard.” (Klimova et al., 2016).

Furthermore, older citizens are utilizing certain electronic technologies such as smart phones, or even tablets. 92% of elderly people under the age of 65 have a cell phone and majority of them cannot picture their life without it. However, elderly prefer classic control buttons, since they primarily use the phone to call (Klimova et al., 2016). Therefore, as Liyanagunawardena and Williams explain, “countries across the world are facing ageing demographics as a consequence of both rising life expectancy and decreasing birth rates. Ageing population introduces significant challenge to society as

well as opportunities. Challenges consider growing competition for health insurance, long-term care and social programs, and rising strain on pension and social security systems; alternatively, older people may make substantial investments as family members, carers, mentors, and community participants. For a number of factors, older persons are at risk of social isolation: reduced interactions with friends, bereavement, accessibility problems and poor health. Internet use has demonstrated positive potential for approaches to reduce loneliness in elderly people. This analysis reveals that there is a shortage of studies on the usage of MOOCs by older learners while at the same time determining their interest in MOOCs by examining MOOC demographic data from 10 courses provided by Reading University. Given the large number of older learners taking part in these classes, there is a shortage of evidence to establish more specifically what other characteristics these learners share. The introduction of courses for the aging and the development of courses directly aimed at this age group may also be another means of addressing alienation experienced by an increasing number of elderly adults. In addition, the participation of older learners as key personnel in the development and offering of MOOCs will allow them to stay involved and at the same time providing greater benefit to society by leveraging the immense expertise and experience of older people”(LiyanaGunawardena & Williams, 2016).

The research conducted by Tutoky discusses that, “adult education is increasing in popularity, and still older people are not left behind. Personal computers and some other ICT tools now reach older people's households via e-health and telehealth. While their main goal is to enhance healthcare services, elderly people will benefit from the integration of e-learning and e-health care in their homes. This not only enhances their health but also their participation and employment in community. Successful implementation of such programs involves collaboration with all the organisations, governments, stakeholders and suppliers concerned” (Tutoky et al., 2013).

The research by Heart and Kalderon examines that, “in view of the usage of ICT in healthcare among older people, the findings provided in this analysis are variously motivating and disincentive. In the other hand, this is found that the inclusion rate among the 'youngest' aged 60–69 is equivalent to 8% and that the levels of ICT adoption by older citizens is slightly higher relative to the data obtained ten years earlier. Many of respondents had fair exposure to computers and some degree of assistance, but the existence of a similar source of help is still as relevant as it was seven years ago; however,

help nearby now appears more readily accessible. At the other side, although elderly adults accept new technology, they are very conservative and prefer to spend resources only if the predicted advantages much outweigh those offered by more conventional, equally operating technologies. They maintain that the opportunities for older adults using ICT are stronger than ever as learning and healthcare have appeared as significant determinants of PC usage, upon this, potential older adults in the developed world are likely to be healthy and highly educated, as well as more qualified in computer usage. On the less optimistic side, the impact of accessibility of funding and safety and marital status on ICT usage will pose major obstacles to the implementation of ICTs relevant to health care now and in the future, while encouraging progress.” (Heart & Kalderon, 2013) Health status tends to be a main moderating factor impacting PC usage. Therefore, unhealthy individuals would be much less likely to implement ICTs, even programs designed to enhance their quality of life, probably because of poor assumed regulation over actions induced by physical or cognitive impairment. Providers of these services will also guarantee that future users have first-class exposure to assistance from close relatives, friends or neighbourhoods. Potential adopters would realize explicitly the advantages the modern technologies will offer. Another assumption arising from the reasons provided by respondents for non-usage is the importance of perceived utility as a determinant of ICT usage. Additionally, according to findings stated, most respondents of the study believed that computers are of no concern to them and do not believe they have to use them. Compared with simpler existing innovations, the superior ability of modern healthcare relevant technology to enhance patient safety status and quality of life must be made clear and irrefutable.

As the findings of Heart and Kalderon’s study suggest, “attitude towards usage is more relevant as people get older, at least in the case of the US sample. This result indicates that attempts to maintain a healthy mindset are needed beyond and above the burden of immediate relatives and friends. Moreover, the deviations between the American and Israeli participants that indicate cultural differences in this aspect. These variations should be taken into consideration, if substantiated by more study, and indicate that diffusion strategies should be adjusted to the unique characteristics of the future customers. PBC appears as the most significant determinant of usage of the three TPB variables in general with both populations. The launch of new ICT relevant to healthcare should also not only deliver simple and easy-to-use technologies, but must also be paired with a robust training curriculum. Any emerging technology that varies substantially from technologies with



which elderly people are now competent is likely to face difficulties with acceptance now and in the future because of cognitive and physiological impairments impacting PBC in older people. Actually, the findings will not entirely endorse a promising future for health-related ICT targeting older citizens-unless the technology is held basic, considered useful and paired with first-rate help” (Heart & Kalderon, 2013).

### **2.1.2 ICT integration in elderly in Estonia**

The research by Paimre examines that, *“digital healthcare services are particularly important in the context of population ageing. This is especially relevant to the Baltic States with declining fertility rates and shrinking population. Estonia, which is the northernmost and smaller of the Baltic States, has a population of just over a million. The share of senior (65+) citizens in Estonia is about European average (19%) and, what’s even more positive, is that they work longer and are better educated than their European peers. The sad side is that their participation in society is meagre and their health is poor. The e-health system could play a vital role here by enabling the elderly to make a doctor’s appointment online, to obtain digital prescriptions and to access their health data e.g. referrals and test results. However, given the fact that Estonia registers by far the worst results in the EU when it comes to old-age poverty, acquiring a computer or subscribing to internet service could present a major financial challenge for them. The European Commission has repeatedly drawn attention to the problem that about 40% of people aged 65 and over are at the risk of poverty in Estonia”* (Paimre, 2019).

Furthermore, Paimre explains, *“there is a vast number of people who will suffer a kind of information blackout. Estonia’s strive towards a digital society teeming with eservices could present a serious challenge for older Estonians, because they can’t use e-services due to lack of access or skills, or they simply do not own a computer.*

*With respect to Internet usage information technology devices, Statistics Estonia collects only data among Estonian residents up to 74 years old. Thus, the elderly citizens have been left out and there is no adequate information on their health information seeking behavior and usage of e-health system. Probably it is assumed that they use Internet less than other age groups. However, as noted by Estonian Chancellor of Justice, acquiring updated data about elderly cannot be considered less important. There is no good reason to distinguish 75-yearolds and older people from the rest of the population when collecting Internet usage data. For these reasons, the Chancellor of Justice advises the*

*Statistical Office to also collect Internet usage data from people older than 74 years of age.” (Paimre, 2019).*

Thus it may be assumed that there are a large amount of older Estonians who never used a computer and a very small proportion of those with advanced tech skills (Paimre, 2019). Thus, Paimre discusses *“the frequently launched e-services are not actually accessible to those who need them the most. The chancellor of justice has noted that Internet access is taken for granted by most people in Estonia and this service can already be considered a main necessity. Computer skills training and Internet usage is associated with quality of life and well-being for the elderly. This can be a significant tool for supporting the elderly when solving issues associated with living arrangements. For instance, to avoid social isolation, solve practical issues, and in case of reduced mobility, encourages life-long learning and cultural participation.*

*To diminish the digital divide between elderly people and younger generations, EUR 7.2 million has been set aside in the state budget for 2017–2020. It is hoped that more extensive use of the Internet may help to increase seniors’ quality of life. The objective this plan is to increase the percentage of Internet users among the entire population by 2020, from the current 89% to 95%. The means for this include digital literacy and other training as well as raising awareness. Fortunately, the first steps have been taken nationally to eliminate the digital divide, for example, the government has allocated millions to teach the elderly to use the internet and IT tools.” (Paimre, 2019).*

## **2.2 Theoretical Framework**

The below chapter aims to present the description and use of the following theories and concepts: Good Governance, New Public Management and Public/Private Partnerships.

### **2.2.1 Good Governance**

The definition of the word "good governance" remains unclear. In the 1980s and 1990s, donor countries and organizations started trending that make assistance conditional on the target country's changes, which were considered relatively unsuccessful in promoting meaningful policy progress. recently, donors including the International Monetary Fund, United States, and the World Bank are gradually relying on success and good governance as a condition for assistance, a process named "selectivity." This is a matter of allowing a recipient state to display the extent of its contribution to economic and social reforms.

There are no clear criteria for good governance, other considerations include political order, the rule of law, corruption prevention and transparency. There are connections between high rates of poverty and weak governance, rendering selectivity hard to implement. Domestic sponsorship, control and dedication are essential for positive changes, as are the cultural background and experience of the recipient (Nanda, 2006).

The environment for governance has improved significantly since the establishment of the UN. Furthermore, the concepts of governance differ considerably, as can be shown from the opinions of different international organizations on governance listed below.

UNDP: “Governance is seen as the practice of fiscal, political and administrative power in managing the affairs of a nation at all levels. This includes structures, processes and organizations whereby individuals and associations express their desires, practice their legal rights, fulfill their responsibilities and initiate their differences.”(Weiss, 2000)

World Bank: “Governance is described as the way power is described as the management of the economic and social resources of a country. World Bank listed three different governance aspects:

- Political regime form;
- System through which authority is exerted for the management of the economic and social development resources of a country;
- Policy ability to develop, establish and execute strategies and discharge duties.”(Weiss, 2000)

OECD: “The principle of governance relates to the usage of political power and the practice of influence within a community in relation to the use of its economic and social development tools. This specific description includes the role of public institutions in defining the framework in which economic operations work and in deciding the allocation of profits, as well as the essence of the ruler-ruled partnership.”(Weiss, 2000).

UN Secretary-General Ko. Annan: “Good governance includes obeying integrity for human rights and the rule of law; consolidating democracy; fostering accountability and public administration capability .“(Weiss, 2000).

Recent experience with good governance has contributed to criticism of the UN scheme, which aims to reconcile cost-benefit considerations and to address the political and economic constraint that several recipient countries perceive as unwanted intrusions. Good governance certainly features on the international ideology. Yet three forms of concrete UN opinion applied the brakes and hindered the momentum of unity in

Washington. There is a need to understand the complicated realities of government, which includes all the mechanisms and procedures used to assess the usage of available resources for the interest of the public within a nation. While controversy persists about its specific elements, good government is more than multi-party voting, a judiciary and a parliament, identified as Western-style democracy 's key symbols. "The list of other attributes, with the necessary resources and culture to accompany them, is formidable:

- The fundamental protection of human rights;
- The laws which are not discriminatory;
- Efficient, fair and quick judicial proceedings;
- Strong government authorities;
- Political authorities are responsible for decisions;
- Devolution of assets and decision-making from the capital to local level;
- Significant individual engagement in the debate on public policy and decisions."

(Weiss, 2000)

Good governance indicators offer a sort of description, usually representing what we might find to be sensible and desirable features of successful governance. They recommend, for instance, that governments should be fiscally responsible and autonomous in order to identify and react to citizens' wishes, have politically impartial management and create and implement policies that are business friendly(Andrews, 2008).

The culture of good governance has evolved over the last decade, creating a number of indicators of good governance. There are also different kinds of; A broad range of spotlights institutional and governance features and related results considered essential for development. Specific examples include formality of the budgeting method, degree of decentralization, regulatory efficiency, level of service delivery in areas such as education, health, and infrastructure, and fiscal policy. The WGI is the most famous product in the Society. These incorporate separate measurements into composite metrics of six principles of governance such as "effectiveness of government". In academic literature, the indicators are commonly used as measurements of core concepts such as efficient governance and impact donor organizations' lending and public sector policy designs. They played a significant part in the mainstreaming of discussions and treatment plan of fraud, legislative ailments and governmental development vulnerabilities. Nevertheless, the indicators probably underlie what sociologists may term isomorphic

factors in thinking about what an efficient government is, where isomorphism relates to the desire to emulate organizational factors from one environment to another. The point is that research study, loan commitments and policy measures achieve credibility in the development world if they align with the "myth" that structured frameworks expressed in the indicators offer a legitimate means of achieving beneficial ends. The strengthening identity of most indicators reinforces isomorphism, particularly in developing countries where government appears ineffective and reliance on external factors such as donors who suggest these models is strong. Giving such power one believes that good governance thought regarding efficient governance is suitable for development usage. One should at least wonder if this job needs for an efficient government (Andrews, 2008). Good governance leads to effective management, successful efficiency, effective expenditure in government money, excellent public behaviour and positive results. There are many standards for governance of the public service that offer guidelines through the dynamic and varied field of public services delivered by the public sector and a variety of other agencies. The Good Governance Framework for Public Services of the Independent Commission for Good Governance in Public Services lays out six standards of good governance that are applicable to all public sector organisations and seek to assist all others with a focus on public governance in evaluating good governance activities. This requirement allows public institutions to evaluate their own efficacy and to include a shared context for the assessment of good governance (Juiz et al., 2014).

Publicly run businesses and public utilities are important for every government. Some function as a tool for the government to enforce its policy, and fewer to give the government any dividend. Given its significance, good governance activities focused on concepts of good governance are quite relevant. These basically have clarity and transparent decision-making procedures, policy and accountable systems, success metrics and accountability. As IT has become an important tool in every business, along with the public sector, good governance standards on IT governance practices should also be applied. Such programs remain as core concepts of good governance in the public sector in order to explain that transparency and a firm ethical standard will be applied across all the holdings of public bodies. This deployment should be explored especially in the IT assets. In their behavioural development, the IT governance system will lead to the same priorities for the control of public IT properties as the general good governance programs (Juiz et al., 2014).

### 2.2.2 New Public Management

Since at least the 1970s public government has been criticized for its incompetence and the difficulty of evaluating success and making elected representatives responsible. Bureaucracy of the 'classic form' has been seen as stagnant, inefficient and unwilling to adjust to evolving circumstances. "Public sector 'bureaucratic disorders' had several issues:

- Adopting strict guidelines and loss of flexibility in the management;
- The difficulty of replacing inexperienced employees and of rewarding the professional;
- The distorted compensation scheme of reward for increasing expenditures and workers, regardless of public advantage;
- Irrational decision-making processes not related to some form of research or resource reward cost/benefit contrasted with those of market-oriented enterprises." (Navarra & Cornford, 2005)

This extensive review, under the name of New public management, has generated a wide body of literature. NPM has no clear theoretical provenance, with the impact of the New Institutional Economics on the one hand and the emergence of Managerialism on the other. Yet all support legislation that works by establishing sufficient compensation mechanisms, including an improvement in customer preference by contestability as the alternative to the old public management problems (Navarra & Cornford, 2005).

The core principles of the NPM definitely inspired other western reform initiatives governments. Those initiatives can be outlined in four specific areas: efficiency, communication, transparency and decentralization (Figure 5).

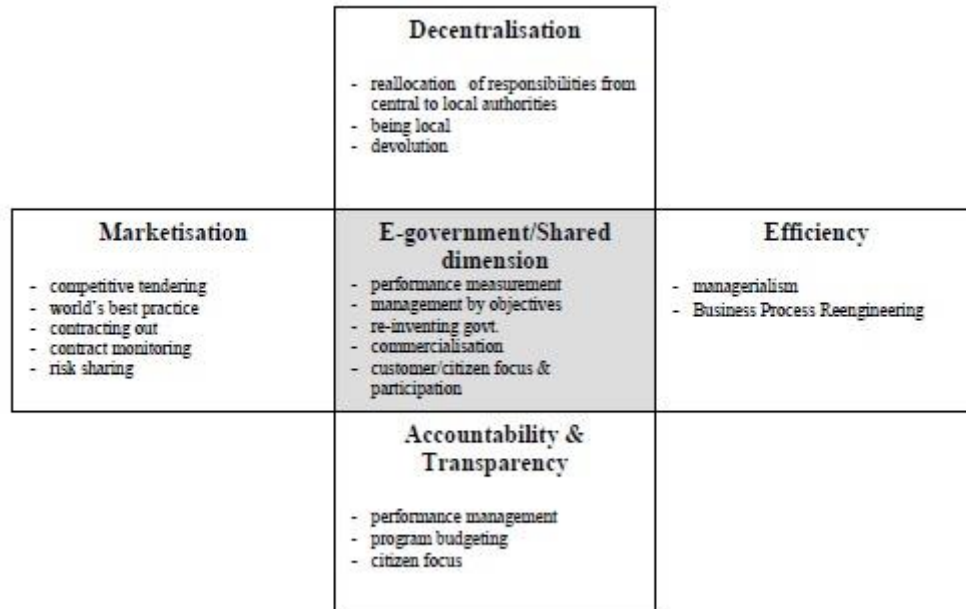
*"Efficiency would be improved by varying input to production ratio, thereby minimizing unit costs, reducing resources where necessary and introducing modern methods of work.*

*Communication suggests the change from vertical management and control target activity to horizontal integrated public sector relations, reshaping contractual relationships of recruitment, procurement and service delivery.*

*Responsibility renders the government more accountable for their acts on the basis of their effect on social safety and governed by performance indicators and efficiency requirements under the same labor market laws as private sector workers.*

*Decentralization encourages moving decision-making to lower rates for the public sector and setting up more decentralized elements within and outside government to enhance*

*action, strengthen civic resilience and tailor local solutions. This includes the creation of processes and systems that lead to better governance frameworks, and the involvement of individual and other NGOs.”(Navarra & Cornford, 2005).*



**Figure 5.** The four poles of NPM: reforms in government and the location of e-government (Navarra & Cornford, 2005)

In this perspective, e-government could be used as an effective translation and inscribed of these definitions, identified, for example, by the use of the Internet and related ICTs for the provision of government services. We would suggest, however, that this signifies more; a profound structural transformation of the underlying rationale for administrative systems and processes and a redefining of the boundaries between the government, the citizen and other civil society actors. This indicates that major problems lie ahead when it comes to conceptualizing ICT as an interface for the government or governance technologies, one that connects a number of players in modern and frequently preliminary networks that represent multiple interinstitutional partnerships and other innovative interdependencies. Such a problematization of e-governance raises challenges for those who seek out to build technologies and frameworks, ICT platforms and transport infrastructure that can work within these complex organizational ecosystems and turn them (Navarra & Cornford, 2005).

The alternative approach to e-government proposed here is to understand that e-government requires the formation, growth and interconnection of a number of social,

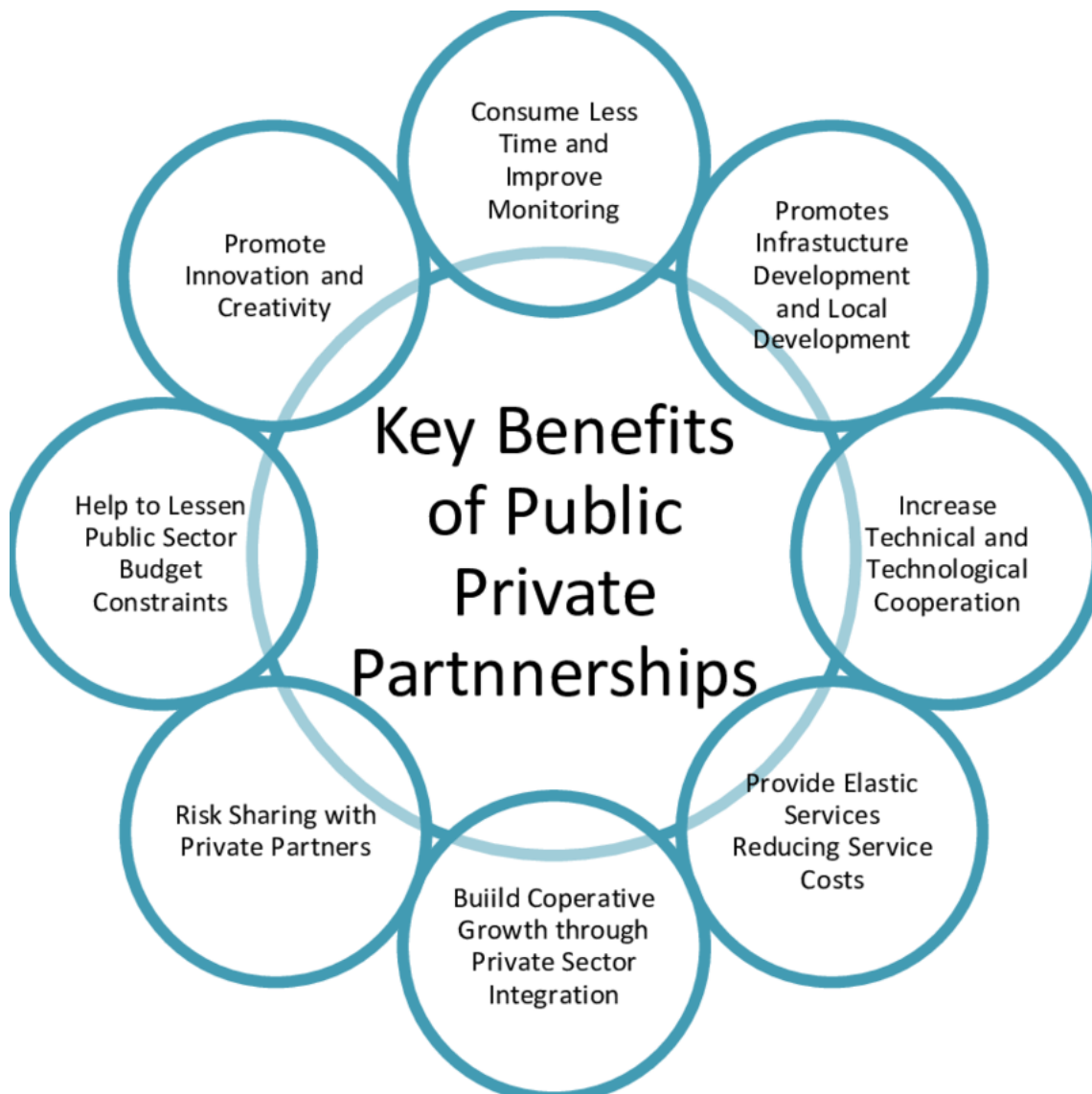
administrative and technical ecologies to provide programs that are viewed as legal, creative, useful and improving security. This concept allows one to highlight the high degree of sophistication inherent in building the large-scale architecture and the challenge in managing corporate transformation programs by adopting the management model alone. Whereas the former considers a knowledge network only as a set of various ICTs, frameworks and implementations, the former argues for the incorporation of complex and evolving elements during deployment and the value of implementing concepts supported through the participatory model for improvisation, accessibility and versatility. This in fact shows a further change in the conventional e-government system, seeks to look at each framework in isolation and contemplating the concept of a collaborative and scalable architecture. In addition to the limited conjectural NPM scope, e-government is intended to support the population by bringing together the public sector, civil society and foreign stakeholders, by increasing participation and engagement in all aspects of society and by ensuring a more collaborative governance and decision-making mechanism. In addition to the limited conjectural NPM scope, e-government is intended to support the population by bringing together the public sector, civil society and foreign stakeholders, by increasing participation and engagement in all aspects of society and by ensuring a more collaborative governance and decision-making mechanism. Porto Alegre 's definition of participatory budgeting is identified as a significant alternate model to the prevailing framework, presenting important scientific evidence to support the promise for social justice advocated by e-government. Along these, the Irish ROS illustrates how a digital technology would have an important policy execution forum when the project began and produce outcomes that were unexpected or unplanned (Navarra & Cornford, 2005).

### **2.2.3 Public-Private Partnerships**

To put it clearly, public-private partnership implies a deal between public entities and privateers. It can be labelled as efficient and proactive in which members agree on few shared goals and build trust relationship. The information, expertise and properties are pooled for the benefit of public growth while at the same period income is created for private parties. This partnership has a clear longevity and seeks to generate goods and services by exchanging threats, obligations, costs and resources available to produce such products and services. The World Bank described PPPs is an arrangement between both government and a private company whereby the private company provides an commodity, a service or both in exchange for payments that are somewhat dependent on



the long-term quality or other characteristics of the production delivery (Fife & Hosman, 2007).



**Figure 6:** Key Benefits of Public-Private Partnerships (Profile, 2020)

Therefore, there are a number of opportunities if we should get interested in PPPs. The concern always arises as to why the public sector should cooperate. “The advantages of partnering with the private sector was clearly defined as

- Enhancing consistency
- Improving customer service
- Focus on improving standard of management
- Investigation and Development

- Development of new services and market based rationing systems” (Navarra & Cornford, 2005)

The rapid increase in PPPs between governments of developed countries and private companies is particularly influential in the ICT sector. These collaborative ventures are conducted in an effort to carry the advantages of technical innovation to the developing world, taking advantage of each partner's strengths and interests. Even so, the fundamental motives for the particular partners vary widely: one is motivated by a benefit motive; the other by a willingness to provide the constituents with social services. Nevertheless, it is achievable and crucial to try to align the interests of those partners, to encourage the important task of bridging the digital divide (Navarra & Cornford, 2005).

Present ICT business PPPs aim at identifying and addressing a development challenge. This collaboration is actively funded and encouraged by states, international organisations, NGOs and private businesses alike. As there are other possible advantages, improved project productivity and scalability, financial capacity, human capital, technologies and intellectual property, customer engagement, cutting-edge best strategies and other skills, these collaborations can be viewed as the most effective route to cross the digital gap as all public and private players join together. Indeed, the UN Millennium Declaration considered a measure the establishment of public-private partnerships to demonstrate the value of new technologies, particularly information and communications technology, are available to everyone. It is necessary to note that the investment group come to the project with various expectations, objectives, experiences, mindsets and forms of doing business; all these must be made transparent, as must the action plan. Indeed, private companies are profit-making enterprises. In this situation, their activities also produce benefits later, because existing investments continue to build potential opportunities. While private companies view economic viability as the primary legitimacy of a PPP, the public partner may regard local suitability and public support as invoking in significance (Fife & Hosman, 2007).

PPPs provide desirable benefits for the public partner, such as expanded private funding and innovation, technical knowledge and skills, risk management, public recognition arising from being affiliated with a profitable multinational company, and a possible downsizing of the public sector or a decline of government-subsidized services. Another economic case for PPPs involves the gains associated with the liberalization of laws and

economies, expanded technology access and more effective forms of doing business, and a greater willingness to stick to fiscal restraint policies needed to do business with global corporations (Bovaird, 2004).

An important incentive for governments, and undoubtedly the development users, is the value adding capacity of ICT, not just in terms of economic growth, but even by increasing social and political resources. Potential adverse outcomes for governments contain control and intelligence asymmetries, and political and economic costs in the event of abandoned programs. Nevertheless, growing citizens' desire for government services, combined with static government revenues, suggests the possibility that more PPPs will be generated in the future (Bovaird, 2004).

Advantages for the private party provide access to new opportunities, risk management and elimination of volatility, and an enhanced reputation as a consequence of their philanthropic work. While operations are targeted for potential profitability, businesses achieve immediate measurable benefits not generally correlated with profit margins. Which involve increased morale among their employees and the development of a good picture of the business at home and abroad (Fife & Hosman, 2007).

### **3 Research Methodology**

The approaches and methods adopted for performing the study will be described in this section. This will be done while considering the research purpose, which is conceptualization of the DSH. The research aims to give a conceptual overview of the DSH which should be input for requirements engineering and further development of a virtual collaborative platform which will act as a virtual environment where various stakeholders may cooperate in innovation processes. The various approaches proposed in this paper are discussed as follows.

#### **3.1 Research design Approach**

Research design relates to the process or method adopted for undertaking and preparing a study. There are different methods that can be used to insure that the study questions are posed in an practical or comprehensive way. This is one of the most critical aspects

of any study because it inculcates the four most essential sections namely the approach to be followed, the framework applied, the subject definition, the research and the method used to gather and then evaluate the data later on (Butt et al., n.d.).

In this study, the qualitative form of research will be used because it is a tool that helps the researcher to analyse attitudes, values and the cultural and social context. When performing a study in an operational manner, a method should be selected which is most feasible and appropriate for the specific research to ensure that relevant results of the study are obtained. This thesis covers the current state of ICT integration for elderly people; thus, it is important to understand what is DSH and how it can serve elderly people.

### **3.2 Data Collection**

There are three techniques that are applied to gather relevant data to this study, and provide insightful conclusions and discussions.

#### **Questionnaires**

The 20 different triple helix actors who are experts from different fields in BSR (Latvia, Lithuania, Denmark, Russia and Finland), will be requested to fill out preliminary questionnaires in order to provide some relevant information about conceptualization of the DSH. The goal is to merge the project consortium ideas and to create a centralized framework, as well as to help us improve the basic knowledge of the DSH. The questionnaire consists of 16 questions, often open-ended, to encourage further detail to be collected, including the thoughts, behaviours and the subject's comprehension. The survey results will serve as the basis for future development of a more necessity-specific survey.

#### **Workshops**

For the purpose of identifying features and roles for the DSH, digital survey questionnaire and workshops have been conducted to achieve outcomes. To confirm the outcomes of the questionnaires, workshops were conducted.

Workshops were conceived after the survey analysis. The objective of the workshops was to corroborate the results of the survey and establish a combined DSH agenda through open discussions and brainstorming. Participants in workshops were the early-stage

researchers, IT specialists and IT project managers from energy sector. The workshops were planned to discuss the significance of first step survey data. Outcomes of workshops will help us to build an integrated DSH concept which will serve as a basis for requirements creation.

### **User stories**

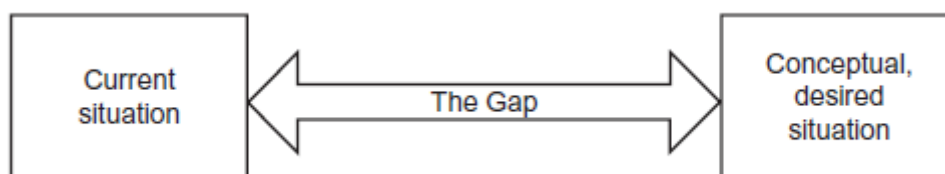
Based on the workshops, in order to recognize how each member identifies actions that can be translated into interplay between the roles and the DSH, user stories will be discussed. We will create user stories from the end-user perspective to collect a description of features. It will define and describe the user type to discover who they are, what they need from the DSH or even why. Also, user stories will simplify definitions of requirements and features of the DSH.

### **3.3 Data Analysis**

One of the most important part of any research is the process of data analysis. This chapter will explain about the business analysis method which well be used in this study.

#### **business analysis**

For improving existing business systems, advanced methods to business analysis used a systematic process. It generally included analyzing and evaluating the current situation and also incorporating additional requirements to address existing issues. Although this perception of business analysis frequently led to rapid improvement, it refused to take into consideration larger stakeholder expectations for the business context. As a consequence, the insistence on solving challenges often implied that larger possibilities were ignored (Gap, n.d.). Business analysis method has developed over time to take into account methods focused on systemic thinking (Figure 7).



**Figure 7.** Systemic analysis approach(Gap, n.d.)

Examination of the business process provides a vision of an organisation considering the client. It is also in contrast to the practical perspective that appears to be based on internal goals and also named 'silo thinking'. The business process view of organizations has risen in prominence over the past twenty years, especially when addressing organizational changes, because it avoids the silo effects faced when focused on functions or internal departments(Gap, n.d.).

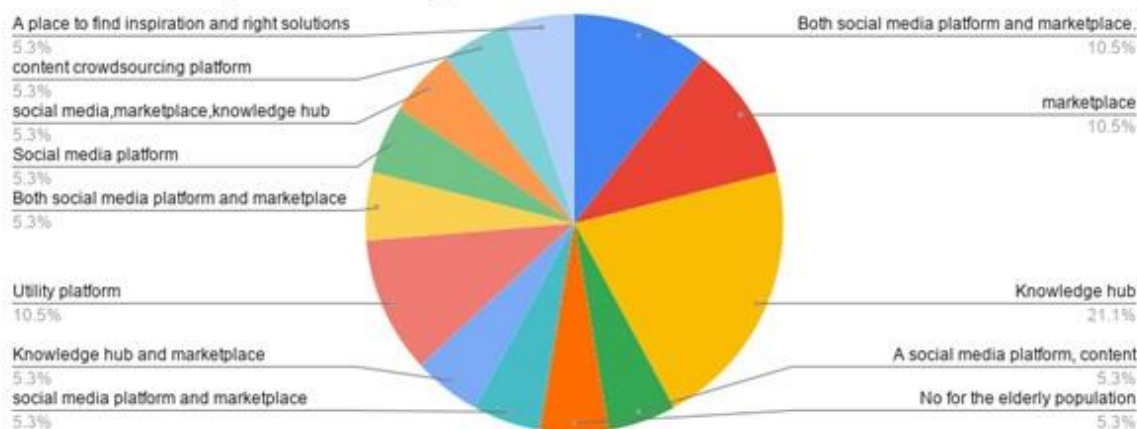
## **4 Results**

This chapter explains the analysed responses for the conducted survey as well as the result from workshops.

### **4.1 Results from Survey**

As the first step of the research, a survey was conducted by sending out questionnaires to experts. The questionnaire was designed to integrate closed-ended and objective questions, thus we got 20 responses for the survey. The preliminary questionnaire was designed to get an initial idea of the DSH which will serve as an environment where different stakeholders in BSRs (Latvia, Lithuania, Russia, Denmark and Finland) can collaborate in innovation processes. The purpose was to integrate the ideas of the project consortium (partners) and establish a consolidated concept which will help us to set a general scope and direction of the envisioned virtual collaborative platform.

As a result, majority of the respondents stated that DSH can serve as a knowledge hub which should serve systematic information, employment, educational and care opportunities for the elderly population however, 10% believe that it should also serve as a utility platform as well as the marketplace (Figure 8).



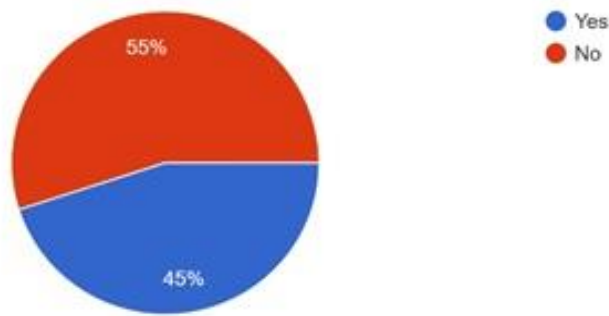
**Figure 8.** Platform of the DSH

Gathered data about the objectives and goals of DSH listed below:

- There should be a connection of different stakeholders that would enable business opportunities.
- Security, social, health and accommodation services
- Build small communities that share the quest
- Knowledge sharing
- Relevant service provider search for elderly (suppliers, peers, mentors, psychological support)
- The platform should provide digital connectivity, support the development of digital skills and encourage the use of emergent innovative technologies.
- Develop DSH as a number of labs.
- Tailored solutions – developed services

The DSH can be organized to initiation by: firstly, doing market research to identify target group, secondly, developing business model, attract business, customers and etc., thirdly, being adoptable to changing technologies, and finally, identify value propositions and finally negotiate the structure of the platform.

Smart devices can make a connection between different platforms as well as gathering and sharing data from network. Although they are small but they are efficient and powerful. This is an idea that the DSH can be considered as a smart device. This was asked from the experts and the response shows that, 55 percent of the them think that he DSH can be interoperable with smart devices like smartwatches (Figure 9).



**Figure 9.** Integrating the DSH with smart devices

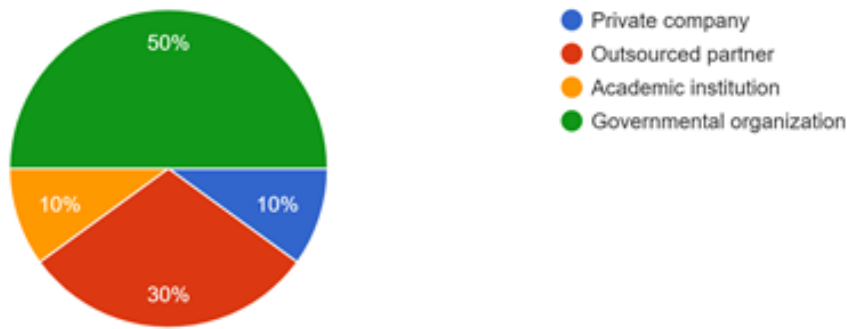
Regarding the participated actors in the DSH, majority of the respondents stated that all the actors/roles (innovators, elderly population, public/private sector, academic institutions, voluntary sector, ministries of welfare) should be involved in the DSH and 10 percent think that only Academic institutions should be participated.

In additions, experts believe that the purpose of the usage of DSH can be as following:

- Innovators: Bringing new inventions and innovations to the elderly.
- Elderly people: Target group, product user group and mapping and informer of key service needs for the elderly.
- Public sector: Information on laws and guidelines in the areas of action, targeted public administration surveys.
- Private sector: Products 'General language' reporting of practical research results for everyday life and quality of life. Information on access to third sector services.

The maintenance of the DSH is concern of putting basic values into practice in this project. It includes testing the process toward objectives in an active way rather than considering that everything will take place as planned. Regarding that, we asked from partners about the main responsible sector for the maintenance of the DSH .50% of the respondents believe that the governmental organizations should be responsible for the maintenance of the DSH (Figure 10).Moreover, experts believe that best way of integrating OSIRIS work packages results can be based on the processes, developing user stories/ cases and identifying requirements and capabilities/functionalities and build architecture.





**Figure 10.** Responsible for the maintenance of the DSH

In addition, experts' responses show that, based on the processes, by developing user stories, identifying requirements and capabilities/functionalities and building an architecture, we can integrate OSIRIS previous work packages results.

Moreover, to identify the obstacles and barriers that would prevent the DSH from being successful, it is needed to make risk analysis based on the processes, resources and stakeholders/IT part, also doing SWOT analysis. Finally, the most important assets of the DSH are as following:

- innovation and information;
- Stakeholders and target group interests should be satisfied;
- Services and products lifecycle management must be supported with platform.

## 4.2 Results from Workshops

The workshops were structured to coordinate the implementation of the DSH in order to establish a user story, define roles and features and define investment strategies. This chapter attempts to demonstrate the results of the workshops conducted.

### 4.2.1 User Story

User storeys were discussed based on the workshops to recognise how each member identifies actions that can be translated into interplay between the roles and the DSH. A user storey is a short, simple-language description of a user-written element or functionality.

Following user stories are short and simple descriptions of a feature told from the perspective of the different actors of the DSH such as: politician/municipality, senior citizen, business/entrepreneur/innovation support, health care professional and commercial service/product provider who desires the new capability of the system.

As a Politician/Municipality

ID	USER STORY	ACCEPTANCE CRITERIA
1	We will lack hands in healthcare in the future and we need more knowledge about and experience with the technological possibilities	Opportunity to exchange experiences with other authorities in own country and international. Share knowledge and provide inspiration

**Table 3.** As a Politician/Municipality

As a senior citizen

ID	USER STORY	ACCEPTANCE CRITERIA
1	I want to be more self-reliant and seek knowledge and information about the technological solutions that exist.	Opportunity to seek information about aids (assisted living technology) based on your needs. Opportunity to be informed whether the aid can be granted by the municipality, or whether you have to buy it yourself.
2	As relatives, they would be nice if one could learn more about technological solutions that could help our relative. Prices, test results, etc.	Access to films and test results that can inspire, inform and make it possible for the senior citizen and their relatives to find solutions to the challenges.
3	It is difficult to find out who to ask and what you are entitled to as a citizen. Where can I complain? And who can help me find out if a decision is correct?	Guidance or links on how to find the needed information in different municipalities and different countries.
4	I can see that many of my friends and acquaintances are lonely - especially if they are single. There is a need for technological solutions that can alleviate loneliness.	What is on the market? What have others done? Can we disseminate and inform about possibilities, solutions and experiences?

**Table 4.** As a senior citizen

As a business/entrepreneur/innovation support

ID	USER STORY	ACCEPTANCE CRITERIA
1	Testing new products is necessary to get to market, but often difficult to access and complete	The system provide access to individuals and organizations that can help with testing. Alternatively, information on how to approach it when testing and who is important to get involved.
2	I need more knowledge about the municipality's way of working and what systems and requirements they have for new products. Furthermore, I also need my ideas to be tested in practice before I get too far in the process.	The system could provide some general information on where to look for this knowledge and where to get advice and guidance.
3	I experience that the entrepreneurs lack entrepreneurial skills - they are preoccupied with the good idea, but completely forget to look at the market, needs, financing, etc.	The system must provide knowledge about this or refer to advisers and others who can supplement and provide the missing competencies.
4	Universities have a lot of knowledge that we could apply in our development. We should take much more advantage of that.	The system must mediate contact between researchers and entrepreneurs and development companies.
5	Our technology collects a lot of data - it is a potential risk and can develop into an ethical dilemma, which we of course want to avoid	The system should address possible ethical issues with technological solutions and enable users to move forward with their challenge, possibly by referring to organizations they can talk to.
6	We find it difficult to access the export markets because there are different regulatory requirements in each country - and no standard. This is a big barrier for us.	The system should address these issues and perhaps establish a forum for exchange of experience and knowledge
7	I have always learned a lot from listening to other people's stories about their failures. I wish there was a place where you could share those kinds of stories so others could learn from it.	The system should provide a room for stories of failures.

**Table 5.** As a business/entrepreneur/innovation support

As a health care professional

ID	USER STORY	ACCEPTANCE CRITERIA
1	I need more knowledge about the technological solutions that exist and how they are used	The system must provide videos and good examples on how technology is used and the effect for the health care professional and the citizens.
2	Me and my colleagues would like to attend more conferences, exhibitions and training courses in the field of assisted living technology.	The system must provide online workshops, online exhibitions etc.
3	The introduction of a new technology could be implemented faster and more efficiently if we were better at learning from the experiences of others. Colleagues in your own municipality, in other municipalities and in other countries.	The system should provide room for knowledge exchange and exchange of experience.
4	I would like those who develop and do research to talk more with us who work in practice. We have many ideas and above all a lot of knowledge about what is difficult and hassle in the daily work - we know where help is needed.	The system must mediate contacts between practitioners and researchers

**Table 6.** As a health care professional

As a Commercial service/product provider

ID	USER STORY	ACCEPTANCE CRITERIA
1	I need to know what kind of products and services already exist so that I can develop new or improve existing services.	The system must provide an overview of commercial products/services and product/service providers.
2	In order to enter the market, I need access to an overview of the formal and informal regulations and knowhow of organizations, decision makers and processes.	The system must provide an overview of organizations, decision makers and processes.
3	I need access to dialogue with stakeholders such as public sector, seniors, patient organizations, front end professionals in order to develop relevant solutions with the right fit to end user needs and also the requirements for successful purchases and implementation.	The system must provide a "register of stakeholders" who have signed up for dialogue, testing or co-development.
4	I need to set up the service for the end user so that end users can find relevant solutions for them, find out how to get access to them and to share user experiences and ratings.	The system must provide an overview targeting end users who can use the services and products?

5	I need to deploy and setup new products and services into the platform and publish them so that the other system users can start to use them.	The system should communicate the deployment of new entries to the elected stakeholders.
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**Table 7.** As a Commercial service/product provider

#### 4.2.2 Visions and Missions of Digital Silver Hub

A workshop consisted of three participants including early-stage researcher, IT Specialist and IT project manager from energy sector. The workshop was initiated with a brainstorming and participants were asked to have an open discussion about the main factors to identify vision and missions for the DSH (Table 8).

Vision	Mission
Digital Silver Hub’s vision is to support life cycle of innovative solutions to tackle ageing challenges and to enhance silver economy growth opportunities in the Baltic Sea Region.	Is to have a collaborative virtual platform where we can create, deploy and support innovative solutions to generate economic growth by using smart specialization approach.

**Table 8.** Vision and Mission for the DSH

The main objectives to achieve the missions are as following:

1. Built for the DSH with respect to the silver generation, quadruple helix actors and smart silver framework
2. Perform system analysis
3. Development of the platform
4. Implementation of the concept

The second part of the workshop was dedicated to get basic understanding of what the platform should include as features, roles and responsibilities, who will be the main stakeholders. The workshop ended in open discussions and the results and findings were completed as shown in Table 9.

<b>Role</b>	<b>Examples</b>	<b>Description</b>	<b>Main features</b>
RIS3 Authority	-Ministry of Economy in Latvia (www.em.gov.lv) -Ministry of Social Affairs in Estonia (.ee)	Governmental Authority	1. Handle and govern RIS3 priorities (they have the budget) 2. read reports
Smart Silver Lab	-Tallinna Municipality (Tallinn.ee) - Kuldiga Municipality (Kuldiga.lv) - Taltech - H�ame University of Applied Sciences	They have the budget and govern development projects (starting/freezing/terminating/closing the project)	1. Identify bottlenecks and focus points (of elected priority) 2. make innovation calls for proposals launching 3. Assess ideas for products/services 4. Assess project proposals 5. govern development projects (starting/freezing/terminating/closing the project)
Service provider	Company (IT company) Organization (Medicine, care keeping etc)	Provide/sell services supported by the platform.	1. Test and validate 2. sign SLA-s with platform owner 3. read reports (usage statistics etc)
Service generator	- scientist (Represented by a researcher and/or an organization) - juristic person (private/public company, organization)	Can be potential service provider Team responsible for developing the service.	1. create and propose ideas for products/services 2. Invite to collaborate to design the project proposal 3. Collaborate to design the project proposal (sharing knowledge) includes business model and service descriptions. 4. submit project proposal 5. Sign SLA for the project workspace 5. Find/invite product/service developers/providers 6. Collaborate to develop the product/service (incl. sharing knowledge, system analysis, software development, requirement management, architecture management, system design etc.) 7. Test and validate 8. manage project aspects (risks/budget/time/scope etc) 9. Close the project (incl. reporting, lessons learned etc.) 10. hand over to platform owner
Platform System			1. Generate workspace for the collaboration in design of the project proposal/product/service development (Project lab) 2. Close the workspace (cancel user access rights)
Service consumer	- senior citizen - service provider (care keeper)		1. provide feedback in consuming product/service
SME	-Potential end user -Expert (IT company) -Service provider	Subject Matter Expert Consultant Companies	1. collaborate to design the project proposal 2. collaborate to develop the product/service 3. Test and validate

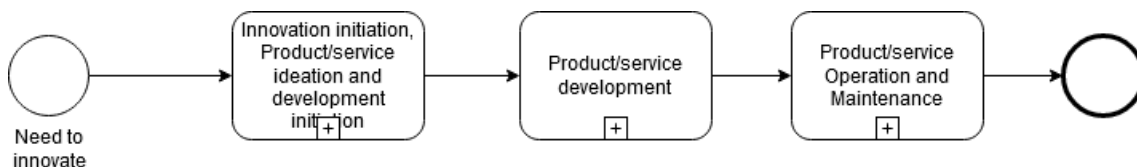
Platform owner	RIS3 authority? Public authority? Smart Silver Lab?	Responsible for platform governance	<ol style="list-style-type: none"> <li>1. govern platform life cycle (incl. contracts, compliance, budget/costs, functional requirements management, helpdesk)</li> <li>2. Sign SLA for the project workspace</li> <li>3. Manage Service Level Agreements (SLA) with service providers</li> <li>4. Handover platform to service provider</li> </ol>
Platform architect	-		<ol style="list-style-type: none"> <li>1. Manage non-functional requirements</li> <li>2. collaborate to develop product/service</li> <li>3. Manage architecture (software, data, security, identity, ... architecture)</li> <li>4. Deploy product/service software to the platform</li> <li>5. Govern application life cycle</li> <li>6. Govern hardware life cycle</li> </ol>
Platform administrator	Platform main user (super user)		<ol style="list-style-type: none"> <li>1. Manage user access</li> <li>2. Manage feedback</li> <li>3. maintain platform</li> </ol>
HelpDesk			<ol style="list-style-type: none"> <li>1. manage contacts with service consumers</li> </ol>

**Table 9.** Roles, responsibilities and features of the DSH

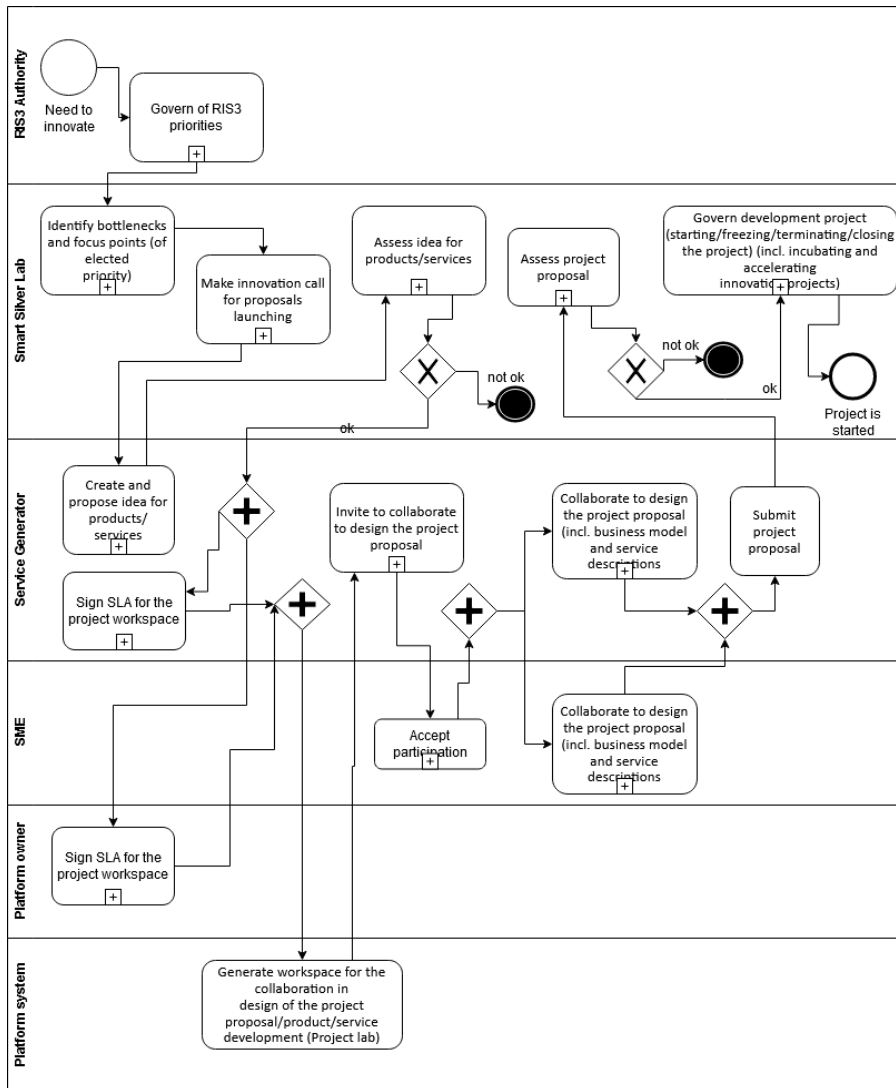
### 4.2.3 Processes Model

The following figures display suggested (not validated) processes covering service/product life cycle from ideation to maintenance. These processes are candidates to be supported by DSH.

First figure (Figure 11) presents whole life cycle. Following (Figure 12, 13, 14) are more detailed models of life cycle steps. In models BPMN is used, but not in detailed level. Main goal of these models is to present how features presented in Table 9 are connected and make process flows.



**Figure 11:** Process Map



**Figure 12:** Innovation initiation, product/service ideation and development initiation



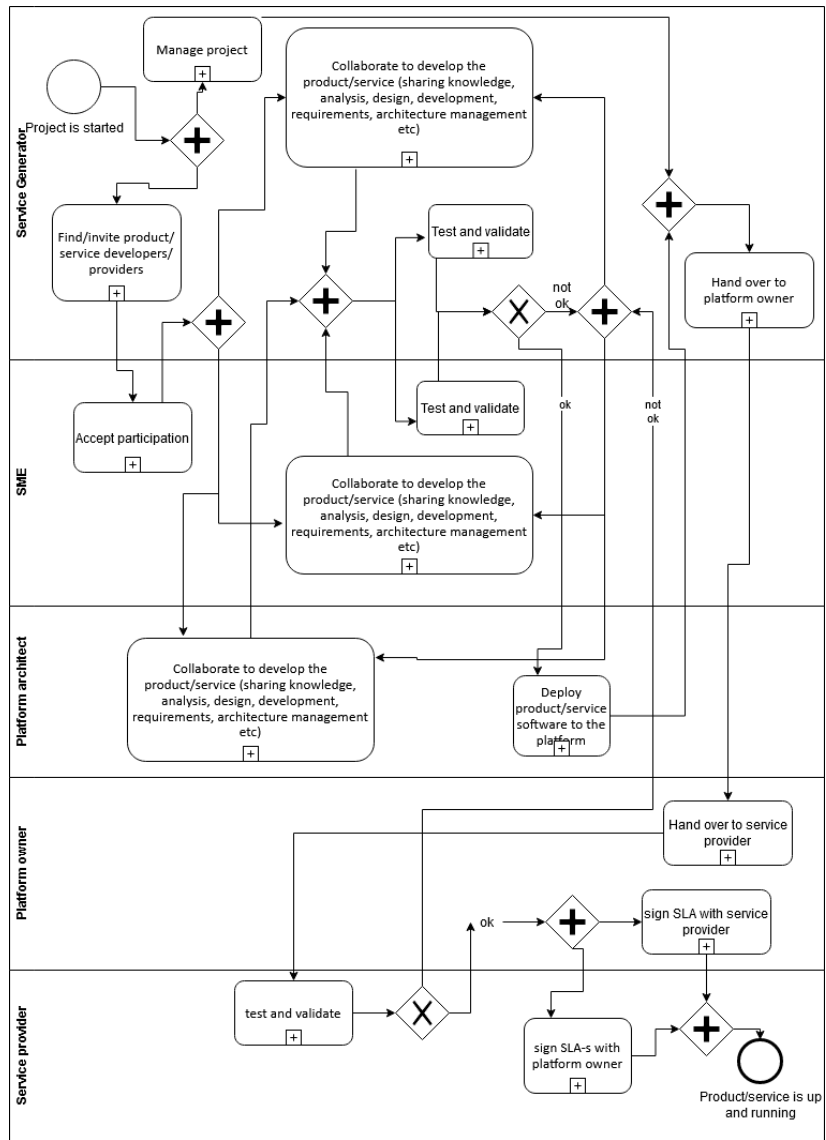
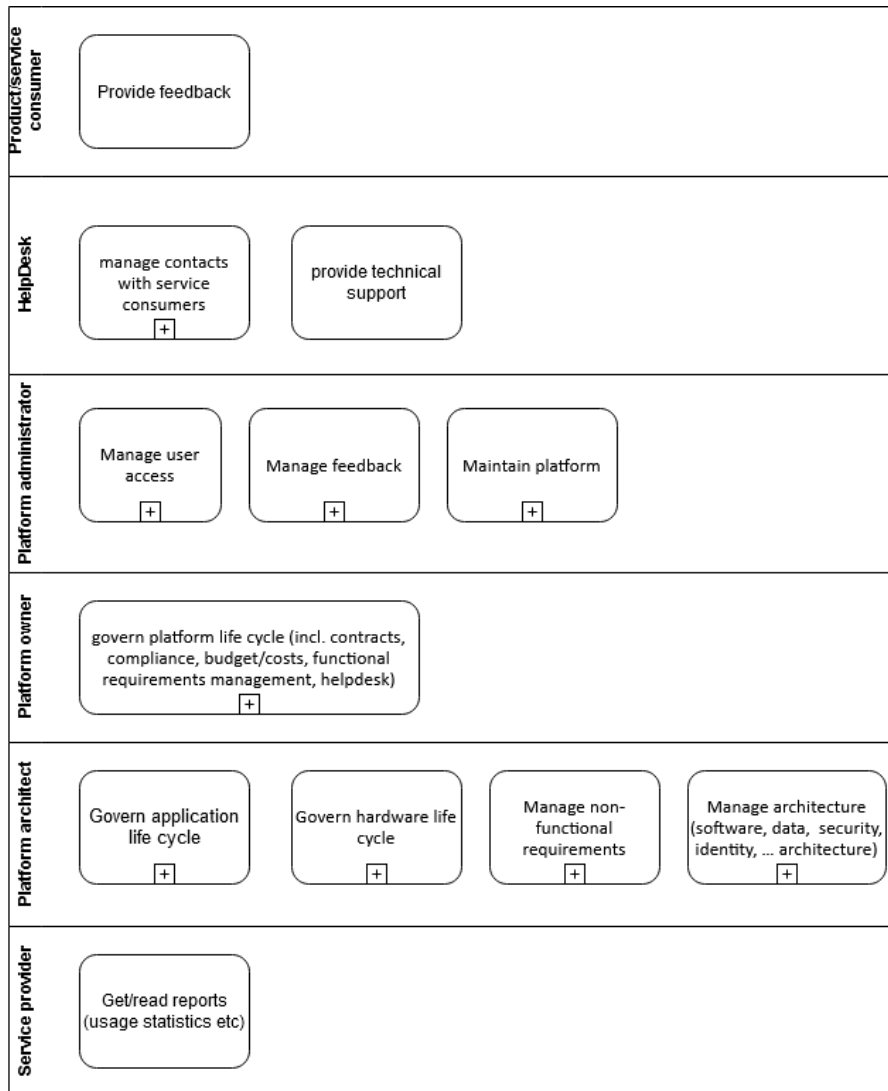


Figure 13: Product/service development



**Figure 14:** Product/service operation/maintenance

## 5 Discussion and Recommendations

### 5.1 Responses to the Research Questions

#### RQ1: How DSH can help elderly with service provision?

According to the survey results, DSH should serve as knowledge hub which should serve systematic information, employment, educational and care opportunities, and innovations can be created to help elderly people. Similarly, the study conducted by Christophorou shows that “there are several application contexts that have already been explored on

supporting elderly, (i) at the work context, by motivating them to stay productive for longer and experience better quality of work and social life balance, (ii) in the community, creating and maintaining their social contacts thus, overcoming isolation and loneliness, (iii) accessing public and private services and (iv) at home by providing needed support for specific everyday tasks and activities for stimulating their independence, autonomy and dignity”(Christophorou et al., 2016). The Christophorou’s study identified some ICT services which are more useful, effective and suitable to be developed in an ICT system for elderly support (Table 10). Christophorou says:” First, we performed an analysis of the relevance that these services have to the QoL of end users. Second, the technical feasibility, technical constraints and the risks associated to the development of the services was assessed. Finally, selected services were built in a prototype system and evaluated with real end users.” (Christophorou et al., 2016)

Service	Description
<b>S01. Contact Assistance</b>	Assists the elderly to create and maintain a contact list, view their contact details and means to communicate.
<b>S02. Messaging</b>	Enables the management, organisation and communication of messages between the users. It facilitates communication, between the elderly, his/her contacts, and other users of the system.
<b>S03. Shopping Assistance</b>	Assists the elderly to create (by adding or removing items) a suitable shopping list and send the list to the (informal) caregiver to buy the missing items.
<b>S04. Medication Service &amp; Reminders</b>	Provides medical information related to medicine associated with an elderly such as name, description, dose, frequency that a medication should be taken and route of medicine. Based on this information the system reminds, at a set times, the elderly to take his/her medication.
<b>S05. Wake-up Calls</b>	Assists the elderly to set the wake up alarms at a specific time they want to wake up (can be set for a day, weekends, weekdays etc.) and trigger the alarm clock at the specified times.
<b>S06. Periodic Advice</b>	Provides periodic advices, written by caregivers, or animators, that are periodically provided to the elderly by the system to improve the health of the elderly.
<b>S07. Fall Detection &amp; Alerting</b>	Detects a fall event of the elderly and alert the appropriate persons (emergency contacts) in case of need.
<b>S08. Dangerous Objects Adviser</b>	Detects dangerous objects, e.g. on the floor that could potentially cause injury. Warns the elderly for obstacles, reducing the risk of fall.
<b>S09. Dangerous Situations Adviser</b>	Reminds and warns the elderly of dangerous or highly risk activities/situations that can result an injury. For example, if the system detects that the elderly is preparing a meal, after cooking it reminds him/her to switch off the stove/oven.
<b>S10. Call for Help &amp; Alerting</b>	After a ‘Call for Help’ voice command from the elderly, the system alerts the appropriate persons (emergency contacts) in case of need.
<b>S11. Windows Monitoring</b>	Monitors the windows and reminds the elderly, after they wake up in the morning to open the windows for having fresh air, and close the windows before they go to bed, if the elderly forgets it.
<b>S12. Go to bed reminder</b>	Detects if the elderly is not in the bed during the night. If the user is not detected in the bed, the system suggests him/her to go to sleep (at a set time based on his daily pattern).
<b>S13. Agenda Service</b>	Keeps track of certain activities related to an elder. In particular, it provides details regarding agenda items that an elder should consider and/or attend. Also, the elderly can create social activities and invite friend or relatives to join activities.
<b>S14. Event/Group activities</b>	Provides information about events or group leisure activities organized by the institution or in the city, which the elderly can consult and subscribe to participate. It also allows the elderly to invite other members to participate.
<b>S15. Appointment reminder</b>	Reminds the elderly of his/her and pre-scheduled activities before the events begins.
<b>S16. Object Location Assistance &amp; Reminder</b>	Assists the elderly on locating ‘forgotten’ objects at home, with the help of sensors, and help them retrieve them. If the system fails in locating the object lost, it will provide reminders to the elderly where they normally put their personal items so that they can find them easier.
<b>S17. Notifications</b>	A general group of messages written by caregivers, animators etc. and sent to the elderly by the system.
<b>S18. Meal preparation Assistance</b>	Provides information regarding meals, their recipe, the ingredients, and assist/teach the elderly to prepare the meal, by providing oral guidance. Also the recipes provided to the elderly by this service consider the dietary requirements and allergies of the elderly (e.g. allergies).
<b>S19. Motivation for Physical Activity</b>	Detects if the elderly is not performing sufficient physical activity, and motivates him/her, based on his profile (e.g. physical activity preferences, health status, disabilities etc.) in performing physical activities/exercises.
<b>S20. Physical Activity Service</b>	Guides the elderly during undergoing their physical exercises. E.g. the elderly can watch short video clips demonstrating physical exercises suggested by a physiotherapist that he/she can perform at home based on his/her profile (e.g. preferences, health status, disabilities etc.).

**Table 10.** High valued ICT services for Ageing Well (Christophorou et al., 2016)

The aging process triggers new economic and social issues. Therefore, frequent attempts are made to extend the productive era of these older citizens who wish to live an engaged, satisfying and quality life in the context of integration, socialization and freedom. This can be obtained not just by constant support from friends and family, but recent developments suggest a significant position in this cycle for ICT, the private and public sectors. Since there is no such framework to gather all organizations such as: innovators, research institutions, the elderly public / private / voluntary sector, to meet the needs of the elderly population in society through ICT, DSH aims to connect different stakeholders and enable business opportunities to implement security, social, education and health care services for the aging population. Besides, DSH integrates networked operations of Smart Silver Labs, transnational accelerator functionalities and financial mechanism functionalities (Figure 15) to facilitate the marketing of innovative products or services developed using smart silver frames. This seeks to unblock national and interregional collaboration between various innovation players in order to achieve mutual goals and increase development based on an informed approach to specialization. In addition, the DSH connects companies and research organizations to generate new, innovative solutions to address ageing difficulties and exploit opportunities in the silver economy. Lastly, DSH is introducing a network that will lead to even more assisted living services for our society's elderly people and caregivers.



**Figure 15.** Integrated networked operations for the DSH

## **RQ 2. What are the main features of the DSH?**

### **Sub RQ 1: What are the different roles and responsibilities involved in the DSH?**

According to the workshops results, the DSH 's proposal is to develop a single platform to gather and connect all stakeholders from different sectors of society, all stakeholders

including the public sector, the private sector, innovators, elderly people, academic institutions and research institutions are DSH members. It will include innovators in presenting new technologies and innovations to older citizens. Elderly citizens should be incorporated as focus group of the community customer group, as well as identifying and educating the elderly of key care requirements. The public sector is also one of the participants who can provide information on the legislation and guidelines in the fields of action. Private sector can take part in the coverage of practical research results for everyday life and quality of life as 'General language' products.

### **Sub RQ 2: What are the main user stories?**

As discussed in chapter 4.2.1, one of the main outcomes of workshops was user stories which were a short and simple descriptions of a feature written from the perspective of the different actors (end-users, experts, business/innovation sectors etc.) of the DSH. Those user stories aim to explain how the DSH will deliver a particular value back to the society.

## **6 Conclusion**

Silver economy is the third largest marketplace in which the major consumers belong to the older age category, which indicates that they need and deserve more consideration than is currently being given. Integrating ICT into the silver system is complicated, as older people are typically the last to embrace and support change. Often, they are more vulnerable to reliance on others because of their limited mobility, lack of technological capabilities, social, emotional and financial needs. The findings obtained so far allow us to gain an overview of the key factors affecting the adaptation of ICT in the elderly with the described problems. As discussed above, this study is part of a larger set of research activities that will be conducted throughout the entire BSR in the coming years. The aim of this study was creating a consolidated concept of the DSH which will act as a virtual environment where various stakeholders may cooperate in innovation processes using a methodology focused on information sharing, co-creation, co-productive strategies and participatory methods to address the silver generations needs in the BSRs. In addition, the DSH will build a collaborative virtual platform where partners can create, deploy and support innovative solutions to generate economic growth by using a smart specialization

approach to support life cycle of innovative solutions to tackle aging challenges and to enhance silver economy growth opportunities in the BSR.

Regarding this study, we identified and introduced the required features, roles and their responsibilities in the DSH.

## **6.1 Future Work**

This study is part of a larger project and motivated to complete many productive future outcomes. This study can serve as the basis for the requirement engineering for the DSH in the future. This research on factors that influence technology absorption can help in each of the project's phases (Figure 16). As a future work, there will be requirement building and the system design for the DSH. The DSH will be intended at responding to the challenges of addressing the needs of aging communities currently faced by the Baltic Sea governments. The project aims to enhance opportunities for growth in the Silver Economy by strengthening the ability of innovation actors to apply smart approaches to specialization. The partners will develop and launch a Smart Silver Lab, an innovation ecosystem model, in each participating country. This model will bring together researchers, product developers, funding agencies, and user organizations into a network. This will help all innovation stakeholders to track and speed up the growth of new products and services that help elderly people to simply live a comfortable, independent, and productive life. The Digital Silver Hub will combine networked operations of Smart Silver Labs, transnational accelerator functionalities and financial system functionalities to promote the selling of new products or services provided using smart silver frameworks. The DSH interactive sharing network will incorporate six regional Silver Labs to promote transnational co-operation, training, and knowledge exchange in the Silver economy market, and to facilitate cross-border exchange of new technology and business schemes (Paola & Rosenthal-Sabroux, 2014). As a consequence, it will draw together business associates, governments (government entities), and academic stakeholders. In addition, DSH will link companies and research institutions to generate new innovative solutions to address ageing challenges and exploit opportunities for the silver economy.



**Figure 16:** Project Road Map

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