INNOVATIVE LEARNING ENVIRONMENT ARCHITECTURE HANDBOOK

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![Interreg Danube Transnational Programme D-CARE / European Union logo]

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Abstract **(for dissemination)**	A guiding document for the creation of Innovative Learning Environments in each project country comprising the main requirements and functional characteristics for an optimal deployment and operationalization
Keyword List	ILE, learning requirements, learning processes, learning ecosystems, learning actors, learning target groups

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1 Summary

Summary of regional chapters

2 Innovative Learning Environments theoretical framework

As understood in the project, the handbook is a **guiding document** for the **creation** of Innovative Learning Environments (ILEs) in each project country comprising the main requirements and functional characteristics for an optimal deployment and operationalization. Handbook can be used by other organizations from the Danube region (or other regions) to **design** and **establish** Innovative Learning Environments.

Although it is not a complex and comprehensive analysis of the ILEs, it provides useful **insights** based on the examples and practices shared for stakeholders from regions participating in the project, can serve as an **inspiration** for them, but also for other organisations from other regions, can give them some **recommendation** from lessons learnt, how to further develop and utilise the potential of ILEs for addressing the challenges relevant for regions and target groups related to Smart Care Services/Models. The Smart Care Services development and implementation is a method to provide **higher quality services** in Social Care in a more **efficient** way in the context of **ageing**, **limited resources** and **accelerating technological development** requiring new **skills**. And one of the important elements is introduction and preparation for new models.

The **sources of information** for elaboration of this handbook were: a) information provided during the first rounds of workshops with regional stakeholders and processed in technical reports, b) personal experience and knowledge of experts of project partners, c) information from literature review and other projects.

This chapter provides **conceptual and theoretical framework** as a harmonised optics we use to decompose and structure various forms of ILEs, defines the ILE, its elements, key stakeholders, presents main findings on ecosystems, and offers guiding principles for a successful designing and establishment of ILEs.

The following **country chapters** introduce a) specific conditions, key challenges, and gaps in participating regions (not universally applicable for the whole country) in relation to social services and main target groups, then b) showcases how the region tackles the challenges in the context of ILEs (the ILE architecture, key elements., what tools are used...), and c) recommendations for regional stakeholders and other regions as well.

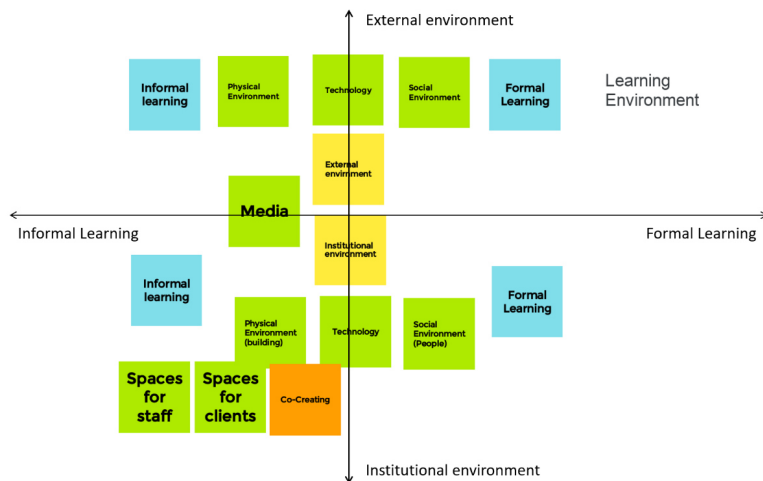## 2.1 Key architecture of Innovative Learning Environments

Regarding the learning environment, there has been a shift from a very traditional approach bound to a physical space and hierarchical position of the sources of knowledge (e.g. teachers, trainers), towards the increasing role of informal learning, digital tools and channels, collaborative approaches. There has been also a shift from knowledge building to gaining skills and competences.

The most frequent approach to the learning environment in literature is a **physical space**, analysing architecture, set up of rooms, and other physical aspects influencing learning processes (e.g. colours, light, plants….). However, we can define the learning environment in a **narrow sense as a space** (physical or virtual), where learning processes (formal or informal) occur, this might include e.g. unit (institutional level), classroom/lab, e-learning/digital space, family.

Or it can be understood in a **broader contextual sense**, which includes also **influencing factors** enabling, driving, slowing, supporting, or blocking the learning processes. This might include institutional conditions, efficiency of processes, availability of resources, economic development, cultural environment, values, attitudes like openness to new things, management styles, leadership, overall digital literacy, and many others. Also, the OECD Handbook on Innovative Learning Environments recommends going beyond a classroom and sees learning environment as **organised learning,** where in the centre there is a pedagogical core and shared learning leadership (OECD, 2017). Based on the focus, there are several types of learning environments: student-centered; knowledge-based; evaluation-centric; and community-oriented. (National Research Council, 2000; Froyd & Simpson, 2008).

What makes the learning environment innovative? The Innovative Learning Environment can be considered as an **intelligent** learning environment that utilizes the contemporary, most modern, and effective teaching techniques and tools, which in fact changes the basic methods of teaching, and practically allows learning anywhere, with any tools and devices. The learning process takes place in continuous, complex ways: we always learn in all situations, from each other, from our environment, from the media, etc…. Including the evolutionary approach, the ILE can go beyond usage of modern or intelligent tools. It might be considered as a design of a learning method within specific learning environment and for users and it is able to evolve and adapt to the evolution and change of educational practices and technology and needs (of users or society).

Figure 1: Broader understanding of ILE

Source: own processing.

Literature often uses the abbreviation ILE for **intelligent** learning environments. The latest technology development suggests a definition of Innovative Learning Environment (ILE) as Digital Technology based Learning Skills (Huda et al., 2017). This is embedded in the OECD 7+3 Framework, which should help understand potential of technology. This framework combines 7 **learning principles** and 3 **dimensions of innovations** (pedagogical core, leadership, and partnership). Although, its primary focus is at school, it can be applicable also for the purposes of our project. The 7 principles emphasize: engagement, well-organised cooperative learning, emotions, sensitivity to individuality, hard work without overload, formative feedback, and horizontal connectedness. Building them expects engagement of educators through a "spiral of inquiry", which is a structured and collaborative process for designing ILEs and leading the change. The understanding of **innovation** in this context is more general: "fresh ways of meeting outstanding challenges in a spirit of openness to disciplined experimentation". (OECD, 2017).

When defining general pillars (key architecture) of innovative learning environment (ILE), we come out of the quadruple helix concept, which reflects open, collaborative, inclusive, and co-designing principles. **ILE Architecture** is the structure and functionality of an Innovative Learning Environment for delivering and assuring durability and continuity of smart care learning processes. By this structure we mean the **quadruple helix**, which enhances the original triple helix concept (government, industry, academia) by including the civil society dimension (Carayannis & Campbell, 2009). Therefore, this model is considered to support user-centred

innovation, promotes social innovation, strengthens democracy, induces knowledge creation (Roman, Varga, Cvijanovic, & Reid, 2020).

The models can be further divided based on what aspect prevails, e.g., 1) the Triple helix + users' model, 2) the Firm-centred living lab model, 3) the Public sector-centred living lab model and 4) the "Citizen-centred model. The public centred model is close to traditional approaches and public organisation are both owners and target of the innovations, while in the citizen centred model the focus is on citizens, their needs and knowledge and they are in the heart of the designing process. (Arnkil et. al., 2010).

The **original triple helix model** elaborated by Etzkowitz and Leydesdorff (1995) reacted to the changing environment and increasing role of knowledge-based economies both in real economy and in strategic and conceptual frameworks at national level and international level (e.g. European Union) and suggested this model to be part of innovation strategies. This concept followed previous linear approaches (known as demand pull or technology push), and (co-)evolutionary and evolutionary models (Leydesdorff & Van den Besselaar, 1994). The quintuple model includes natural environment in reaction to environmental challenges.

Figure 2: Quadruple helix structure
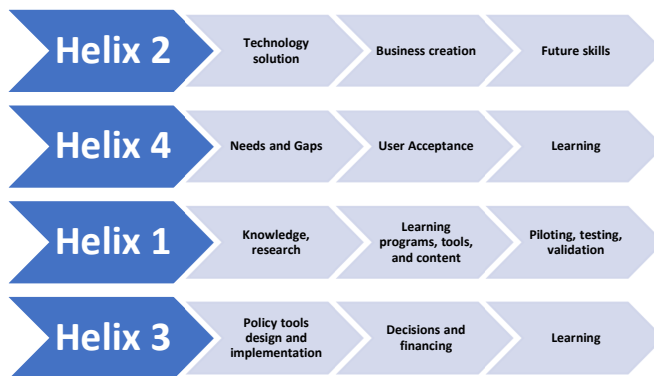
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The quadruple helix divides the whole spectrum of actors and stakeholders (universities, educational institutions and training agencies/organizations; companies (SME's and large companies) from tech sector, healthcare sector, medical devices sector, socio-medical services providers; public and private care facilities for older adults, hospitals; local public authorities and

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regional development agencies; associations of older adults, patients associations; employment agencies) into **4 major groups (helixes)**, which interact among each other:

1st Helix - Research and Education Sector: it includes organizations creating tools, content, learning programs, providing knowledge. It is composed of universities, educational institutions, training agencies/organizations.

2nd Helix - Business Sector: where belong organizations providing solutions or technologies, which are one of the main technologies and innovation drivers, but they (themselves) may need specific skills, their new products/services might require new skills, they create new (market) niches, and thus influence, what the future skills are. This group is composed of companies SME's and large companies from tech sector, healthcare sector, medical devices sector, socio-medical services providers, public and private care facilities for older adults, hospitals (if their legal entity is for-profit).

3rd Helix - Government Sector: comprising of organizations designing and implementing policy tools related to skills, digitalization, new services, new skills, new jobs. It is composed of local and regional public authorities, regional development agencies, employment agencies, national authorities (e.g., Ministry of Health, Ministry of Social Affairs, etc.).

4th Helix - Civil Society Sector: brings to the forefront other important aspects of democratic societies, emphases dialogue and interaction with various communities (not included in triple helix model). In our context it means e.g., reflecting end-user needs, and learners needs. It is composed of various non-profit organisations and groups, e.g., associations of older adults, patient associations, doctor and nurse professional organizations, sectoral non-profit organizations (clusters, industry organizations etc)

Figure 3: Functional consecutive relationship between ILE helixes architecture

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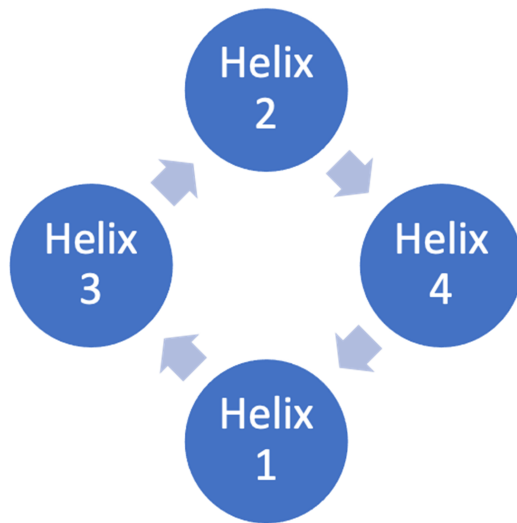
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The changes might be initiated top-down from national, regional, or local authorities, or they might have only strategic, political, financial, and supportive roles; the top-down approach might be also at institutional level, where changes and innovations are initiated by the management. Especially technology-oriented companies or even universities can stimulate supply side driven innovation. However, employees or clients (patients) and their needs might lead to innovations as well. And by the time of implementation, all these representatives interact in their (formal) roles in a more **linear and consecutive process** (need, request, offer, decision, delivery, evaluation). The co-designing process expects more human centred and collaborative and **non-linear approach**, when needs of users, customers, companies, decision makers are respected and met by involving them into the whole process and each step.

Figure 4: Functional non-linear relationship between ILE helixes architecture
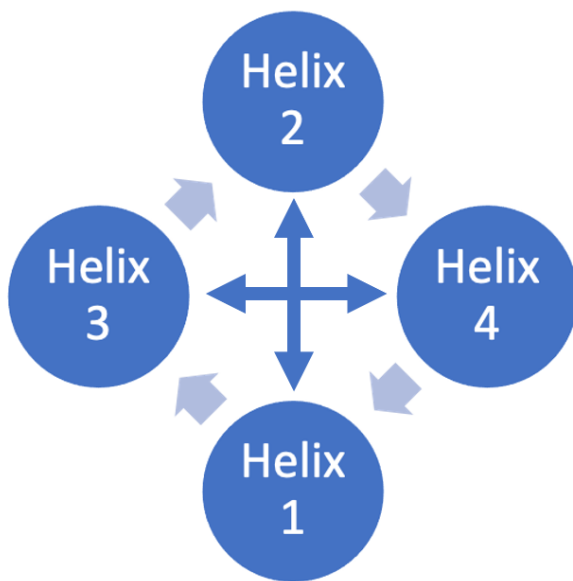
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ILE is designed and operated on the **comprehensive involvement** of learning actors (learners, trainers, companies, educational institutions, employment agencies, etc) to assure the durability and continuity of smart care learning process. In this way, learning content, tools, methodologies, and programs should be created based on the spiral of inquiry (demand of market, demand of learners etc.) and based on the learner characteristics. The ILE helps facilitate the creation, validation and deployment of smart care services. Therefore, there might be more than one ILE in each region taking into consideration different contexts and target groups.

Figure 5: Relation between ILEs and Smart Care Services within the project
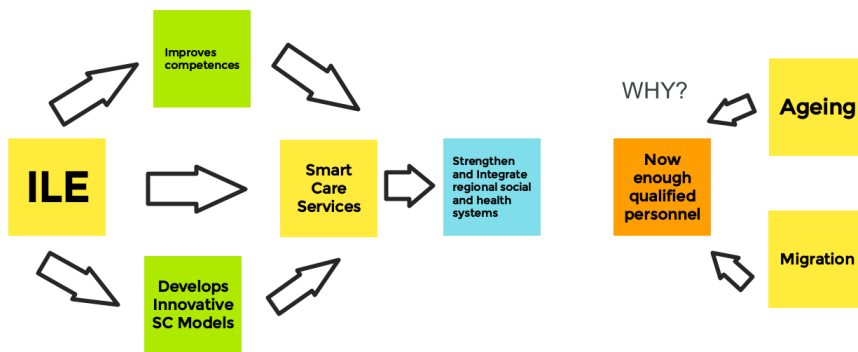
Source: own processing.

The country chapters will describe, what are the roles of the representatives of each helix in the innovative learning environment, who is the main driver, how they interact, if in a more formal and linear way, or if they use co-designing process, and if the co-designing process is an integral part of the ILE when developing and implementing Smart Care services.

2.2 Key users and stakeholders of Innovative Learning Environments

It is an indisputable fact in the contemporary societies that the population is becoming older and at the same time, the number of caregivers is decreasing. This has a number of implications for the society: the workforce pool is shrinking as the ratio between the number of older people and working population is increasing; more money goes to pensions, whereby the share of taxes decreases; the number of age-related diseases is increasing; due to lack of formal caregivers, the greater share of caregiving responsibility is falling on informal carers (EPTA, 2019). The following chapters put target groups into the context of new technology trends and connects them to the ILE.

Striking demographic trends and potential of ICT-based assistive technologies

It is an indisputable fact in the contemporary societies that the population is becoming older and at the same time, the number of caregivers is decreasing. This has a number of implications for the society: the workforce pool is shrinking as the ratio between the number of older people and working population is increasing; more money goes to pensions, whereby the share of taxes

decreases; the number of age-related diseases is increasing; due to lack of formal caregivers, the greater share of caregiving responsibility is falling on informal carers (EPTA, 2019).

Older people are a highly heterogeneous group with different preferences, needs and lifestyles. Moreover, aging is the primary risk factor for a wide range of diseases, often referred to as age-related diseases. Age-related diseases include cardiovascular diseases, diabetes, hypertension, neurological diseases, cancer and arthritis (Lopez-Otin et al., 2013; Jaul and Barron, 2017). Staying fit and healthy is an important factor prolonging work participation and ensuring a good quality of life within the ageing population (EPTA, 2019). A majority of older people prefer to stay at home as long as possible. When supported by decision-makers, industry, researchers, civil society and healthcare providers, this leads to lower costs for society compared with institutional care. The new generation of information and communication technologies (ICT)-based assistive technologies has the potential to increase quality of living, safety, wellbeing, and interpersonal relationships for older people and their informal caregivers. ICT-based assistive technologies have also the potential to contribute to active ageing in a cost-effective manner (EPTA, 2019; Dolničar et al., 2017). Especially smart health and care solutions are seen as one of the most promising opportunities for effective management of the increases in healthcare spending associated with ageing in Europe (Verzijl et al., 2018). Some of the ageing issues and needs that can be effectively addressed by ICT-based assistive technologies are (Dolničar, Müller and Santi, 2011):

- Inter-personal communication and reducing (social) isolation: One of the greatest risks in ageing is not necessarily poor health but isolation. Communication with friends, relatives, health care providers and others is crucial to healthy ageing. Advances in information and communication technologies make it possible and affordable for older adults to remain connected with important others. Moreover, a new generation of interactive and easy-to-use applications have also been developed for caregivers. Those applications ensure that their loved ones are safe and well. Health and well-being also include such activities and enjoyment as learn something new, enjoying new experiences, having fun and managing essential personal services such as transportation and meal delivery.
- Recreation and leisure: Studies show that more than one fourth of older people experience boredom. In this regard, new technologies can offer an enormous range of possibilities by allowing remote participation in leisure and entertainment activities, for example chat rooms, online games, participation in virtual communities. In addition, virtual education can offer new opportunities to older people, especially in the case of individuals who live in remote places or have mobility problems.
- Improving security: Security seems to be one of the main preoccupations of older people, particularly for those who live by themselves. These people are concerned not only with anti-intrusion alarms, but also with security related to domestic accidents e.g. fire, water and gas leaks. AT also allows older people to have a programmed set of functions for a day-to-day routine (for example, programming certain tasks before leaving their homes, such as turning off lights, locking doors, closing windows and so on).

- Solving mobility problems: To the older person mobility problems present an obstacle not only in the home but outside as well. Online shopping, online banking services and the implementation of domestic solutions that help automating some day-to-day activities within the homes of the elderly could partially solve these problems. Examples of this might be controlling the air conditioning, lighting, raising, and lowering blinds.
- Healthcare: Most older people are well aware of their vulnerability. The assurance of knowing that there is somebody who will react in case of emergency, gives older people confidence and peace of mind. However, the wish to have someone available at any moment is not only related to physical health but also has a bearing on any psychological problems deriving from a feeling of solitude. Nevertheless, there are other necessities like taking medicine, carrying out simple health checks such as testing heart rate, pulse rate and temperature or other tests related to a particular disease e.g. blood sugar analysis, measurement of blood pressure, ECGs etc. which can be done at home by using alarms and smart health sensors and devices.

Regardless of their preferences, needs, lifestyles and health, there are some characteristics, common to majority of older people when it comes to the acceptance of new ICT-based solutions, including smart health and care solutions. By way of example, Diaz-Orueta, Garcia-Soler and Urdaneta (2011) found that, when it comes to the integration of new ICT solutions in older adults' lives they do not want to depend on others but to have control of their lives and thus of their own technological devices. They also reject solutions that increase dependency and in terms of optimization of resources and costs prefer to use existing devices that have been enhanced with new functionalities rather than learning how to use new devices or technologies. Older adults may face different barriers for technology adoption and acceptance, including issues related to technology familiarity, willingness to ask for help, trust of the technology, privacy and design challenges (such as sensory problems – sight and hearing loss – or cognitive, navigation and memory issues) all of which may make technology a major challenge to learn and use (Doyle, Bailey and Ni, 2014). Peek et al. (2016) identified technology acceptance (in context of staying at home as long as possible) as being influenced by six major themes:

- challenges in the domain of independent living;
- behavioural options;
- personal thoughts on technology use;
- influence of the social network;
- influence of organizations, and
- the role of the physical environment.

Their results showed that older adults' perceptions and use of technology are embedded in their personal, social and physical context. Moreover, they found out that role of social network - children, other family members, friends, and professional caregivers, is essential in enabling older adults to use ICT-based solutions, as well as household appliances or computers (Peek et al., 2014). Nevertheless, the influence of social networks can be both favourable and unfavourable in

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terms of technology acceptance. It seems that feeling part of the same society as others and not being treated differently because of the age, is an obvious key factor for technology acceptance by older adults (Diaz-Orueta, 2020). Golant (2017) attempted to progress the prediction of factors for technology acceptance by older adults and developed a model, which proposes that older individuals differentiate three attributes of their coping options when they make their judgements: perceived efficaciousness (usefulness, relative advantage), perceived usability (effort expectancy) and perceived collateral damages (unintended harm). His model claims that more positively older people evaluate their coping options, the more likely they will adopt them.

Despite the growing body of evidence about positive effects of ICT-based assistive technologies, including smart health and care solutions, many EU countries are still in its infancy or in the introductory stages of their adoption.

2.2.1 New technologies and specific groups of older adults

The group of older adults is too general and needs to be decomposed into smaller groups with specific dominant needs and then addressed. This subchapter therefore describes two selected subgroups: i) older adults with cognitive impairments, ii) older adults with chronical conditions. In both cases, there is a special emphasis on ICT-based assisted technologies.

2.2.1.1 Older adults with cognitive impairments like Alzheimer or dementia

Dementia is an umbrella term for several diseases that are mostly progressive, affecting memory, other cognitive abilities and behaviour, and that interfere significantly with a person's ability to maintain the activities of daily living. Alzheimer disease is the most common form of dementia and may contribute to 60-70% of cases. Other major forms include vascular dementia, dementia with Lewy bodies, and a group of diseases that contribute to frontotemporal dementia. The boundaries between different forms of dementia are indistinct and mixed forms often coexist (WHO, 2017a). At the moment dementia affects around 50 million people worldwide, and these numbers are expected to increase to 75 million in 2030 and 132 million by 2050 (WHO, 2021).

There are several different typologies of stages of dementia and Alzheimer's. Some define three general stages: early, middle and late, sometimes referred to as mild, moderate and severe. Others distinguish between the five stages of the disease: preclinical Alzheimer's disease, mild cognitive impairment (MCI) due to Alzheimer's disease, mild dementia due to Alzheimer's disease, moderate dementia due to Alzheimer's disease and severe dementia due to Alzheimer's disease. Sometimes dementia is described with seven stages: no impairment, very mild cognitive decline, mild cognitive decline, moderate cognitive decline (early dementia), moderately severe cognitive decline, severe cognitive decline (middle dementia) and very severe cognitive decline (late-stage dementia).

In the D-CARE project, we refer to older adults with dementia of maximum third stage – mild/early stage dementia with moderate cognitive decline. In the mild dementia stage, people may experience (Mayo Clinic, 2021; Alzheimer's Association, 2021):

- memory loss of recent events (e.g. forgetting material that was just read);
- difficulty with problem-solving, complex tasks, sound judgments;
- difficulty in organizing things and making plans;
- changes in personality, including wandering and repeated questioning;
- difficulty in organizing and expressing thoughts (e.g. coming up with the right word or name);
- getting lost or misplacing valuable object.

Dementia and ICT-based assistive technologies

Smart health technologies that have been developed to support people with dementia and their informal caregiver are aimed at improving care and reducing the levels of burden and stress the older person and caregiver experience. However, Guisado-Fernandez et al. (2019) argue that more work is needed on smart health technologies to fully achieve their potential for use in dementia care.

In the literature, little is known about how assistive technologies are used by people with dementia and their caregivers (Gibson et al., 2018). According to Sanchez (2017), the main challenge and difficulty to overcome concerning technology designed for people with cognitive disabilities is the preservation of personal autonomy, since there is a thin line between improving and limiting individuals' lives, as opposed to compromising their privacy and freedom given the potential to overlook their dignity and integrity. Consistent with van Hoof et al. (2007), a simple instruction list for the development of technologies for people with cognitive decline and dementia should include ICT that (1) minimizes new learning, (2) looks familiar, (3) does not take control away from the user and (4) keeps user interaction to a minimum (unless supporting user interaction is the goal of this technology). The study exploring factors that facilitate the use of technology in daily life of people with dementia (Riikonen, Paavilainen and Salo, 2013) found out that a well-functioning social network is essential in integrating technology into daily life of people with dementia. The role of the significant others is to encourage, guide and receive alarms. Timeliness is another important factor. Active technology is indicated in the early and to some degree in the moderate stage of dementia, after which passive technology is recommended. The period of crisis relating to onset of the syndrome is not an optimal time for intervention. Thirdly, attitudes and motivation of the affected persons and their social networks greatly affect the incorporation of technology in daily life. Guidance is another important element in successful introduction of technology. All members of the network should participate and the guidance should be continual, repeated at suitable intervals (Riikonen, Paavilainen and Salo, 2013).

2.2.1.2 Older adults with diabetes, cardio-vascular diseases and other chronical conditions

Aging of the population and increasing life expectancy are significant drives of the diabetes epidemic. Diabetes is a serious disease, one of the leading causes of death in the world and affects many older adults. The prevalence of diabetes among older adults aged 65 or more in the United States varies from 22 to 33 % (Kirkman et al., 2012). Worldwide, one out of five older people has diabetes and one in two adults living with diabetes is unaware of the condition (IDF, 2019). The most common type of diabetes among older adults is type 2 diabetes, which is clearly linked with increasing rates of overweight and obesity, inactivity and family history of diabetes (NIH, 2021). Symptoms may include tiredness, increased hunger or thirst, weight loos, blurred vision ... and are often interpreted as the consequences of the aging process. Over time, diabetes can damage the heart, blood vessels, eyes, kidneys, and nerves. Adults with diabetes have a two- to three-fold increased risk of heart attacks and strokes (WHO, 2020a). Diabetes may lead to cardio-vascular diseases, which are the number one cause of the death globally and cause annually more deaths as any other cause (WHO, 2017b).

Cardio-vascular diseases are a group of disorders of blood vessels and heart and they include (WHO, 2017b): coronary heart disease – disease of the blood vessels supplying the heart muscle; cerebrovascular disease – disease of the blood vessels supplying the brain; peripheral arterial disease – disease of blood vessels supplying the arms and legs; rheumatic heart disease – damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria; congenital heart disease – malformations of heart structure existing at birth; and deep vein thrombosis and pulmonary embolism – blood clots in the leg veins, which can dislodge and move to the heart and lungs. The most important behavioral risk factors of heart disease and stroke are unhealthy diet, physical inactivity, tobacco use and harmful use of alcohol. The effects of behavioural risk factors may show up in individuals as raised blood pressure, raised blood glucose, raised blood lipids, and overweight and obesity. Moreover, age play a vital role in deterioration of cardiovascular functionality, resulting in higher risk for cardio-vascular diseases (Rodgers et al., 2019)

Besides dementia, diabetes and cardio-vascular diseases, older adults are also at risk of developing hypertension, other neurological diseases, cancer and arthritis.

Older adults with chronical conditions and ICT-based assistive technologies

As already discussed, increasing number of older adults are living with one or more chronical conditions which also results in diminished ability to remain independent and live on their own. As argued by Ricart et al. (2018), current tools and strategies are not well aligned to providing high-quality health care to this segment of ageing population. Therefore, there is a huge need for improvement in the areas of health care, services and support, such as resource allocation, service

delivery, continuity of care and chronic disease management for the older adults (Ricart et al., 2018).

With the use of assistive technology and smart care solutions, older people with chronical conditions, including dementia, diabetes and cardio-vascular diseases, can be encouraged to stay at home longer and live autonomously and independent, and to postpone the need for institutional care. Telehealth technologies that can be understood as subtype of smart health solutions digitally connect older adults with care providers, health education, and emergency services. They allow them to interact with health professionals through various interfaces, for example teleconferencing. This enables health care providers to assess a patient's health condition at a distance and allow remote diagnosis (Garcon et al., 2016; Thomas & Applebaum, 2015). Moreover, telehealth may improve the experience of care for care recipient in several ways. For example, the familiar environment, comfort and convenience of individual's own home is much more appealing than the hospital or care facility. This is also much more convenient option for older adults being homebound and to those for whom the logistics of travelling is burden (Osborne et al., 2018). Home telehealth may also significantly improve the experience of care by facilitating communication. These benefits comprise creating a direct connection to care providers, friends, and family, as well as providing a sense of security via electronic safety alerts that are routed to an appropriate agency. As argued by Osborne et al. (2018), the potential benefits of dampening the social isolation experienced by many who are chronically ill, as well as the empowerment of self-management and independence, should not be understated. Also, we should not ignore the care costs reduction on system level and on the level of individuals and families.

Nevertheless, the adoption rate of newer smart technologies is low in comparison to traditional assistive devices (Lee, 2014). There are several potential explanations for this observation – relative affordability of basic assistive devices (Garcon et al., 2016; Schulz et al., 2015; Wolff et al., 2005), awareness among caregivers and receivers of such devices, ease of use, perceived use value, and their coverage by health insurance. To sum up with, cooperation between researchers, businesses, and policy makers is needed to design and implement effective smart technology solutions for people with chronic conditions and their caregivers (Guisado-Fernandez et al., 2019).

2.2.2 Healthcare professionals

The success of any telehealth or other smart health and smart care related program depends on user acceptance. In the case of technologically enabled home (health) care, the end users are varied, and include patients, caregivers, support staff, and administrators (Cimperman et al., 2013). To be successful, the solutions must meet the needs of each major stakeholder.

Nurses and physicians are regarded as the most important gatekeepers for ICT-based health services, who play direct role in the implementation and diffusion of those services. Moreover,

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health professionals can determine the success or failure of the implementation of new solution in healthcare. Healthcare provides are those who often inform patients/older adults and their caregiver of available solutions and users' acceptance of those solutions often depends on provider's willingness to offer the service (Whitten & Mackert, 2005; Chen, Jones & Moyle, 2019).

The study conducted by Asua et al. (2013) in Spain, showed that healthcare professionals in primary care have the intention to adopt ICT-based health services for monitoring of chronic patients. The compatibility of the service with clinical practices and its perceived influence are seen as the most prominent factor in the healthcare professionals' intention to use it. These results are similar to results obtained by Gagnon et al. (2012) and Orruno et al. (2011). The study conducted in nursing homes (Chen, Jones & Moye, 2019) revealed that personnel working with residents with less complex healthcare conditions that require less assistance with their healthcare conditions and activities of daily living are not so keen to the adoption of new services in contrast to those with higher care burden and insufficient time to interact with resident. Technology should be also easy to use (Grood et al., 2016). Another important aspect of accepting ICT-based health services is provision of training and availability of adequate technical support. Healthcare professionals are not keen to new technology when it requires changes in their everyday practice (Asua et al., 2013).

Most frequently mentioned barriers for the adoption of ICT-based health services among healthcare professionals are threatened clinical autonomy, cost and liability issues, unwillingness to use new technology and lack of adequate training. Professionals also reported concerns regarding confidentiality and privacy of the data gathered by the systems. Also, they are less willing to use the technology if rules surrounding reimbursement and liability are not determined in advance, if their workload is too big and the time needed to learn how to use the system is too long (Grood et al., 2016).

Cimperman et al. (2012) propose that marketing interventions on promoting ICT-based health services should focus on healthcare professional in the scale-up process, using them as social agents. Moreover, effective uptake of ICT-based health services may be facilitated by tailoring to the individual's knowledge of the technology itself and the use of follow-up sessions for healthcare professional and on-site experts to support their use of those services (Grood et al., 2016).

To sum up with, the positive attitude of the healthcare professionals, altogether with positive attitude of patients, are the most prominent factors for the adoption and the acceptance of new ICT-based health services and solutions in health and care.

2.2.3 Low-qualified people and older (unemployed) workers

There is no consent at which age person is described as "older", but in research and policy, 50 is the point most commonly used for person to become "older worker". At this point (UKCES 2011):

- Labour market participation rates begin to fall;
- age discrimination is more frequently reported (especially in recruitment practice);
- individuals' growing awareness of approaching retirement affects motivation to work, and career decisions.

Most often, two groups leave the labour market between 50 and 59: the low paid and skilled, driven out by redundancy and ill health; and the highest paid opt to retire to pursue other interests. Another important driver to leave the labour market are caring responsibilities. Many people, mostly woman, leave their job to take informal care of older person. Between 60 and 64 most people leave, though average retirement ages are rising. Those remaining are increasingly likely to be working part-time, in low skilled work, in professional or managerial roles, or in skilled trades. After 65, the workforce is increasingly concentrated in a few sectors. With age the proportion, though not the numbers, in self-employment rise, though this is often through necessity rather than choice (UKCES 2011). According to OECD skills strategy (OECD, 2010), skills development can be viewed from life-cycle perspective of building, maintaining and improving skills, with three essential stages: children, young people and mature and older workers. The latter are in the stage of maintaining and upgrading existing skills and gaining new skills while also certifying the skills and competencies acquired in the working life. As argued by OECD (2010), complementary policies are needed to keep older workers in productive employment.

In almost all countries, there are large differences between older and younger people and between the less and more qualified. Recent study showed that low-skilled workers are more at risk from displacement by robots that higher skilled workers. It seems that technology development is being more beneficial for high-skilled workers that low-skilled workers (World Economic Forum, 2020). For example, technology is making doctors even more efficient and effective at treating patients, whereas on the other side, low-skilled workers can be substituted with machines more easily (Allas et al., 2019).

The priorities that should be taken into account by policymakers in relation to older employees (and unemployed) are (UKCES, 2011):

- policy assurance that funding and institutional incentives support extending working life;
- recognize diversity among different age groups, firms and sectors;
- making work more attractive by increasing flexibility and strengthening intrinsic, social and financial motivations to work;
- reducing negative incentives, including poor performance management and changes which increases stress;
- raising awareness of the implications of demographic change, and of the risks for those who do not continue to learn and adapt;
- demonstrating value to employers for both, employing older workers and investing in their skills;

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- strengthening careers advice to enable people to make informed decisions about later career and retirement;
- developing systems for early diagnosis of problems which lead individuals to leave work early.

In the literature, there is no specific information available on the low-qualified people and older unemployed workers in relation to new ICT-based assistive technologies and services and their adoption. Therefore, key points on how to address and teach them in relation to those technologies and services will be delivered during the project.

2.3 Main findings regarding smart care and learning eco-systems in project regions

2.3.1 Romania

Key highlights relating to smart health and care in the region

In Romania, in the field of smart health and care the following weaknesses were identified: the research and development system are underfunded; the Romanian labour market is disrupted by socio-demographic problems such as growth, natural negative population and the high level of emigration; culture for innovation, generated by the fear of failure; there are problems in education and training systems; low-user adoption rate of ICT-supported solutions.

In order to implement smart health and smart care, it is imperative to develop applications that can support treatment application manoeuvres, devices that can support treatment plans, including in the area of medical recovery not only in the area of clinical care.

Some of the important findings from Romanian stakeholder workshops are:

- All the stakeholders consider that it is important to stay connected and pay a lot of attention to networking.
- Lack of funding is a huge impediment in developing new smart programs to help the elderly population from the North-East Region of Romania.
- With few exceptions, stakeholders think that there is not enough support for innovation and not enough cooperation between different innovative organisations.
- Stakeholders see a great potential in e-learning in the field of smart health and care especially in the COVID-19 pandemic situation.

Key highlights relating to learning in smart health and care

The Romanian stakeholders would like to gain additional information and knowledge from the experts from other countries on: understanding end-users; knowledge transfer across different disciplines; transferring innovations into use; examples of good practices; networking; social context of smart health and care services development and use.

In relation to learning, stakeholders in the region pointed out the following issues:

- Regarding the development of innovative learning environment, it is possible to identify the possibilities of transferring e-knowledge to older people.
- Other organizations recognize the need to: learn about good practices, expand the offer and promote ICT learning among the elderly; understand end-users; introduction of innovative thinking (innovative toolkits) and innovation.

2.3.2 Hungary

Key highlights relating to smart health and care in the region

Priorities that should be taken into account in the field of smart health and care in Hungary are: implementation of smart solutions and digital support for care workers; trainings among specialists working in social and health care; and actively involving families in accessing smart devices and training on their use. Hungarian stakeholders identified the need to equip users with the knowledge and confidence in relation to new instruments and methods and the need to continuous exchange of information and experience among users. Training programs should be tailored to the demands of target groups.

Main shortcoming in the field are:

- The problem: lack of funding and fear from change.
- Developments implementable from tenders, but there is no funding to maintain their implementation any longer.
- The economic sector has a very simple way of thinking: cost-benefit. If we cannot present this, we will not be able to implement anything.
- Offices are generally anti-innovative; changes can be achieved at the local level only with great difficulty.
- Legislative obstacles. E.g., an institution does not receive a permit, e.g., for a small development significantly increasing the efficiency of care: transfer from paper-based to digital logging.
- The issue of a permit for innovation is stuck between public procurement and GDPR.
- Lack of standards and a long-term strategy.

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Key highlights relating to learning in smart health and care

No educational material, learning environment can be developed without exploiting the process and motivations of learning. For this, it is important to get to know the target groups':

- learning habits, willingness,
- motivation,
- digital competence level,
- their possession of the technology.

It should be treated as a fact that the learning habits and processes of their previous life phases influence their current attitude in acquiring new knowledge. Many have bad experiences with the mode of accountability; therefore they are not much willing to learn and avoid the learning options which end in taking an exam. Therefore, learning methods need to be applied where success experience is ensured, by which motivation for learning can be maintained continuously. A potentially good tool for this is the 'micro learning' method. Its essence is that the person should receive always only as much information that does not avert them. Dividing the knowledge into small chunks of education materials, the knowledge can be operated much more efficiently. The education materials should be shrunk and made attractive. Another possibility is to ensure multi-channel learning paths. People must be allowed to obtain easily and quickly information of adequate depth that corresponds with their interest level beside the basic education material. The middle and older age groups prefer to study from books or paper-based notes. For them, a transfer is needed from traditional to digital learning methods and devices. E-learning must be started with developing the digital base competence. Harmonisation of the combination of personality and digitisation is an outstanding task for the developer. The lesson from the settlements of the case study is that the elderly learns the use of smart devices and digital technologies on three main channels: (1) courses and study groups organised by the municipality; (2) within the family, primarily grandchildren; (3) the manager in charge of the social care organisation. The elderly care organisation primarily learns the use from the smart solution company, then train the trainer who conveys knowledge to the other members of the organisation.

2.3.3   Czech Republic

Key highlights relating to smart health and care in the region

Smart Care should be part of the integrated care and support approach, which should also include assistive technologies. Of course, the client and his family should be at the centre of the integrated care. Discretion and intuitiveness are mentioned as the important aspects of Smart Care. The smarter Smart Care is, the less users should see it as intervention. Further, participants understand and see smart care through specific tools, such as emergency buttons for seniors, smartphones, motion monitors, smart watches (negative experience due to discharging), or online tools that provide information how the caregiver should behave in a certain situation, or web portals where people can consult their health status online. E-recipe was also mentioned in connection with smart care. There is a National Telemedicine Centre in Olomouc which

researches, develops and implements specific technologies in all areas, including legislation. Another workplace which focuses on telemedicine is in Dresden at the Technical University, which is near the Ústí nad Labem Region. Telemedicine care is used, for example, for patients with diabetes or cardiovascular diseases and who use specific devices that send collected data directly to their physician.

Smart care is also seen as a "coherence or interconnection of care" within the particular community. The level of awareness of smart care seems to be inefficient. Smart care proves to be problematic for the target senior group. Smart services already provided in the past, have proved to be problematic in terms of technical equipment used by seniors, but also due to their inadequate knowledge and skills which are necessary to use these technologies properly. It turns out that about 1/3 of seniors is willing, able and enthusiastic to use these tools, 1/3 of seniors remains in the state quo - they use devices they are used to, and 1/3 use only personal services. Therefore, education in the use of this technology should take place in parallel.

As for the target group of unemployed people who need to commute over long distance to get the service, communication via mobile phones maybe beneficial. This would provide savings for clients (commute fees), but it would also reduce the level of stress - a safe and calm environment, allowing them to get acquainted with job offers and then they can address specific issues with the worker.

According to the participants, a specific coordinator is needed at specific localities (urban versus rural areas) who is familiar with the specifics of the region, knows the possibilities offered by smart care and may introduce them to individual providers of care services and who has experience with the needed implementation. Without a person with this expertise it is difficult.

Smart care is closely linked to ethical issues. It includes privacy not only of clients but also of providers. Technology can provide many benefits, but it can also be misused. It is therefore important to build trust in users of this technology.

Key highlights relating to learning in smart health and care

Among the most common reasons that have been mentioned as educational retarders in the field of smart care are those that are mentioned in professional literature and by experts with regards to routine educational activities. This is also the reason why the issue was not seen clearly by the respondents and was rather blurred as they linked their experience to education in general - without specifically defining smart care. However, the most frequently fact mentioned by almost all participants both in terms of practical and theoretical sphere, was the absence of a unified information system - a base where it would be possible to obtain information about educational events or projects including professional and educational project focused (not only) on smart care. Those interested in education must therefore rely on their own efforts, references and recommendations provided by colleagues or superiors, and on personal knowledge and erudition in finding educational opportunities in the virtual space. Another interesting fact was the influence by local environment.

In smaller cities located father from the centre of educational events, mainly away from the capital city of Prague (if we consider an educational form that requires a physical presence), the offer was seen as inadequate - not in terms of frequency, but in terms of other influencing factors, especially financial issues. Financial factors do not always refer to fees paid for course, but also additional costs such as travel, accommodation, allowances, etc., which can significantly increase the total cost and may therefore significantly limit the number of employees who can participate in the event, even at the expense of other educational events organized for a wider range of workers.

This goes hand in hand with the fact that equipment is necessary in order to apply experience and knowledge to the common environment and real life. The need for equipment may significantly exceed even the capabilities of the founder and operator (monitoring systems, smart bracelets, watches, etc.). In parallel with this area, we can identify other factors that negatively affect the education of employees within the system which focuses on the increase of their usability and strive to expand and reach their work (job flexibility).

Another interesting area is the targeting of the effects of educational events and the definition of actors who should be part of the natural educational environment. According to the respondents, educational events should not only be aimed at employees who are in direct contact with the client, but also at their founders, so that they themselves can be aware of the complexity of the work and the conditions of implementation. At the same time the clients themselves were mentioned - saying that they should be able to work with smart care tools, including their family members. Another identified educational group represents persons who are members of a multidisciplinary team not only within their workplace, but also within the relevant cooperating organizations and institutions (state administration and self-government units, non-profit organizations, registered associations, self-help groups, medical institutions, educational institutions, other community organizations).

Respondents mentioned that it is very important to see and feel the needs of the target group on whose development the actual functioning and educational process of employees is focused, and it is necessary to apply and initiate an individual approach which is adapted to their current possibilities (support maps).

As for the teaching point of view, the professional erudition of the lecturer was not always emphasized, but instead the ability to navigate through the practical environment or reality, allowing interchanging of roles between the educator and the educated (a typical feature of andragogically oriented educational systems) in order to achieve a higher effect of an educational event. As mentioned above, the current "trend" which follows the epidemiological situation is an online education, which, despite its undeniable positives (cost savings, the ability to adapt teaching to certain time schedules and priorities, etc.), is not seen by all FG participants as the ideal idea of an educational event. "Shortcomings" are mostly perceived from a subjective point of view, but are also the reflection of the generally presented reality. The following was mentioned: lack of concentration during the educational event - when I am physically present at the event, even though the content does not appeal to me or it does not inspire me, I am usually aware and am able to listen at least. When online, and if I am not interested in the lesson, I tend to

do my other work and therefore do not pay 100% attention to the relevant event. This is usually caused by an excessive amount of administrative or other work within the job. Another limiting aspect is the technical complexity of the equipment needed for online teaching - poor quality software, hardware, weak or fluctuating internet connection, or spacial requirements (undisturbed space).

2.3.4 Germany

Key highlights relating to smart health and care in the region

A recommendation for action was formulated by BioLAGO and Gründerschiff in collaboration with regional partners. In the first step, it facilitates a concrete implementation within a manageable period of time which may be extended later on. The implementation should start with telemedical monitoring of one medically relevant clinical picture which then might be supplemented by further parameters. New technologies of services do not necessarily have to be developed as existing digital solutions can be used and, if necessary, supplemented by new tools and processes. In order to pursue the goal of better health care, recommendation for action firstly focuses on one municipality in the district of Constance. The implementation is intended to serve as a pilot project which then might be extended to other locations.

Key highlights relating to learning in smart health and care

Senior citizens in the Lake Constance region show very different levels of digital literacy. This is vital as this aspect must be considered in all following steps of this project. Furthermore, the different reality of life which is faced by senior citizens including their age, housing environment, health and medical conditions, doctor-patient relationship, mobility etc. have to be taken into account when developing solutions for them. It is of critical importance for the project that a solution is carefully chosen to please the needs of the respective target groups and that these target groups understand the benefits emerging from a change or new solution in their personal health care. Generally spoken, there is a conservative attitude towards digital solutions in Germany, therefore it is important to include the stakeholders an offer a high level of transparency regarding possible solutions and to focus on improving the quality of care.

The regional innovative learning environment (ILE) should provide tools which allow a very simple and barrier-free communication with elders, caregivers and physicians. These tools should consider different methods of learning, be able to reach people of different age groups and, ideally, should take different educational levels into account. The ILE should be open to feedback and suggestions to further develop "itself" and the solutions provided. This means that among all stakeholders linked through the quadruple-helix, solution providers are key partners in the ILE architecture, just like public authorities and research institutions. Communication with key partners should reach beyond the providing of a service to make sure that feedback and suggestions fall on fertile grounds.

2.3.5 Slovenia

Key highlights relating to smart health and care in the region

Following weaknesses related to the innovations in the field of smart health and care were identified:

- Policy. Stakeholders feel there is not enough strategies, legislation, standards, and solutions on the governmental level or political will. Smart health and care are not policy priorities. Policy was identified as a main obstacle for development and use of new ideas and services in smart health and care by stakeholders. There is no established network of the organizations operating in the field of smart health and care development and innovations. There is no sufficient collaboration between those organisations and not enough partnerships.
- Cooperation. As an obstacle, the stakeholders recognised poor cooperation between various stakeholders in the field of smart health and care and the lack of communication between them. Stakeholders involved in smart health and care in the region work with each other rarely and mostly on an occasional basis. Moreover, bureaucracy is too complicated and slowing them down. Departments that should be working together are separated (e.g. social affairs and health). Support services may not be available to everyone who needs them. New (and small) stakeholders have difficulties entering the system.
- Financial support. There are no calls for proposals targeted at developing, designing, piloting and/or scaling up smart health and care solutions. There is a lack of financial support for disseminating results of research and pilot projects and their further development.
- Low user adoption rates. Large share of population lives in rural areas which adds to the resistance towards using new ICT-supported solutions. In Slovenia, society as a whole is also quite reluctant to changes. Mistrust and fear are present at potential users, especially the elderly. Care provision is often based on informal care, whereas technology is perceived as an intruder. Another reason underlying low adoption rates is lack of information on smart solutions available for end-users. Moreover, smart solutions are often not enough user-friendly and designed without having them on mind.

Key highlights relating to learning in smart health and care

Slovenian stakeholders would like to gain additional information and knowledge from the expert from other countries on: understanding end-users-Knowledge transfer across different disciplines; transferring innovations into use; examples of good practices; networking; social context of smart health and care services development and use

Some other stakeholder emphases in relation to learning:

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- There is great potential in the transfer of knowledge to older users by young people and within the community (e.g. courses organised in libraries). COVID-19 prevented the possibility of such knowledge transfer.
- On the other hand, COVID-19 revealed the potential of telemedicine solutions. Indeed, in several Slovenian "COVID" hospitals there is a segment of COVID patients who are remotely monitored by telemedical solutions. These patients have had to learn how to use the technology in some ways, and their reactions to the technology and its use have been very positive. The patients are cooperative and the nursing staff are satisfied with the process of remote monitoring overall.
- Telemedicine was also implemented in another project (SOSTOP) and used by 40 patients. The technology was introduced by the family medicine nurses and the users were very keen to adopt the technology and learn how to use it.
- Regarding the development of innovative learning environments, it is possible to identify the possibilities of transferring e-knowledge to older people (e.g., within the activities of the secondary medical school in Postojna and various non-governmental organizations).
- The People's University of Postojna is also interested in spreading knowledge in the field of smart health and care, otherwise provides various formal and informal education for various target groups. Other organizations recognize the need to: learn about good practices, expand the offer and promote ICT learning among the elderly; understand end-users; introduction of innovative thinking (innovative toolkits) and innovation.

2.3.6 Bulgaria

Key highlights relating to smart health and care in the region

In Bulgaria, social services, especially those for the elderly are provided through the municipalities and non-governmental organisations. The role of the business is important and is facilitated by including private companies in the development of new products. Smart care solutions are often very expensive and there is a niche for development of more affordable smart care solutions which would make them available to more people.

Social providers and elderly people, users of the social services need to be provided with the specific training and skills necessary to use smart care digital tools.

The pandemic has negatively affected the end users of social services due to the social restriction measures. Social service providers and researchers in the field point out the need to provide better communication and orientation for the most vulnerable and to give priority to prevention and focus the attention on psychological health.

The practice of One-stop-shop for integrated social services is showing very good results and can be easily replicated throughout the region.

Key highlights relating to learning in smart health and care

MU-Varna has a special programme in integrated care which is taught at the Faculty of public health. The learning programme is part of the development of the social services for the support of elderly people of those with chronic illnesses, or this could well be the people between 55-80 years old as in D-CARE project.

Varna Free University has long years of experience in creating educational tools for people with special needs. Although at the moment the researched has stopped, it can be easily continued on the basis of the gathered experience.

Social workers should be taught on how to use specific software that they will use in their day-to-day work. This training might as well be provided by the company providing the software or another organisation, providing specialised digital skills training.

As to the elderly people using the services, they would also need initial training on how to use the software and what are the opportunities it provides them. The training process should include both sides – the users of the social service and the social service providers.

2.3.7 Austria

Key highlights relating to smart health and care in the region

In Austria, "smart" is understood as support for care processes by technology. By this general definition, an example sharpened the perspective: fall detection with automated alarm. Smart Care should improve efficiency, effectivity and innovation processes. Technologies at this time are already: GPS tracking and alarming (e.g. for dementia patients); fall prevention and fall detection and alarming; electronic locks and key systems (entrance control); and personal alarm systems.

General aim of Smart care shall be to allow seniors to stay longer in their apartments and reduce the pressure on care staff. Main topic in this area is not the technology itself but the acceptance of technology and the usefulness for the users. A second perspective on smart care is software to support documentation processes, such as care documentation system, that are in Austria already available in almost all care organizations. Standardization could be a topic in this context. In terms of ecosystem and innovation: It is necessary to involve stakeholders already in the development of technologies. A user centred design should be mandatory. In the same procedure, care staff should be introduced to new technologies. This could be done by co-creation workshops. A one stop shop is demanded of the ecosystem. An overview over the financing of care related technology is currently not available but is necessary. The decision to buy a smart care technology is done by the relation between acceptance, usefulness and financing. At this time, the consultation position is missing. Even for simple issues, a central contact would be requested, similar to a wound care nurse. Best practice for this are AAL showrooms of several organizations. Within this ecosystem, a warranty or quality label would be recommended. The target audience of smart care is mainly threatened by poverty. This makes the price very important. A major concern for smart care and AAL technologies is the stigmatisation of the technology. It is made for people who are not self-sustainable any more.

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Digital care documentation is already integrated in almost all care organizations in Austria. A portfolio of solutions is missing in Austria. There have been projects on this, but none were ready for a self-sustainable survival on the market. An easy installation of the technology is mandatory. It may not be possible to need a big training action of installation at the care givers. A plug and play solution is demanded.

Key highlights relating to learning in smart health and care

Learning and training should focus on the use of technology in the care process, not dealing with problems of the technology itself. Therefore, the focus of training should be similar to wound care nurses and dementia nurses. A good practice in this case are System Owner positions and Data Owner positions as key persons. Through COVID-19 a push in technology was witnessed. A fast transfer of technology in the administration and cooperation was the result. A wide usage of MS Teams is known. A lot of learning platforms were initiated. The main issue is that content is missing and not growing in the same speed. Development of this content needs resources (money and staff). A good practice are demo-videos of products on the internet. Another good practice from COVID-19 is the online prescription of medication. Concerning the outlook for the job market, two examples were mentioned: 1.In cooperation with the job market service (AMS) a care organization started to introduce long term jobless people to light support actions for disabled people. By this, they can see, if this area is interesting for them and get the offer of a further training and education in this sector. 2.The Viennese fond for social actions (FSW) started together with the job market service (AMS) a training programme for nurses and other health professionals with an intensive assessment in the beginning. This results in very low dropout rate of 5% finally.

2.3.8 Bosnia

Key highlights relating to smart health and care in the region

The introduction of "smart services in care and health" should facilitate and improve access to services, it should reduce the need to deal with personal contacts between providers and users of services and to save resources. The level of awareness about terms smart services in care and health is quite low and therefore a lot of work needs to be done to raise awareness through the presentation of concrete examples used on the regional level and in Europe.

Participants of Bosnian stakeholders meeting agreed on the need to implement a multidisciplinary approach, which however, is currently not working well. Also, important thing is networking, information sharing, the transfer of good and bad experiences and knowledge among the stakeholders. It is noted that Cluster for Research and Technological Development in the Area of Medicine and Health Care is one of the pioneer actions in this field. D-CARE is a good opportunity to promote above mentioned among main actors in Bosnia and Herzegovina.

D-CARE could produce a small guide containing free of charge applications online in smart care and smart health and deliver it to stakeholders in programme area. D-CARE is a good opportunity for the Chamber to learn more about smart care services and to initiate some negotiations with

the government and private financial institutions in order to evaluate the possibilities of designing new financial products for financing implementation of such services.

IT companies in Bosnia and Herzegovina are developing applications for health and care sectors in the country and for foreign market. Chamber of Commerce will use D-CARE to promote this sector as one of the most socially responsible and profitable at the same time.

Key highlights relating to learning in smart health and care

The biggest barriers for learning and introducing smart technologies are usually low awareness of users and care givers, as well as the change carriers in other levels of ILE.

The system of education for providers and social and health workers in Bosnia and Herzegovina needs to have provision of smart services in health care as an integral part of the curricula studied in primary and secondary education.

Some stakeholders, such as NGOs, are co-recognized as possible providers of services for non-formal education of staff to provide services to help the elderly and inform. Ad hoc projects of series of seminars have been introduced by NGO sector and supported by foreign donors.

In 21st century, knowledge is all over us. To approach it, you just need your smart phone and good will. But, some help is never bad. Such as help to create innovative learning environment by D-CARE.

2.3.9   Republic of Moldova

Key highlights relating to smart health and care in the region

Most participants of the Moldavian stakeholder meeting defined the notion of "smart care and health" in terms of interaction between various services and the use of information technologies in the situation of chronic / oncology patients, their access to quality care, meeting their needs and other services provided to the elderly.

Whether at home or in care units - smart technical solutions help healthcare staff by helping them ease their workload into their daily care routine. They facilitate the care of relatives at home and allow people in need of care to stay in their own homes.

At the moment in the Republic of Moldova innovative support in this segment is at the initiation stage.

The main goal at national level is the participation of each of the participants: from the responsible person, head of department as deputy director, executive director, researcher, trainer / teacher, doctor, student. We even determine a mixed response of trainer / teacher and head of department (head of completion section) simultaneously and responsible person, who combines trainer / teacher with medical professional and exercises and the medical profession is the consolidation for a clear mission with objectives understood by all.

Key highlights relating to learning in smart health and care

Several trainings conducted in Moldova with the support of various external technical assistance programs were identified. They included people from rural areas and those responsible for regulations in smart devices their role to provide an efficient ecosystem. Within national programs in specialized areas, such as combating smoking, promoting a healthy lifestyle, organizing activities in situations of violence, etc., there are planned actions that include several partners. The purpose of this project to have a Training Center is appropriate to the situation.

2.4 Guiding principles for designing and establishing Innovative Learning Environments

Besides the 7 principles included in OECD 7+3 framework, the following list provides hits, how to build and develop functional ILEs.

1. ILE is in its essence human centred and reflective to specific needs of users, target groups and other stakeholders.
2. ILE is open, based on inclusivity and co-designing process, where relevant actors within the quadruple helix are encouraged to participate.
3. ILE is transferable and scalable to other institutions and regions.
4. ILE is efficient in terms of addressing challenges, gaps and needs in relations to resources allocated.
5. ILE is innovative and evolving, adopting and/or creating new solutions reflecting changing environment, needs and technological opportunities.
6. ILE is safe and secure and respecting privacy.
7. ILE provides positive, enjoyable, user-friendly experience.

3 Romania ILEs establishment and deployment

3.1 Regional/country characteristics

Romania is an EU Member State located in Central Europe. It has a resident population of just over 19 million inhabitants and a surface of 238.397 km². The demographic aging continues and evolves in Romania, at January 1, 2020, the National Institute of Statistics reporting 121.3 older adults (> 65 years old) for every 100 youth (< 15 years old). Also, the difference, in absolute numbers, between the older adults and youth was at the same time point of 643.000 (INS, 2020). Romania ranks second in the EU regarding the number of older adults living with different disabilities, 80.8% of the country's older adults reporting at least one disability. Most of them, 66.7%, reported that they have walking difficulties, and 51.9% that they have vision problems (Romania ranks first in the EU when it comes to the number of older adults with vision problems). Another 46.7% reported hearing disabilities. The main causes of death in Romania are (in order): circulatory diseases, cancer, respiratory diseases, mental illnesses and behavioral disorders. Source: *Country Report Romania* 2020 (https://ec.europa.eu/info/sites/default/files/2020-european_semester_country-report-romania_en.pdf)

In what regards the number of working older adults, Romania performs quite well. While only 4.2% of women over 65 worked in the EU in 2018 (compared to the whole active population of the EU, aged 18–64), the proportion of employed older women in Romania reached 7.4%, placing it fourth in the whole Union. The ratio is positive for men also; compared to the 8.6% EU average, 10.4 percent of older men were employed in 2018 in Romania. Despite this, the proportion of older adults at risk of income poverty is still high in the country: 20% of those over 65 have difficulty making ends meet (such as paying utility bills). This may be the reason why so many of them are working.
Source: *Country Report Romania* 2020 (https://ec.europa.eu/info/sites/default/files/2020-european_semester_country-report-romania_en.pdf)

The old-age dependency ratio in 2017, defined as the number of people 65 years or older who are economically inactive divided by the number of people 15–64 years old times 100 is 26.7%, lower than the EU average of 29.9%. The old-age dependency ratio has increased from 20.7% in 2005 and 23.7% in 2010. The combination of smaller families and higher dependency ratios compromise the ability of families to cope with the expectation of ensuring the welfare of older individuals and providing most forms of needed support (2).
According to Eurostat (Source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Ageing_Europe_-_statistics_on_social_life_and_opinions) , the social interactions and leisure opportunities of elders in Romania are very close to the EU average, 19.3% of those over 65 reporting daily contact with their family members (19.2% EU average). On the other hand Romania ranks third in the whole EU regarding the proportion of elders that

could not reach any family member in the last year. This means that 4.6% of older adults didn't have any contact with their relatives in the year 2018 (Source: https://ec.europa.eu/eurostat/documents/3217494/10166544/KS-02-19-681-EN-N.pdf/c701972f-6b4e-b432-57d2-91898ca94893?t=1571047376000 . In what regards the daily interactions with friends, the situation is worse: only 4.9% of Romanian older adults reporting daily contacts with their friends.

Also according to Eurostat, Romanian older adults do not perform well regarding digital skills either, ranking the last in the EU, only 4% of them reporting having such skills. However, social media usage among those between 65 and 74 is high, 64%, compared with 34%, the EU average.

Access to health and social services

In the last two decades, the infrastructure of the health system has undergone changes significant, both in the public and in the private sector. The number of units providing medical services has steadily increased, but certain categories of units have disappeared permanently, especially in rural areas (eg rural polyclinics). In parallel with the changes in the public sector infrastructure, the private sector has expanded greatly offering alternatives for almost the full range of services and medical units. The development trends of this sector are due to the fact that the private sector can provide quality services and technical performance, being mainly influenced by the increase in demand for medical services and the development of the private health insurance segment, purchased by the population or paid by the employer. Source: WHO https://apps.who.int/iris/bitstream/handle/10665/272465/9789241513906-eng.pdf?ua=1

In 2018, there were 515 hospitals in our country, mostly in the public sector (71.5%). However, the number of public hospitals decreased from 422, as they were registered in 2005, to 368 in 2018. At the same time, in the private sector the number of hospitals increased significantly, and their typology is much more diverse leading to the need for their separate identification in public statistics. Thus, in 2018, in the private sector, 159 health units were registered, assimilated to hospitals, equipped with a small number of beds for day hospitalization, which offered day hospitalization services for a diverse range of medical specialties. The available data on the performance of long-term care services indicate high rates of hospitalization and institutionalization for care that could be provided in primary care. Self-reported unmet health needs are also high. Further data need to be systematically collected on beneficiary satisfaction, experience with providers and other patient-reported outcomes. Source: WHO Regional office: https://www.euro.who.int/__data/assets/pdf_file/0008/426383/LTC-Romania.pdf

Although most of the older people are cared for by their families and other unpaid caregivers, the long-term care system offers no structured and systematic support for this type of care. Counseling and training programs for unpaid caregivers are scarce and limited to training on daily tasks provided by social personnel.

Assessing system performance is difficult because country-level data on long-term coverage and system outcomes are lacking. However, the available evidence indicates that long-term care coverage is very low. Although data on hospital length of stay and on falls are encouraging, amenable mortality is high. Financial access to care may exacerbate this problem. There are some data on health outcomes disaggregated by sex, but information on long-term care utilization, satisfaction with care and waiting times for women and men is lacking (WHO, 2020b).

3.2 Solutions and measures leading to customized regional ILE architecture

Romanian Government approved, the National Strategy for the Digital Agenda for Romania - 2020. The document takes over and adapts to the situation of our country, the elements of the Digital Agenda for Europe, one of the seven flagship initiatives of Europe Strategy 2020.

The Digital Agenda defines the major role that the use of information and communication technology (ICT) will have to play in meeting the Europe 2020 objectives. The National Strategy for the Digital Agenda sets out four areas of action as follows:

1. e-Government, Interoperability, Cyber Security, Cloud Computing and Social
Media - field which aims to increase efficiency and reduce costs in the public sector in Romania by modernizing the administration;

2. ICT in education, culture and health - field which aims to support these technologies at the sectorial level;

3. ICT in e-commerce, and research, development and innovation in ICT - area aimed at regional comparative advantages of Romania, and backs growth in the private sector;

4. Broadband and digital infrastructure services - aimed at ensuring a social inclusion field.

Direct and indirect impact on the economy can be translated into a GDP growth of 13%, increase in the number of jobs by 11% and cut in administration costs by 12% during 2014-2020 (Romanian Government, 2020).

In a period of digitalization and the continuous evolution of technology, the North-West region in Romania speaks about software development more than any other area of the country; "we have to keep up with the new trends, regardless of age". Therefore, through the years, in Cluj-Napoca many software companies invested time and resources in digitalization programs targeted at the older adults' population.

As an example, in 2018, the program The Digital Seniors was funded by Cluj-Napoca city hall. As part of this program, over 150 seniors from Cluj-Napoca were the pioneers of the first digitization program for the older adults. They realized the importance of learning some basic information on how to work with a computer. The project brought together companies from the private sector such as AROBS Transilvania Software, Transilvania IT Cluster, Simplon, as well as from the public sector such as the Cluj-Napoca City Hall, he Social Assistance Directorates and the Elders Centers no. 1 and 2 in Cluj-Napoca (Arobs, 2019).

On the other side, The Northern-East Region of Romania is an area with a rich historical, cultural and spiritual background. The region covers traditionally a part of the old historical region of Moldavia (mainly, Western Moldavia and southern Bucovina). The economy of the North-East region is mixed, agricultural, especially towards the east, and with several industrial centres. The regional GDP per capita is the lowest in Romania, at about two-thirds of the national average. The territorial analysis of the endowment of households with computers shows that, in the region,

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only slightly half of them have a personal computer (57.8%), a level that puts the region in last place. In the region, two-thirds of people aged 16-74 have never used a computer, the value registered being lower than the national level (72.7%).

Among the possible explanations we list:

● the absence of an internet connection;

● lack of a computer / smartphone / other devices.

● the reluctance of some of the elderly to use new, modern technologies.

● lack of necessary income.

3.3 Recommendations

Smart care and health

In order to implement the concept of "smart care", it is imperative to:

● develop applications that can support treatment application manoeuvres, devices that can support treatment plans, including in the area of medical recovery not only in the area of clinical care.

● create an opportunity for the medical staff where they can practice and apply virtually different techniques, then actually on the patient.

Creating strong links between academia and business is a key concern both through clusters, which support technology transfer and help take over research results in industry, as well as through other existing entrepreneurial initiatives, such as activities spin-off and technology transfer, science and technology parks. However, the connection of universities with the industry remains weak. Research and development activities in academia are quite irregular and depend only on the funding obtained on projects and on the publishing efforts of the faculties.

Ecosystems

The relevant ecosystems for providing smart care services are organizations in the field of: health, social assistance-services for the elderly, IT sector, local public administrations, universities, NGOs in the field of care for the elderly, private companies offering services or solutions for the care of the elderly as well as all responsible services in the field and public institutions in the field of research.

There are no sufficient structures and services that ensure the development of smart care services. In order for this to be taken care of, local public structures and services should be created, developed in partnership with the private sector and civil society, to increase the degree

of expertise, resources and innovation, as well as the acceptability of the identified and proposed solutions in order to be implemented.

The main roles of assumed by various stakeholders in the ecosystem would be to:

● coordinate the services related to smart care;
● conduct innovative systems and services;
● employ qualified or voluntary human resources;
● ensure financial resources for the development and sustainability of smart care;
● increase awareness among the population about the importance of these services.

Innovations

There are no sufficient structures and services to ensure the development of smart care services. In order for this to be taken care of, local, public structures and services should be created and further developed in partnership with the private sector and civil society, to increase the degree of expertise, resources and innovation, as well as the acceptability of the identified and proposed solutions in order to be implemented. The following weaknesses related to the innovations in the field of smart health and care and subsequent recommendations are:

- R&D system underfunding -> Higher GDP allocation for R&D activities, infrastructure and human resource;
- Socio-demographic context causing disruptions in the labor market -> Development and adoption of policies stimulating immigration (decreasing bureaucracy and corruption, increasing support/financing for small enterprises) and procreation (fiscal facilities and professional support for mothers, social assistance for vulnerable groups);
- Low innovation culture -> Curriculum reform and development, including entrepreneurial education; investment in human capacity development projects providing multi-sectorial entrepreneurial knowledge and skills;
- Decreased performance of the education and training systems -> Increase investment in education and reform the education system, from human resource to curriculum and performance indicators;
- Low user adoption rates -> Stimulate IT&C solution development and adoption in public institutions and in rural areas; support wide adoption via facilities offered to customers for using the IT&C solution, widely available customer services and user-friendly apps.

Learning

The main channels and instruments for learning in the domain of smart care are the electronic methods, online learning platforms, webinars from the provider's side, and for the older people, the mobile applications combined with face-to-face learning activities in workshops, that are probably a suitable combination for their cognitive, social and medical needs. An important means for awareness would be press releases, media advertisement about research in this field, debates, workshops to explain digital techniques to the target groups.

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Covid-19 and implications to stakeholder organizations

During the pandemic, a significant part of the time was allocated to the response of the older people to the pandemic, informing the population about the measures adopted by the Government (via the Greenline), another part of the time being allocated to provide expertise in developing certain guidelines (e.g. safe operation of educational institutions). The impact of the COVID-19 pandemic is increasingly positive from the digitalization point of view, leading to an appreciation of the need for learning and consequently to the allocation of the necessary resources for the development of this sector. It was a rapid chance in activating the learning to use technology for solving problems easier through online means. However there is still a big need to develop digital skills especially among people above 55 years old.

Good pratices

In the context generated by the pandemic, when social distancing became an essential criterion, taking into account the need to respond as quickly as possible to the immediate medical needs of the population, but also to limit the risks of spreading the virus, telemedicine was one of the practices quickly by both private and state health care providers. It must be pointed out that telemedicine is not just a simple video conference, but also involves the interoperability of systems and the integration of information and data, such as the patient's medical history, the transmission of test results and investigations, and probably, in the future, the communication of electronic prescriptions and not only.

University of the 3rd Age - U3A, realized in public partnership, between Universities and the local Social Services - where its main purpose was dedicate to lifelong learning, social inclusion, intergenerational dialogue, valorisation and capitalization of human potential are just some of the key words that structure our approach. But beyond opportunities and projects, the initiative is enlivened by the idea that what is really important in any action is first and foremost the person himself, regardless of his biological age.

A good initiative could be the creation of modules for learning the seniors how to use computers and using online platforms, using the online environment in providing social services according to the capabilities / abilities of each person.

GENERAL CONCLUSIONS

● It is important to maintain connections between stakeholders and pay a lot of attention to networking.

● Lack of funding is a huge impediment in developing new smart programs to help the older adults population from Romania.

● In general, there is not enough support for innovation and not enough cooperation between different innovative organisations.

● There is a great potential in e-learning in the field of smart health and care especially in the current COVID-19 pandemic situation.
● The pandemic has highlighted the importance of smart health and care services and all stakeholders involved should recognise their development and implementation as a priority.

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4 Hungary ILE establishment and deployment

4.1 Regional/country characteristics

Hungary's population

Hungary had a population of 9.65 million in January 2021 - 52.4% of Hungary's population is female, while 47.6% of its population is male. 72.1% of Hungary's population lives in urban centres, while 27.9% in rural areas.

Demographical, economical status of elderly

In Hungary currently 26.55% of the population is aged over 60. This ratio is constantly increasing, by 2050 it is forecasted to raise up to **37,41%.**

Figure 6: Ratio of Hungarian population over 60 years old in 2020
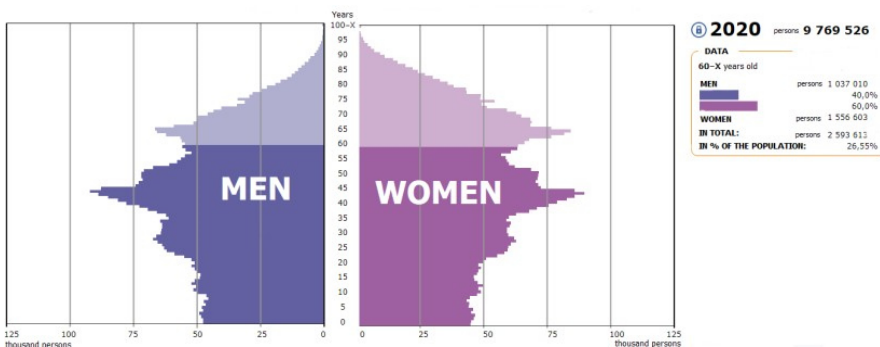
Source: National Statistics Office (KSH) - https://www.ksh.hu/interaktiv/korfak/orszag.html

In Hungary, the employment rate of the elderly is low. (Period before the COVID-19).

- It is 71% in the age group of 55-60 years.
- It is 35% in the age group of 60-64 years.
- It is only 2.7 per cent over the age of 65 (EU average: 5.8%).

Main reasons:

- age discrimination,
- health status,

- low rate of flexible employment,
- increasingly accelerating loss of competence.

Health status

It is common knowledge that the health status of the Hungarian population is one of the worst among the advanced states. (KSH Micro Census 2016).

74% of the population over the age of 65 report chronic diseases, 39% report severe musculoskeletal or sensory problems affecting their health, and 35% of them have not severe but constant health limitations (we do not have health data for the 55+ age group). Reforms to increase the healthcare workforce are in progress. In November 2018, the government rolled out a plan to increase physicians' pay 72% by 2022, and, in early 2020, announced government scholarships for 3,200 people in order to bring more Hungarians into the understaffed nursing profession. But still - in line with European status - expectation to have a huge lack of trained staff in healthcare seems very realistic. There are open positions for general practitioners in the countryside after the old doctors retire. Introducing digital tools can be a good solution.

According to PACITA research prepared in 2014, applying new ICT technologies, telemedicine can make the health and elderly care system work 20% more effective.

Care for the elderly

The necessity of caregiving increases gradually and quickly also in Hungary. 75% of people over the age of 65 (1.8 million people) live with some health limitation. However, care close to home (home care) is available only for 7% of the age group (lack of capacity and information). (Andrea Gyarmati Elderly Care in Hungary 2019.)

The number of people waiting for a place in a nursing home care is much higher than the capacity and it is growing exponentially.

The state keeps outsourcing the maintenance of elderly care. Municipalities, NGOs and, for some time, churches are the operators of the system as a task allocated by the state. The involvement of churches quickly increases in the system. Market-based care reaches only a narrow layer.

Another problem is that a vast number of people older than 65 years live alone in their homes. In 2020 the ratio in Hungary was 65%, out of which 44% were women and 21% were men. Taking care of them is another, special challenge for their families and local social caregivers.

According to a report released in 2019 the bigger part of caregivers for elderly is currently are over the age of 50. It gives an alert for another problem: within 10-15 years quite a lot of them will be retired. But only smaller number of younger caregivers take over their roles in professional elderly caretaker.

There is a contradiction situation: on one hand digital technology in caregiving can really help the caregivers' work. But on the other hand, this age group is very much against learning and using new technologies, applications in their work.

Modern healthcare technologies can be the most useful tool for caring family members of elderly (e.g. monitoring the health status from a distance).

The human capacity is very narrow in healthcare and elderly care, too. Prevention programs can be a very effective tool. Unfortunately, in Hungary there is no general health prevention policy.

Digitalization in healthcare

Technologies that make life easier for the elderly remotely or by electronic means, such as remote monitoring, remote control, intelligent technologies for well-being (cleaning robots, built-in sensors, smart homes) and widely used consumer (electronic) technologies such as desktop computers, smartphones and tablets are likely to play a key role in continuing to support the elderly in the future.

They can ensure that the elderly:

- be able to live independently (self-sufficient) and safely in their own home for a longer period of time,
- not be hospitalized or only for a short period of time and only in severe cases,
- become more social and active members of society,
- users of care and nursing programs can live in better conditions.

After years of planning and collaboration with various stakeholders, in 2017 the Hungarian government launched the Electronic Health Service Space (abbreviation in Hungarian: EESZT). It is a centralized database of patient records and health interventions with the aim of bringing Hungary in line with other countries at the forefront of digital healthcare.

The EESZT is a unified information technology environment created from EU resources with the aim of providing effective communication within the healthcare industry with the highest level of data and cyber security. The key to this is the ongoing relationship between care providers, physicians and pharmacies, so that information is consistent and accessible to all eligible participants. This means, that there is no need to visit the doctors for a prescriptions, it is enough to make a phone call or send an e-mail. Doctors can prescribe an e-prescription and in any pharmacy people or the authorized person can buy the medicine.

4.2 Solutions and measures leading to customized regional ILE architecture

Considering the above tackled challenges and gaps in Hungary the following demands could be identified:

- there is a need for introducing digital tools in healthcare,
- teaching people how to use digital tools is a must – effective teaching/learning methods need to be developed,
- access to digital tools, equipment – identifying mutual advantages together with producers and retailers (using the market competition),
- disseminating good practices and discussion about potential introduction in a quadruple helix model.
- lobby power is also necessary for changing
- A permanent and sustainable communication platform could help in spreading information and sustaining cooperation
    - with developers in order to develop learning content for different target groups and needs,
    - with local general practitioners to discuss application of different digital tools in their practice,
    - with local governments and NGOs to channel the volunteer work they offer… etc.

D-CARE's target groups are different from each other. Therefore, educational material, learning environment cannot be developed without **exploiting the process and motivations** of learning. For this, it is important to get to know the target group's:

- learning habits, willingness,
- motivation,
- digital competence level.
- their possession of the technology.

As there are various target groups in the D-CARE project, it is worth examining the needs separately in order to offer them the most efficient and most motivating instruments.

It should be treated as a fact that the learning habits and processes of their previous life phases influence their current attitude in acquiring new knowledge. Many **have bad experiences with the mode of accountability**, therefore they are not much willing to learn and tend to avoid the learning opportunities which ends in taking an exam.

Therefore, learning methods need to be applied where **success experience** is ensured, by which motivation for learning can be maintained continuously.

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A potentially good tool for this is the '**micro learning' method**. Its essence is that the person should receive always only as much information that does not avert them. Dividing the knowledge into small chunks of education materials, the knowledge can be operated much more efficiently. The education materials should be shrunk and made attractive.

Multifunctional learning environment

Another possibility is to ensure multi-channel learning paths. People must be allowed to obtain easily and quickly information of adequate depth that corresponds with their interest level beside the basic education material.

The elderly are **dependent on themselves;** getting acquainted with digital devices should start as soon as possible. The elderly learn the use of the internet and digital devices on the following channels:

- Internet and community media study group financed by the municipality from tender fund. It is a preferred method, because it is better to study in a community.
- New devices are given as gifts within the family, the grandchildren help in mastering.
- As to the alarm system, the head of the signalling system shows to each elderly one by one, in a personalised manner, the use of the device and the system. They master it easily. The staff member of Sonaris Kft. transferred the knowledge for the use of the alarm system in a 1-day training to the dedicated manager of the TÁMASZ (Support Family Assistance and Child Welfare Association) Foundation. So the manager got the training, and they will transfer the knowledge within the organisation and to the end users.

The middle and older age groups prefer to study from books or paper-based notes. For them, a **transfer is needed** from traditional to digital learning methods and devices. E-learning must be started with developing the digital base competence.

The pandemic situation brought in a number of new situations and opportunities. **Personal contacts were shifted to the online space**, which affected the teaching and learning processes alike.

Harmonisation of the **combination of personality and digitisation** is an outstanding task for the developer.

4.3 Recommendations

The development of a **platform for smart elderly care solutions** for the new needs can be considered as an innovative initiative to develop customized ILE for regional actors/stakeholders. The aim is to establish an easy-to-access and use amongst

The information, communication and knowledge transfer, latest market intelligence, information search, exchange of experiences, new methods, tools, multi-professional workshops, access to research results and age-friendly methods in usage this platform. It could serve as a multifunctional information spreading and exchanging information.

The basic idea is a webpage, a sort of repository, a library of best practices. The content would comprise of two main types:

1. digital solutions, which are dominated by technological innovation, and
2. social innovations, which would comprise of social innovations, methodologies, and other "soft" solutions.

All these solutions can be collected from the network of the consortium, and also solutions outside of our project members and ideally outside of the EU, so globally.

Every item in the dataset would be one solution, which would be defined based on certain attributes. These attributes could the anticipated benefits (e.g., cost reduction, capacity expansion, etc.), the type of organisation it might be used in (e.g., nursing home, hospital, municipalities, etc.), type of settlements it could be used in (e.g., larger cities, smaller cities) and so on. With these attributes, the elderly care institutions would be able to search for these solutions that are perfectly match with their own local context.

The **e-learning part** of the project could be linked to the application of the solutions. Another key value proposition would be of the platform, to strengthen linkages between elderly care organisations, and also connect them to private companies offering digital solutions, who can showcase their solutions in the library. When the pandemic is over, the project could offer the solutions, ready to be searched by the stakeholders.

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5 Czech Republic ILE establishment and deployment

5.1 Regional/country characteristics

Tips: Based on technical report findings, introduction to the specific context of the region (the most important aspects, not to copy everything from technical reports). It includes gaps and challenges to be tackled, needs of region according to the target groups.

Geography and economy

From the geographical and administrative points of view, the region does not have a single natural centre. The Usti Region is divided into seven districts, which further break down into 354 municipalities of various sizes, of which 59 are municipalities with the status of a town. Since 2003, 16 administrative districts of municipalities with extended powers have emerged in the region along with 30 administrative districts of municipalities with authorised municipal offices.

The Usti region is and an old mining region with strong presence of chemical, energy, and machinery industry. There was up to 36% of employees working in industry in 2019. It belongs to three least economically developed regions in the Czech Republic accompanied with various negative socio-economic effects like high unemployment (4,6% in 4Q21; CZSO, 2021b) and long-term unemployment, lower educational profile (e.g. highest proportion of people with basic education), brownfields, socially excluded localities, distraint procedures. For the regional economy are typical labour cost-oriented productions (assembly lines), with low proportion of R&D and innovation activities. In 1Q21 the average gross monthly wage in the region was CZK 33,105 (FTE), below the national average by CZK 2,180. (CZSO, 2021c)

Social and health services

A network of outpatient establishments and pharmacies provide basic health care services in the region. Acute medical care was provided by 19 hospitals with 5,315 beds in 2019. (CZSO, 2021b). The most important medical facility in the region is Krajská zdravotní, a.s., which brings together the Děčín, Ústí nad Labem, Teplice, Most, Chomutov, Litoměřice and Rumburk hospitals. After-care and rehabilitative care services was provided by 7 specialised medical facilities, with 792 beds overall in 2019.

The network of social services is composed of the basic network financed by the Ministry of the Social Affairs (through the Regional Authority) and development network, which is complementary and dependant on other financial resources (e.g. Operational Program Employment). As of 5 May 2021, a total of 743 registered social services were operating in the

Usti region, of which the largest proportion was in field social services (342), followed by services provided in outpatient form (335) and residential services (198). There were 42 retirement homes and 38 Some social services are provided in two, in a few cases even in three forms at the same time. (Usti region, 2021). Seniors are among priority groups. The emphasis is rather on field work (care services and personal assistance). In line with the country-wide documents, services support the policy objective of keeping people in their natural, home environment.

Population and ageing

The aging trend of the population has become a general societal trend. The trend is also evident in the Czech Republic, where the CZSO expects to double the number of seniors in the first half of the 21st century and 2.5 times more seniors than children in the second half of the century. The number of people aged 85 and over is expected to triple by 2050. (CZSO, 2020)

It is important for the Usti region that the pace of aging is faster here than in the whole of the Czech Republic. Seniors make up 19.9% of the population in the Ústí nad Labem Region (CZSO, 2020). Very often, they suffer from other associated handicaps, which are discriminated against within a normal open society. Although the population in Usti region is relatively stable, it is due to immigration. The average age increased to 42.4 in 2020. Ratio of population aged 65 and more to population aged 0-14 increased to 124.2% in 2020 from 96% in 2010. (CZSO, 2020)

A growing demand for services for the elderly can be expected due to a given development. And the demand can grow faster than available (financial) resources, either public or private. This will further increase pressure for effective use of resources while insuring to the scope and quality of services provided.

However, demographic developments include far broader and more interlinked changes in public and public administration, affordable housing, financing and quality of social and health care, lifelong learning, employment, social services rewards and remuneration, protection of senior rights or the functioning of public space (especially in the context of its accessibility) and the development of (digital) infrastructure.

Preparedness for Smart Care and Health

Innovative Learning Environment (ILE), when considered from the regional perspective, is subject to several factors. The main problem is the perception of the concept of Smart Care and its definition. Since it is not standardised yet, actors stick to processes and initiatives they come across in their practice and do not apply systemic approach. The external limiting factors involve information literacy, lack of (economic and human) resources and legislative "gaps" in the application of smart care in the ILE environment. In our national conditions, moral and dilemmatic

aspects also play a role in applying this type of care. The current pandemic situation improved conditions for implementation of Smart Care solutions.

5.2 Solutions and measures leading to customized regional ILE architecture

Although, some elements typical for quadruple helix are already visible especially during the community planning process, the prevailing model for most of the activities, including education and innovation, is still rather linear. Situation is slightly different in the field of health care, where innovation and digitalisation accelerate faster than in social services.

Health Care

The fact that healthcare is digitalising (partly in relation to COVID 19) is a palpable and transparent factor in the deployment of smart care. Not only do the databases of health care facilities (and partly those of ministries) become far more interconnected, the users themselves also capitalise on these possibilities. Online ordering, appointment date notifications by electronic tools, online document submission without the client/patient's involvement have become a standard, which optimises decision-making processes and keeps information loss at a minimum. Other examples of this include the activity of health insurance companies, which digitise their services vis-a-vis the insured persons (Life Card, treatment records, medicines, financial costs of care). E-prescriptions are also heavily used, saving the time of not only the physicians, but also of the clients/patients. However, the role of the owner—founder/operator/head of the healthcare facility—should also be mentioned here; in particular, it is their managerial abilities, skills and understanding of the role of information that play a dominant role in using smart technologies (one specific example is the website: which should be comprehensive, attractive, user-friendly, up-to-date and adapted to the target group). In regional terms, the rising age of general practitioners, who most often come in contact with our target groups, and local influences (municipality, town, community), must not be overlooked. One example of cross-border cooperation is the use of mobile emergency assistance—"Záchranka" (Ambulance).

Social services

The main objective is to generate favourable conditions to ensure the natural needs of the people are satisfied, through support and assistance in taking care of themselves and ensuring their self-

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sufficiency necessary for leading a full life, and in situations where a person may be excluded from everyday social life. For the future needs of ILE, it is necessary to distinguish between seniors who live in an institutional or family environment, or those who use social services in isolated instances or as field services, and those who we refer to as "active seniors" or seniors who face limitations due to their mental or physical disability for the purposes of education (animation, spirit lifting). From the perspective of the government, there is a clear preference on development of assisted living services and usage of ICT improving the quality of live of seniors and allowing them stay in their natural environment.

In institutional care, smart care was viewed mainly in terms of its protective effect: e.g., identification bracelets monitoring client's movements or medical condition, entrance/exit sensors, movement monitors, emergency buttons (also used outside the institutional care setting), or as a mediator of contact with the outside world—mobile phones, tablets, online conversations, etc. In the home environment, such technologies were mentioned that partially "replaced" the care service - drug control, monitoring of basic health functions. The common denominator should be the integrity and wholesomeness of the care provided, human-centred design, discretion and intuitiveness. The ethics of Smart Care cannot be overlooked either.

Long-term unemployed people or people at risk of long-term unemployment

This group targeted under the project is relatively difficult to contain in the context of the ILE process as the people concerned are also subject to other factors that limit or prevent their full employability in the open labour market, the level of completed education not necessarily being the most important of them. Some of these other factors include health condition, social status, marital status, work experience, recipients of social benefits, low mobility (willingness and ability to move for work).

The online space also opens up new educational opportunities, although there are additional factors that must be taken into account, such as the environment in which the interaction and instruction take place as well as possession of resources and technology by the target group. They come under the responsibility of the Ministry of Labour and Social Affairs, namely the Labour Offices. In addition to public administration, non-profit or interest organisations also have a role to play.

Educational setting

As regards the educational process and integral adult education, there are several distinct learning processes: formal instruction, which ends with a specific certification; non-formal instruction, which is viewed as personal adult education, i.e., education within the educational system of personal work in an organisation; and informal education, which is presented as education through everyday opportunities.

The system of instruction for social care providers and staff in the Czech Republic is clearly defined by Act No.108/2006 Coll., as in force on 1 July 2019, which clearly determines the requirements for the levels and types of instruction for a specific provider, also with regard to quality-of-care standards.

The critical problem in Smart Care learning is the ambiguity of the term and the lack of a clear definition of the very concept and the area as such in the educational setting. For this reason, it is very difficult to clearly identify the existence of educational activities focused specifically on the area of Smart Care. "Smart" Care tends to be perceived equal to "modern" care.

The obstacles are like those occurring in relation to other educational activities. The absence of a single information system, a base, where it would be possible to obtain information on educational events or professional and educational events focused (not only) on Smart Care, plays a huge role in this. Those interested in the learning must therefore rely on their own initiative, references of their colleagues, recommendations of their superiors and personal knowledge and expertise in finding educational opportunities online. Digital education enhances opportunities for those living away from centres or with limited resources.

Related to this is the equipment necessary for the experience and knowledge obtained to be applied in the common practical environment; the cost of the equipment can significantly exceed the financial capacities of the founder and the provider (monitoring systems, smart bracelets, clocks, etc.). Shortage of employees and substitutability negatively affects time availability for learning.

The clients themselves and their family members are also regarded as actors in education as they need to get at the hang of Smart Care tools. Another group that benefits from the educational activity involves the people on multidisciplinary teams, not only those at the workplace, but also cooperating organisations and institutions (state administration and self-government, non-profit organisations, registered associations, self-help groups, medical institutions, educational institutions, other community-based organisations).

Specific actors in the educational process in common practice include educational institutions (especially vocational training establishments - secondary schools, vocational schools, upper secondary schools, universities), as well as libraries such as community centres, the Czech Red Cross, the Association of Educators, Healthy Cities, MAS, informal caregivers. As part of individual,

community, and group work), they are involved in informal education - the so-called sharing of good practice (e.g. in the form of counselling meetings of self-help groups).

Attainment of the educational goal directly correlates with the specific educational form applied. The most beneficial and effective are those forms, methods and techniques where active personal involvement is desirable, so-called learning by experience (the Invisible Café)—through interactivity or personal experiences (of course, to the extent the nature of the educational content makes this possible). Demonstration- or simulator-based events (laboratories) are viewed equally favourably, while practical workshops focused on good practice or internships and excursions, shadowing or work rotation and supervision were also mentioned as sound educational tools.

The current trend of online education puts emphasis on the skills and expertise of educators. However, the limiting factor might be the technical complexity of the equipment used in online instruction—poor quality software, hardware, slow or fluctuating Internet connection, or space requirements (requirement for disturbance-free space). It demands higher concentration of participants. The need for personal contact cannot be neglected either - social work is based on personal contact, which online form cannot fully substitute.

The educational system is characterised by the clash of these (often contradictory) notions: legislation x educational need of the employee x capacity of organisation x offer of educational events x priorities and economic security of the founder. We must not forget the ethical side of education in using smart care systems either, which, according to the participants, is often neglected with only the benefits of smart technologies being emphasised. It is important to listen and follow individual needs.

The successful implementation of quadruple helix principles into the ILE needs active participation of representatives of all four helixes., strategic and policy framework, resources, and reflection of needs.

Good practice and important actors

In general, there are already existing first successful projects related selected smart care solutions in the region and in the country. Thus, there is a certain awareness on relevant tools. The National Telemedicine Centre in Olomouc (NTMC), which is a leader in solutions applicable for Smart care, investigates, develops, and implements specific technologies in all areas, including legislation. Their project Connected for Health (in cooperation with Finish partners) tested fiber-to-home networks for home health care.

Similarly, Czech Technical University (ČVUT). and its specialised centres UCEEB and CIIRC, is an important knowledge provider oriented on applied research and development of new technologies also for social and health care. Another institution, from the broader ecosystem, which focuses on telemedicine, is at the Technical University in Dresden, near the Usti Region.

DEX IC, a private innovation centre, implements innovative projects in healthcare (eg tablets for patients with mild dementia, hybrid forms of telemedicine), is involved in international projects such as Interreg (HoCare 2.0) and has a position as the EIT Health Hub in the Czech Republic.

Telemedicine care is used, for example, with patients with diabetes or cardiovascular diseases, and the patients can use specific devices that transmit the collected data directly to specialists. Companies uLekare.cz, EUC or TeskaLabs belong to the most active. APLAS.cz is a catalogue of already existing mobile application suitable for (or used in) health and social care.

One of the care providers (Diakonie) created services for informal carers written in "intelligible language" (www.pecujdoma.cz), where they can find e.g. emergency care plan, or emergency crises phone line. Another very active regional player is Diecézní charita Litoměřice experimenting with emergency buttons and tablets for elders.

VR Vitalis brings virtual reality to the elderly, e.g. for rehabilitation activities. Smart owl (Moudrá sovička) provides learning platform for elders to build digital skills or maintain cognitive abilities, it is complemented by mobile learning centre or digital assistants.

5.3 Recommendations

Possible answers to the above-mentioned development and challenges might be:

(a) **innovation** – e.g. the use of smart care, a wider range of innovations, digitization and new technologies such as robotics, artificial intelligence, big data, etc., but also innovative ways of collaboration, such as quadruple helix and other creative and participatory methods (design thinking, human cantered design, co-creation, etc.). Their application creates opportunities for more effective solutions to many situations.

b) **education** - acquisition of new skills of both potential users (clients), care providers and their staff, or potential new staff. This creates the preconditions for the successful deployment of new solutions in practice.

To make further progress in utilisation of Smart Care in the region, it is necessary to overcome weak relation between Smart Care and ILE. Among the potential challenges to be addressed are:

- **Low level of interconnections** among various actors – this is related to i) low level of presence and acceptance of cooperation between the for-profit and not-for-profit sectors, ii) lower degree of interconnection between the academic and other educational communities as initiators of changes in the local space, including ties with the business community. Incorporating new ways of cooperation (participatory methods, quadruple helix, co-creation…) in the strategy and planning processes, as well as into the innovation systems, might create collaborative, human centred and problem-oriented environment.

- **Absence of a single shared information space** – creating interactive website and catalogues might be a good starting point, or a localisation of already existing page from abroad.
- **Costliness of Smart Care solutions** (but also in some cases low acquisition costs followed by high operating costs) – development of new business models, support of pre-commercial public procurement schemes, negotiating conditions for national operational programs (co-funded by the EU).
- **Lack of educational opportunities focused on smart technologies** and smart solutions – the possible way is further enhancement of cooperation with companies and care providers within educational and research activities of the university.
- **Different concepts of ILE actors** regarding the programme and competencies within the educational processes, different levels of awareness and knowledge – this might be solved again by more intense cooperation and dialogue using new approaches acquired even in this project (co-creation, quadruple helix, etc.).
- **Absence of a recognised leader** within the local and regional environment – this role might be dedicated to a strong R&D oriented institution, technology centre, university, innovation centre, or a cluster.
- Project readiness for **intuitive use, user-friendliness, practicality** – this creates space for creative methods like design thinking, human-centred design, etc.
- **Privacy** and GDPR – those are especially sensitive. In general, the target groups worry about the privacy issues. However, the development of new services and products might be accelerated when the power of big date might be used. Possible solution might be including, besides the target groups, relevant experts, preparing suitable data management systems, or kind of sand-box solutions.
- **Other legislative restrictions** – including public sector representatives and politicians into the process might increase understanding of problems and speed up the process of legislative adjustments.

6 Germany ILE establishment and deployment

6.1 Regional/country characteristics

Looking at the Lake Constance region situated in southwestern Germany the main characteristics in respect to this project are the rural population structure, nursing and physician shortages, digital literacy, and digital readiness.

Population structure

Due to the demographic development on the one hand and urbanisation on the other hand, the Lake Constance region faces a difficult situation in which the proportion of older people in the population is increasing at disproportionately high rates. The biggest city in the region (Constance) has hardly 82.000 inhabitants. In the last three decades a continuous transformation process is taking place in various industrial sectors of the region which ensures that new companies settle, but also makes entire sectors of the economy collapse. Even though there are some well-established universities located in the cities of Constance, Friedrichshafen and Ravensburg which attract young people to study in the Lake Constance region, only a few of them stay there after graduating due to the high cost of living and few jobs available.

Nursing and physician shortage

As it is typical for rural areas all over Germany, the Lake Constance region suffers from a shortage on physicians, as young doctors are rather attracted to urban areas. Bigger cities offer clinics with a promising career whereas adequate incentives for country doctors are lacking all over the country, particularly in the rural areas of the Lake Constance region with its low density of population.

In addition, there is a shortage of professional care givers/nursing staff to meet the growing demand in the elderly care sector. Even though there are different political agendas at state and federal level to make nursing professions more attractive, it is questionable whether they have the speed and impact needed to react adequately to demographic developments. New solutions that include care givers and all skilled workers in the health care sector should therefore offer a relieving aspect as the sector is working under rising stress.

Digital literacy and reality of life

Senior citizens in the Lake Constance region show very different levels of digital literacy. This is vital as this aspect must be considered in all following steps of this project. Furthermore, the different reality of life which is faced by senior citizens including their age, housing environment, health and medical conditions, doctor-patient relationship, mobility etc. have to be taken into account when developing solutions for them. It is of critical importance for the project that a solution is carefully chosen to please the needs of the respective target groups and that these target groups understand the benefits emerging from a change or new solution in their personal health care. Generally spoken, there is a conservative attitude towards digital solutions in Germany, therefore it is important to include the stakeholders an offer a high level of transparency reg. possible solutions and to focus on improving the quality of care.

Digital readiness

The progress of digitization in Germany must be viewed at different levels and shows strong disparities and regional differences. On the one hand, the infrastructure given in rural areas like the Lake Constance region in some areas is weakly developed. On the other hand, digital solutions are developed at a high pace and neighbouring countries like Switzerland offer useful best practices. Apart from federal regulations reg. data protection to health guidelines which pose hurdles for innovative solutions, the regional levels of digital readiness should also be included in the process of finding solutions. The rural areas of the Lake Constance region show the profile mentioned above as the more than 35 per cent of the country doctors have reached an average age between 57 and 67 years. These doctors must be able to work with appropriate digital solutions with a very low barrier of application for both the patient and the doctor.

6.2 Solutions and measures leading to customized regional ILE architecture

To address the challenges mentioned above, the Lake Constance region establishes an innovative learning environment (ILE) that will educate users (elders, caregivers, physicians) regarding smart care solutions and communicate basic knowledge on how to access and use these solutions.

In the area of preventive medical examinations, a possible use case would be the establishment of digital surveys as a sort of "pre-preventive check-up" with a low entrance barrier. This could be one or several surveys in various complexities to give elders an easy way to assess, whether they should consider a preventive check-up and if yes, in which areas. Such a solution can be easily accessible (e.g. over the internet) and it can provide knowledge not only to elders themselves, but

also to their supporting family members. It is important though, that such a solution is developed very carefully and, on top, updated regularly and that it does not contain any misleading information for the elderly people.

In the area of chronical diseases, a possible use case could be the measurement of blood pressure. With this very common disease in elderly people (65+) the respective patients have to see their doctors frequently for a repetitive and easy to handle procedure. A suitable hard- and software solution could allow patients to perform this procedure by themselves and at home. The data gathered could be sent digitally to their personal country physician who then can analyse the data and reach out to the patient if necessary. In an ideal scenario this solution saves a lot of time for both the patient and the physician. Particularly patients with a limited mobility would profit from this very comfortable way of telemedical solution and give them more freedom and spare time. Nonetheless, this solution can also have negative effects if patients fear they could lose the personal contact to their physicians (or get the subjective feeling of losing it). Also, if the handling of the solution is not suitable to the abilities of the patients, this could lead to frustration or, even worse, to incorrect measurement results which eventually could harm the patient's health and well-being.

Therefore the regional ILE should provide tools which allow a very simple and barrier-free communication with elders, caregivers and physicians. These tools should consider different methods of learning, be able to reach people of different age groups and, ideally, should take different educational levels into account. The ILE should be open to feedback and suggestions to further develop "itself" and the solutions provided. This means that among all stakeholders linked through the quadruple-helix, solution providers are key partners in the ILE architecture, just like public authorities and research institutions. Communication with key partners should reach beyond the providing of a service to make sure that feedback and suggestions fall on fertile grounds.

The use of such a basic architecture can assure the organic establishment of an ILE which will take regional challenges into account and that can build up and share sustainable knowledge to benefit all stakeholders. Ideally, this includes all stakeholders in the quadruple helix, from the elderly patient as end user, his respective supporting family members, care givers, his corresponding telemedical doctor, his health insurance, the pharmacist processing digital prescriptions up to members of the municipal council and the mayor of the municipality itself.

6.3 Recommendations

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In order to enable a successful ILE development, this and similar projects which are aiming to build up such basic structures should focus on a clear vision (with low barrier access) and define goals that are regarded worth to be met by all stakeholders involved – as a guarantee for success.

The ILE can be settled with a clear and easy to understand vision and a predefined target group (at least one) such as "senior citizens (65+) living independently in a private house/flat in a rural suffering from high blood pressure who have to check on this chronical disease with their doctor on a regular base". Additionally, it is vital to get as much relevant information on the target group as possible, to assure that feasible solutions are developed and applied.

In the case of blood pressure measurement, it means that it must be clear which age group should be targeted and under which circumstances (such as described above). How often do they normally visit their physician? Do they live remote from the doctor? Do they live independently and on their own? Which chronic diseases do they suffer from? How mobile are they? How about their digital literacy and readiness? Etc.

With the help of the key partners, it should be possible to build up an ILE and provide attractive solutions that will be accepted by the target group and have a very positive and long-lasting effect for new digital health care solutions in the rural areas that also can be applied in general health care.

7 Slovenia ILE establishment and deployment

7.1 Regional/country characteristics

The Republic of Slovenia, with a population of around two million, is well educated and has a good labour market. Two emerging trends, as in other modern societies, are an aging population and a low birth rate. Slovenia has a Bismarck-type social insurance system based on a single insurer for health insurance - Health Insurance Institute of Slovenia (HIIS). The central regulatory function lies with the Ministry of Health. Primary care is decentralized to the municipal level.

The Littoral–Inner Carniola Statistical Region (Slovensko: Primorsko-notranjska statistična regija) is a statistical region in southwest Slovenia. The Largest city in region is Postojna. It has 52.841 habitants (2020). Region stretches over 1.456 km2, thus representing one of the smallest regions in Slovenia, covering 7,2 % of the country.

The region is among the economically less developed ones in the country because it contributes less than 2 % of Slovenia's GDP. Employment structure is the following 55,8 % services, 36,8 % industry, 7,4 % agriculture. The region has one of the highest employment rate in Slovenia.

The Primorsko-notranjska statistical region had 3 % of Slovenia's population in 2018. The region stood out with the lowest share of population and with the lowest population density (36 persons per km2). In 2018 the region had one of the lowest shares of deaths before 65 years of age (14,5 %).

The population is getting older. The average age of the population increased from 42,6 years in 2013 to 44,2 years in 2020.The aging index is increasing, in 2020 was 139,8 (in 2013: 121,2), this means that there were 139,8 people aged 65 or more per 100 people under the age of 15. The current situa- tion affects the situation on the labor market as well as the need for services that ensure quality of life in old age (home help, long-term care for the elderly, smart care and health services and other social and health services.

Since 2013, the number of doctors and dentists per 100.000 population has increased (131,4 and 57,1 in 2013 and 136,3 and 58,7 in 2019), as well as the number of nurses and midwives per 100,000 population (121,8 and 20,9 in 2013 to 195 and 26,5 in 2019). The number of the latter is still above the Slovenian average, thanks to the functioning regional Hospital for Women's Diseases in Postojna.

In project cooperates also The Municipality of Ilirska Bistrica where we within D-CARE project intend to implement two pilot projects from the scope of smart and health care.

The Municipality covers an area of 480 km2 and has around 13.340 inhabitants. It is sparsely popu- lated and demographically endangered. The Municipality of Ilirska Bistrica has 2 bigger factories (Plama and Lesonit), but a lot of people work in Koper, Postojna and Ljubljana. There are 7 primary schools and also one high school.

In 2018, 98 children were born and 154 people died. Life expectancy at birth is around 80 years. Total population growth here is 0,9, in Slovenia 6,8 (per 1,000 inhabitants). The average age of people was

46.1 years, which was higher than the national average (43.3 years). Population (55+) is greater than the younger (0-14 year). Raise the average age of inhabitants in that municipality is faster like aver- age in Slovenia. Municipality has The Home for the Elderly which gives home around 230 seniors and also, they have a day center for 15 people.

Currently in Slovenia there is no unified system of long-term care, long-term care benefits in kind and cash-benefits provided and financed within healthcare system, social and parental protection system, and pension and disability system. There is also no unified entry point and unified needs assessment.

The main gaps and challenges in long-term care in Slovenia are:

- Providing adequate care for those in need of long-term care.
- Promoting integrated home care and independent living.
- Improving financing arrangements.
- Improving quality and value for money.
- Promoting prevention and the use of ICT-based (smart health and care) solutions.

In addition, a step change is needed in relation to the implementation of smart care and health solutions. We need more comprehensive strategic planning, better collaboration between key stakeholders, new business models and a better understanding of costs and benefits. There is also a need to promote the uptake of services, for example by providing relevant information to all stakeholders (older people, formal and informal carers, nursing staff and doctors ...), integrating services and technical solutions, creating deployment plans and seeking to identify and understand older people's needs, fears, wishes, skills of older people.

The main gaps and challenges in long-term care in Primorsko-Notranjska region are:

- Potential stakeholders in the region are not connected to ecosystems in the field of smart health and care, so they consider cooperation and networking within the D-CARE project an important opportunity or starting point for improving the situation in this scope in the Primorsko- Notranjska region.

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- Organizations that are part of partnerships see primarily their partial interests. Much more effort will be needed to achieve common goals and at the same time satisfy individual interests.
- The level of interest between the partners is different, so in the future we can expect different engagement from them - also with regard to the possibility of acceptance additional work beside their regular working activities.
- At the regional level, there is no financial support for such ILE which require additional commit- ment and work, and regional stakeholders are not recognized as important actors for improving the situation and bringing about change.
- Regarding the development of ILE, it is possible to identify the possibilities of transferring e-knowledge to older people (e.g., within the activities of the secondary medical school in Postojna and various non-governmental organizations).
- The People's University of Postojna is also interested in spreading knowledge in the field of smart health and care, otherwise provides various formal and informal education for various target groups.
- Other organizations recognize the need to: learn about good practices, expand the offer and promote ICT learning among the elderly; understand end-users; introduction of innovative think- ing (innovative toolkits) and innovation.
- The growing loneliness of the elderly, who would need both: e-care and physical assistance or at least contacts at home, has become an increasing problem.
- Postojna Business Incubator would like to support the creation of new companies in the field of smart and health care, for which potential candidates need the necessary and specific knowledge.

7.2 Solutions and measures leading to customized regional ILE architecture

Two the most important measures taken at the national level in recent years to improve the access to the long-term care and to support active and healthy ageing of the Slovenian population are:

- Active Ageing Strategy that draws on a new conceptual framework for development guidelines in a long-lived society. It is based on the concept of active ageing, which involved activity across the life course, concern for health, and intergenerational cooperation (IMAD, 2018).
- Long-term care pilot projects aimed at testing the long-term care solutions proposed in the Act on long-term care which is being prepared for two decades and has not yet been adopted (Rafaelič and Querrioux, 2018).

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Vision of the Active Ageing Strategy is "a society and systems that will provide well-being and quality of life for all in the altered demographic circumstances. The emphasis is on intergenerational cooperation, the involvement of all generations in society, and awareness of the importance of high- quality ageing". Strategic goals for the implementation of this vision are:

1. Well-being for all generations, dignified and safe living in the home environment with a high level of human rights.
2. Participation of all generations in economic, societal, social and cultural life in accordance with their wishes and needs, intergenerational symbiosis.
3. Preservation and improvement of the physical and mental health of people of all ages.

Overall goal of establishing integrated long-term care system is to establish new pillar of social secu- rity that will in line with changes in other pillars (health, social and pension systems) enable im- plementation of LTC as an integrated service supporting people in independent, safe and quality living (Buzeti and Dominkuš, 2017). In the long-term care pilot projects, the urban, semi-urban and rural pilot sites across Slovenia are testing new integrated care solutions, including smart health and smart care solutions. Pilots are an important step toward integration of long-term care provision and its deinstitutionalization in Slovenia.

Problems related to the ageing society and fragmented long-term care, as well as the low uptake of ICT-based (smart health and care) solutions, are also being addressed at the regional level. Below, the activities in the Primorsko-notranjska region involving different stakeholders and addressing the different needs of these stakeholders are described in more detail.

Quadruple helix

In the table below, we present some of the key challenges and gaps, recognised by Slovenian smart health and care quadruple helix stakeholders which could be, at least partially, addressed by D-CARE Innovative Learning Environment.

Business	**Policy makers**
How to better understand the user?	How can good practices be implemented in larger systems?
How can we promote products and services?	How can business stakeholders be helped to gain broader insight into the system?
How can we solve the problem of funding innovative services and products - users cannot afford them, government funding is notavailable?	How to make innovative projects and proposalsmore transparent?
How to get government support for smart health and care solutions?	How can support be provided? How to simplify the bureaucracy?
How to promote legislation for smart health and care solutions?	
Civil society/NGOs	**Researchers**
How to foster collaboration between policy makers, service providers and users?	How do we gain access to and engage end users?
How to stimulate work in interdisciplinary teams for better legislation and system solutions?	How to better communicate the benefits of innovative solutions to end users?
How to help reduce inequalities between urban and rural areas when it comes to the use ofinnovations?	How to promote understanding of the complex relationships between user and technology and health/disease in the prevailing technological determinism?
How can end users be involved in the design of new solutions?	How to foster collaboration with business partners and/or between different departments?
How can we make the user experience in pilot projects better for our users?	How to ensure regular follow-up of research projects?
How can we be more supportive of ecosystems and innovation partnerships?	How to gain the necessary support for the implementation of innovations?
How can we make it easier for older people to learn to use ICT and provide them with the support they need?	

Hereafter the experiences and insights of the most important regional stakeholders from Primorsko- notranjska region are presented.

Stakeholders (Pimorsko-notranjska region) involved in ILE

Policy makers	Centre for social work Primorsko-notranjska	Centres for social work are the central professional institution in the field of social protection. Professionals employed at the centres help to identify social dis-tress or problems, provide information on social welfare services and the obligations arising from the choice of services.
	Employment Service of Slovenia	Employment Service of Slovenia is one of the key Slovenian labour market institutions.
Research	University for adult education Postojna	Public institution whose main task is education of adults. The University offers national vocational qualification (NVQ) programs. An individual has a possibility to acquire NVQ to implement social home care and complete the training according to the verified social care program.
	Secondary School for Forestry and Wood Technology in Postojna	Secondary school for Forestry and Wood Technology in Postojna has had a long tradition in the field of education. They are offering five programs to their students, two of those programs are in the field of healthcare (the 4-year program Practical Nurse, the 3-year program Nursing Assistant).
Business	The Perspektiva business incubator / Podjetniški inkubator Postojna	At Perspektiva Business Incubator, the focus is on giving support to new and startup companies to develop by providing several types of services (administration,management, training, office space etc.)

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Civil society /NGO/ Formal pro-viders of care for older adults	Medical Center Ilirska Bistrica	Monitors the health status of the population and pro- poses measures to protect, strengthen and improve the health and prevention, detection, treatment and rehabilitation of patients and injured; performs prevention of health risk groups; they advise on maintaining and strengthening health, in addition to offering community visits, nursing care, treatment and rehabilitation of patients at home and patients in social care and other institutions.

Stakeholders (Pimorsko-notranjska region) involved in ILE		
Civil society /NGO/ Formal pro-viders of care for older adults	Fractals, Zavod za družbene inovacije, Cerknica	Institution for personal assistance services.
	Slovenian third age Universi-ty (Ilirska Bistrica)	Provides older people's permanent access to culture and education for personal growth, better employability, and active citizenship; to raise awareness about older people, old age and the role of older adult education.
	Zavod Pristan, Vipava	Private provider of home care or institutional careservices for older adults.
	Residental Care Home Ilirska Bistrica	Residential care home for older adults provides institutional care, care at home and other services for old-er people (day activity centres, temporary accommodations, training for the elderly and their family members, etc).
	Regional hub of NGO`s of the Primorsko-notranjska region	BOREO is an organization that enables all stakeholdersand individuals to actively participate in the development of society. As a support network in Primorsko- notranjska region, it supports and brings together mainly non-governmental organizations from the region and works intensively on integration of local and cross-sectoral partnership.

Promotion and knowledge of smart care and health services in Primorsko-notranjska region

Inhabitants Primorsko-notranjska region aren't well acquainted with the possibilities of using smart care services – this applies to end-users as well as potential stakeholders. According to the current data, the only available ICT-based smart care service – remote wireless trigger »red button« – in the region is promoted by the Municipality of Postojna. Red button can be worn like necklace or around the wrist. By pressing the button in connects the user with his/her relatives, neighbours and other emergency contacts. Municipality of Postojna partially subsidizes the subscription to the red button service, which is offered by a private provider.

This region has some institutions (University for adult education Postojna; Third age university Ilirska Bistrica; …) providing ICT courses for older adults. At the same time, this is also the only learning opportunity for older adults in the region. However, these courses are not offered on the regular basis, as the older adults are not very interested in participating.

Given the current regional situation, it is necessary to promote smart ICT-supported care and health services, which will address both – end-users and potential stakeholders (educational institutions, companies and organizations involved in the care of the older adults, …).

Regional, national and transnational cooperation in the ILE on smart care and health

Collaboration between smart care and health stakeholders in that region is negligible. Definitely, they need to familiarize themselves with examples of good practices at the national and transnational level and try to implement these good practices in the region. Smart care and health services are practically not used by older adults in the region and there are no companies in the region that would develop these services. Although the education stakeholders have the potential to disseminate e-knowledge (University for adult education Postojna; Third age university Ilirska Bistrica; Secondary School for Forestry and Wood Technology in Postojna,…) they don't have clearly defined goals and activities, and are very little connected with other actors in the field of smart care and health. In any case, we would need more knowledge and information from national and transnational partners in this regard, which would contribute to a more comprehensive and high-quality offer in the smart care and health ILE.

ILE and the e-learning on smart care and health opportunities

During COVID-19, the loneliness of the older adults increased altogether with their need for physical contact, smart services and e-learning. To create an effective ILE, we would need a

systematic Identification and description of the e-learning needs of the target groups on the topic of smart care and health. In addition, there is a diverse range of e-learning for older adults and those who are already performing care work in the region. Stakeholders should therefore share information on e-learning programs and promote, expand and segment them. Regional stakeholders should also engage and collaborate with smart care and care providers nationally to enable end-users to access smart ser- vices (from a financial and user perspective). As the supply of smart care and health services is very basic, it is very important to invest in the acquisition of new knowledge and skills for stakeholders and providers who provide care to older adults.

Goal of Slovenian ILE

- Promotion and presentation of e-learning tools in the field smart care and health.
- Raising awareness of the potentials and benefits of using ICT-based smart care and health services.
- Regional, national and transnational cooperation with the aim of improving ILE (exchange of good practices, sharing of knowledge, use of a common e-learning platform).
- Identification and description of the learning needs of target groups on the topic of smart care and health.
- Identification and description of the existing smart care and health services and e-learning potentials of stakeholders on the topic.
- Creation of an additional offer or even implementation of a new curriculum on the topic of e-learning on smart care and health in order to strengthen the skills and competences of target groups.
- Identification and possible implementation of joint activities of stakeholders regarding ILE (joint e-learning programs, new smart care services).

Next steps

- Promotion of the use of smart care and health services - applies to end users as well as potential stakeholders. Various services and e-learning for the elderly will be promoted in local newspa- pers (Bistriški odmevi, Pivški list, Notranjsko - Primorske novice); on local television (Galeja TV, TV Kolut, VASCOM TV); via social networks; on the websites of municipalities of Primorsko- notranjska region and on the websites of D-CARE project stakeholders. We intent to highlight thebenefits of using smart and health care.

- Presentation of good smart care and health practices to stakeholders in the region (within D- CARE project and e-service providers, through transnational partners)

- Exploring the possibility of implementing good practices in the field of smart care and

health and e-learning of older adults

- Connecting all relevant stakeholders in the "ILE working group", which would be led by Munici- pality of Ilirska Bistrica and RDA Green Karst, where stakeholders would exchange their experi- ences and needs, and after the completion of the project they would continue to take care of e- learning and the use of smart care services in some way.

- Identification of stakeholder and end-user needs in order to improve the smart and health care offer - by the »ILE working group«.

- Testing the use of specific smart care and health services, which are recognized in the region as necessary and meaningful. At this point, we propose testing in Residential Care Home Ilirska Bistrica, where patients have 24-hour care, so they would be particularly suitable for testing new technologies. In addition, within the existing financial resources, they could use ICT-based telecare services and provide training for use of the latter. These applications could streamline and optimize some of the activities, that senior citizens homes offer to the elderly.

- Creating entrepreneurial support services for companies in the region that want to develop products or services in the field of smart care and health for the elderly.

- Implementation of training courses for the use of smart care and health tools and services by educational institutions in the region that are already working in this field.

7.3 Recommendations

Key changes that need to be introduced in the Slovenian long-term care system and should be considered when introducing Slovenian Innovative Learning Environment are:

- Unification of mandatory insurance rights.
- Standardized assessment of needs (eligibility), single entry point (one stop shop), active involvement of user in planning.
- Integrated (coordinated) provision of long-term care services, emphasis on community-based services.
- Greater support for informal caregivers.
- Prevention, rehabilitation and use of ICT-based (smart health and care) solutions.
- Integrated quality control.
- Integrated financing.

Even more important for Slovenian ILE are needs and challenges of the regional stakeholders from Primorsko-notranjska region, which is also going to be D-CARE pilot site. These factors need to be examined even in more detail and be included in Slovenian ILE to the largest possible extent.

Recommendations for Primorsko-notranjska region

RDA Zeleni kras will participate in the promotion of the D-CARE e-learning platform for the introduction of learning programs at the transnational level, and will additionally take care of the participation of ILE stakeholders from our region in the development of new learning programs.

Further development of ILE in Primorsko-notranjska region could include:

- Involvement in ILE of actors in the field of health and social care for the elderly in the region and at the national level (municipalities, educational institutions, health centres, homes for the elderly, care givers for other target groups …)
- Potential stakeholders in the region do not know the learning tools that target groups could use (unemployed, 55+, volunteers) when working with the elderly. First of all, we should educate stakeholders in the region regarding e-learning tools.
- Older people are not skilled in the use of ICT and do not have the appropriate equipment, so they would need more accessible, free courses and eventually the help of volunteers. Volunteers are also important in terms of maintaining social contacts. The elderly could be helped in this respect by: Postojna People's University, University for the Third Age, NGO center.
- Smart care and health learning programs could be implemented in the region or. they are already being implemented and supplemented by: The People's University of Postojna, which is currently implementing the social care program. Secondary School for Forestry and Wood Technology in Postojna offers two programs in the field of health care, namely nursing technicians and nurses. As an educational institution, it can offer the transfer of ICT knowledge to younger generations, who will work with the elderly in the future and will provide them with ICT knowledge. It is also desirable to cooperate with companies that offer e-services - in this way students would get to know the offer on the market and eventually co-create it. Individual courses for upgrading competencies are carried out by the Employment Service of Slovenia (Postojna Labor Offices, Ilirska Bistrica, Cerknica) and could include the above-mentioned programs in its training offer for un- employed persons.
- In the region, the demand for care for the elderly exceeds the number of providers on the market, that's why we should consider about more providers of care for the elderly by the private sector. Care providers would need the availability of entrepreneurial knowledge in combination with knowledge from the scope of health and care for the elderly, such a combination of educa- tion would help to establish new companies on the market. This

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potential has Business Incubator Postojna, which offers support in the development of business ideas.

- Pristan Institute, Vipava and Fractals, Institute for Social Innovations, Cerknica, both institutions offer help at home. In cooperation with smart care and health e-service providers, they could use existing e-services and eventually create new e-services that would complement their work on site. With the excellent knowledge of end-user needs they would develop new e-services in cooperation with ICT companies and the education sector. CSWs, health centres, volunteers, universities for the third age and homes for the elderly also know what the needs of end users are.
- Centre for social work Primorsko-notranjska and health centres in the region could advocate for the creation of state aid that would enable access to smart care and health services and submit an initiative on financing e-care assistance at a distance for the elderly to the Ministry of labour, family, social affairs and equal opportunities. In this scope is a need for integrated financing by the State.

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8   Bulgaria ILE establishment and deployment

8.1   Regional/country characteristics

Bulgaria has a total population of 6 951 482 and is ranked 4th in the world for its rate of population aging. Bulgaria has one of the highest proportions of older adults in the world with approximately 20% aged 65 and older. NSI projections show that by 2070 elder people in Bulgaria will make up almost two fifths of the population. (MLSP, 2016)

A number of factors determine the specifics of the lifestyle of elder people in Bulgaria. Existing Eurobarometer and Eurostat data outline the following general picture:

- **Worse health status and bad mental health indicators** compared to the other EU Member States: Many of the indicators of the health status of elder people in Bulgaria also paint an alarming picture – Bulgarians in good mental health aged 55+ make up 52,6%, whereas the EU average is 63,9%; precautionary examinations and tests among Bulgarians, including the elder population, are essentially less common compared to the other EU Member States. (Data Europa, 2009)
- **Difficult access to health and social service**s: According to a study the most accessible services for elderly in Bulgaria are provision of food (88,4%) and transport (82,4%), whereas access to social services raises the highest concerns – 41,6%. Social care for elder people and people in need is unusable because of the absence of such service according to 21,1% of the respondents. Other 30,2% are not aware that such type of services exists as an option.
- Health services are used on a limited basis by 6,8% of respondents because of the shortage of doctors and medical services, other 6,1% do not use them because of absence of doctors and health establishments in their place of residence. As a higher proportion of elder people live in the villages compared to the national average population distribution, elder people are more often found in the groups with limited access to doctors and medical services. (MLSP, 2016)
- **Fragmented model of funding of social services:** i.e. specialized institutions for provision of social services, social services for the community and assistance support are funded by so called delegated by the state budget; personal support is funded through the social ministry budget; social patronage is funded by the municipalities and the patronage service is funded by the Operational programme Human Resources Development and is provided by the municipalities. (IME, 2021)
- **Almost twice lower percentage of elder people using ICT**: Internet uptake by elder people in Bulgaria increases, but the share of elder people using the World Wide Web remains low compared to the other EU Member States. Eurostat data for 2020 shows that on average only

41% of Bulgarians 55-74 years old have used internet in the last three months, compared to 72% for the EU (Eurostat, 2021). The access to information and communication technologies is also important because they enable citizens who do not have medical knowledge to obtain basic information about their own health and physical condition. Problems could thus be detected faster, people could realise better their roles and responsibilities and make domestic measurements – of pulse, blood pressure, etc., necessary for the treatment and the therapy. Care would be thus shifted from the hospital to the patient at home and that is of major importance for the quality of life of elder people.

- Besides, elder people between 55 and 74 years old Bulgaria registers even lower rates on frequency of use 8% for Bulgaria against 12% for the EU use Internet at least once a week (NSI, 2020; Eurostat, 2019). The low level of use by elder people could be attributed to absence of technologies at home – only 18% of persons aged between 55 and 74 years report using a computer at home (NSI, 2020).

- **Lack of support for informal caregivers**: In the Bulgarian context, there are still few practices for provision of professional support and training to informal caregivers. There is also absence of official ways of enabling informal caregivers to receive training or to develop the skills they need.

8.2 Solutions and measures leading to customized regional ILE architecture

To address the challenges mentioned above, Bulgaria should establish innovative learning environment (ILE) that will include main stakeholders - **social care providers** (mainly municipalities and NGOs, community centres)**; universities and educational centres** providing specialized programmes in the field of smart care and health and **private companies.**

Most of the organizations that were contacted during the survey and represented at the stakeholders group are familiar with smart care services and some of them are involved in innovation cooperation and international cooperation in the field of smart care and health.

An example of successful innovative cooperation is the project SAAM under Horizon 2020 Programme with the participation of Medical University – Varna that aims to develop and validate in a controlled environment a Virtual Assistant – "Coach" that supports the process of healthy and active ageing to elderly people that are still active but in risk of disconnecting from the Society.

Bulgarian Red Cross and Caritas Bulgaria are also involved in the innovative partnership. Their role as social service providers is to ensure the connection with the end users.

There are companies are also involved in the project for the development of the software and technological part, i.e. Scalefocus - API and interfaces software development, allergy module, GUI and user system management.

Municipalities as a main social services provider are also very active in the field. Municpality of Aksakovo has implemented a project "Social One Stop Shop", funded under the ESF, OP Human resources development that included development of electronic platform innovative one-stop social service, providing information and directing families and children to specific services in the community. Municipality of Dalgopol has also introduced the social innovation "Integrated social office" with aim of providing integrated social services to elderly people within a project also supported by the ESF, OP HRD.

There is also high potential within the universities (Varna Free University, Medical University – Varna, etc.) and in cooperation with private companies for the creation and distribution of technological solutions in the field of smart care and health. One example is applications that are using testing movements in order to manage software solutions, developed by the Department of Information Technologies at VFU.

Universities and municipalities as main social services provider have capacity in executing educational and training programmes in social care. I.e.: MU-Varna has a special programme in integrated care which is taught at the Faculty of Public Health. The learning programme is part of the development of the social services for the support of elderly people of those with chronic illnesses, or this could well be the people between 55-80 years old as in D-CARE project; Varna Free University has long years of experience in creating educational tools for people with special needs; Municipality of Aksakovo has vast experience in training social workers. There is a need to train the social workers how to use specific software that they will use in their day-to-day work. This training might as well be provided by the company providing the software or another organisation, providing specialised digital skills training. As to the elderly people using the services, they would also need initial training on how to use the software and what are the opportunities it provides them.

8.3 Recommendations

Many efforts are still needed to further advance the development of smart care services in Bulgaria and should be focused on the following aspects. First, the existing public and private smart care services for elderly should be combined. This can optimize resource allocation and management and avoid the waste of public resources. Second, enterprises should be encouraged to develop new technologies to reduce the cost of products and services provided by smart care for elderly. Enterprises should take the initiative to achieve technical breakthroughs on the basis of the industry standardization and finally make the prices of smart care services for elderly could

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be acceptable by more and more elderly people. Third, enterprises involved in offering smart care services should implement customer-oriented strategy. At present, disabled and elderly people have great demand for smart care services, and thus these groups could become the main target market of them. Enterprises should develop more products and services suitable for disabled and elderly people. These services could contribute a lot to the independent living of the elderly and improve their quality of life significantly.

Social workers and informal caregivers should also be supported though training on how to use specific software that they use in their day-to-day work.

There also is a need to promote further the use of smart care and health services.

9 Austria ILE establishment and deployment

9.1 Regional/country characteristics

Austria is amongst the smaller countries in the European Union with nine federal states and around nine million inhabitants (Statistik Austria, 2021). The usual retirement age in Austria is 65 years of age. At the beginning of 2020 1.7 million people were part of this age cohort (19% of the population) (Mohr, 2020). In general life expectancy is increasing. Thus, it is expected that the older population will grow fastest in the next few decades Statistik Austria, 2020, as is the case in many other European countries.

Although Austria is considered to be one of the richer countries, *poverty still is an issue*, especially among pensioners and single parents. The rural areas in Austria are affected by the so-called *rural exodus*. People are moving away from the countryside to attain a better lifestyle (e.g. education, jobs) in the urban areas of Austria (Ringler et. al., 2021). In general, the quality of life in Austria can be considered as very high. Infrastructure and health care services are well developed.

Elements included are[1]:
- Mobile care and social services
- Care facilities for intramural care
- Hospitals
- Compulsory social insurance
- Compulsory health care insurance for medical care
- Funding for provisions of care and social services
- Care allowances
- Minimum benefit system

Informal care is very common in Austria. Mostly done by female family-members who are between 31 and 65 years old (BMASGK, 2019). Due to lifestyle-changes of young females (e.g. career, moving homes/regions) many of them are not able to provide for their elderly family members anymore, therefor creating a *greater need for mobile and/or stationary care facilities*.

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[1] This is not a comprehensive list of the infrastructure and care services in Austria. Only elements relevant for the project were selected.

Austria is *ranked 12th place* (out of 28) in the Digitization Index of the European Commission, placing it in a solid middle-position of the EUs intention to foster digitalization within its member states. This index contains factors like connectivity, human resources, use of the internet, integration of digital technology and digital public services. Part of the digital roadmap for digitalization -specifically in Austria- is to put a focus on media competencies for all age groups in order to enhance social inclusion and to promote digital innovations for all sectors of the public, including health (BMBWF, 2016). Specifically for Vienna a *Digital Agenda Vienna 2025* was written up announcing the goals for the next four years, specifically concerning actions that should be taken to make Vienna one of the *leading digital health cities in Europe*. The actions plan is to improve Vienna's health care system by putting new technologies into use, all the while protecting the health data of its citizens (City of Vienna, 2021). Additionally educational measures are planned to enhance digital competencies (e.g. media literacy, technological competencies) as well as equipping people in the workforce in order to being able to adapt to the fast-growing digitization (City of Vienna, 2021).

The use of the internet can be considered as part of the daily routine for most Austrians. Especially between the ages of 14 up until the 49th year of age 99 to 100% of Austrians use the internet. Numbers start dropping slightly in the age cohort of the 50 to 59-year olds (95%) and even further in the age span of *60 to 69 years of age (83%)*. Only 46% of people who are 70 years or older use the internet in Austria. (BMBWF, 2016)

Smart-phone use as well as the use of the internet (especially Social Media for staying in touch with their network) is on the rise with the elderly population in Austria (Halmdienst & Schmidt, 2018) (the so called "silver surfers"), though many elderly people remain *sceptical* (in particular on the use of health care technologies and monitoring systems). The (regular) use of modern technology does depend on the socio-economic status, the education as well as the former job-experience of the relevant age-group.

Austrian regions of interest for this project are *Vienna* and *Innsbruck*. Vienna is the Austrian capital city with a total of 1.92 million inhabitants. Vienna is known as the location of the oldest and biggest German-speaking university (University of Vienna) as well as a broad array of cultural activities (e.g. operas, museums). It was awarded the status as the city with the highest quality of living worldwide by the international advisory board agency Mercer, ten times in a row. Innsbruck, the capital of the federal state Tyrol, is located in western Austria. It belongs to one of the wealthy regions of the EU and has 158 739 inhabitants (Arbeiterkammer Tirol, 2019).

Vienna and Innsbruck have been chosen as the cities of interest due to several factors, especially in terms of their *regional differences as well as their similarities*. Firstly, the Johanniter are active in both cities, providing an ambulance as well as care providers. Secondly, the population density

of both cities can be viewed as polar opposites. While Innsbruck is one of the capitals with the *lowest population density* in Europe, Vienna is the city with the *highest population density* in Austria. Whereas Vienna is considered as a city brimming with educational institutions (see above), Innsbruck also offers a wide array of educational institutions (e.g. Medizinische Universität Innsbruck) (Tiroler Hochschulkonferenz, 2010). Another interesting aspect, in terms of comparing these two cities within the project, is the very *similar amount of elderly people (65+ years) living in both of the cities*. In Vienna 17% of the inhabitants are part of this age cohort. In Innsbruck 18% of the population are 65 years or older (Statista, 2021b).

9.2   Solutions and measures leading to customized regional ILE architecture

Innovative learning environments (ILEs) are well studied in the context of *formal learning sectors* (i.e. schools and universities) with the main target group of young people (e.g. pupils and students) (OECD, 2021). *Informal learning sectors as well as more diverse target groups* (e.g. elderly people) are *not the main focus* of ILE structures in Austria, although elderly people as well as all the stakeholders involved could benefit greatly.

Several *smart care projects* have been conducted thus far (see list below), most of them with the focus on improving the quality of life for the elderly, enhancing social inclusion and safety. The projects always aimed to *include stakeholders from the industry* (providing the technology), the *target group* (the elderly), *professional caregivers* as well as *academic institutions* in the field of Health Care.

Smart care projects that have taken place in *several Austrian regions* were:
- *MY-AHA-* project was concerned with the empowerment of older citizens by providing them with an ICT-based platform to specifically track their health-related concerns (e.g. water intake) via individualized profiling and personalized recommendations.
- *SOCIALCARE* aimed to connect and thereby empower elderly people amongst each other by providing them with technological solutions. Thereby developing a toolkit for social connection and inclusion among the older population and identifying best-practice examples for further research.

Projects with a specific focus on the *Viennese region* were:
- In *WAALTeR* a special focus was laid on social integration and mobility of the elderly, by incorporating smart technologies into the daily-lives of the target population in order to

raise quality of living (e.g. tablet and smart watch with personalized functions in communication, safety and health context) (Digitales Wien, 2021).

- The *AHEAD*-project was specifically focused on fostering the adoption of new (potentially) helpful technology for the elderly. This was achieved by adjusting hearing aids and eyeglasses with innovative features to improve the quality of life for older people with sight- and hearing-impairments.

Projects that were mainly conducted in the *Tyrolean region* (Innsbruck) were:

- *Caru CARES* aims to ensure safety and wellbeing in the living environments of the elderly as well as an ease of caring for the caregivers by implementing a voice-controlled device in the homes of the respective care takers (e.g. for calling for assistance, notification of clients of the arrival of the caregiver).
- The *24h QuAALity* project is concerned with developing and implementing a client server software to improve the quality in the 24h care of clients. It is aimed at care givers and contains an information and education portal in multiple languages.

9.3 Recommendations

User-centered designs are important for the acceptance of a product. Therefor the involved stakeholders should already be included *during the development* process of an ILE.

It is very important to always consider the *environment a digital technology is placed in*. The technology has to match the environment and has to have the ability to be integrated into existing systems. Therefore, *isolated solutions are not a feasible*/practical solution for all the stakeholders involved. Considering people with chronic diseases (e.g. dementia) – when focusing on technological and digital solutions – is very important. For this particular target group smart household gadgets like automatic stove switch-offs, fall detectors as well as light sensors could be a great relief.

When an ILE solution is being developed, *several stakeholders have to be involved in the process*, in order to guarantee its success for the end user (which do not always have to be the care-takers themselves). In order to implement ILE solutions efficiently and effectively care-providers need to be familiarized with helpful technological assets which can both foster relief for their working routine as well as relief and safety for the care-takers they are responsible for. In order to achieve this level of professionalism when working with new technologies, training should be started as early as possible, ideally during their *primary training*.

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Another very important factor for the smooth implementation is the *cooperation and exchange with other organizations* within the field. Although many of the technologies introduced on the market aim to better the quality of life for the elderly, there is still a *lack of involvement* of this target group in scientific studies.

It is also important to consider that the *usage of a system should be intuitive* in order to raise the acceptance of an ILE amongst the users. Another critical point is the number of requirements it takes for one user to being able to manage and learn in an ILE. These should be *kept to a minimum*.

One of the problems is that, although the industry has a big budget for new innovations (also in the form of ILEs and smart care-technologies), the budget *for installation of these innovations in social settings which are concerned with certain social issues is relatively low*, in comparison.

10 Bosnia ILE establishment and deployment

10.1 Regional/country characteristics

"Bosnia and Herzegovina belongs to the group of developing countries and, from the position of the need for rapid development, one of the opportunities offered is certainly exploiting the full potential of digital transformation and development of digital economy. Conventional economy in BH has significant technical and technological gaps combined with complex political relations and unattractiveness for foreign investors. On the other hand, ICT sector in BH has grown over 70% in the last 5 years. To establish a digital economy, it is necessary to develop the following components: Physical-technological infrastructure, Normative and institutional infrastructure, educational infrastructure, security infrastructure and business and entrepreneurial infrastructure. Fortunately, domestic expert potential points to reasons for optimism with the potential to remove existing obstacles quickly if there is the will of decision-makers." (Mastilovič, 2019, p. 23)

IC technologies in health care

IC technologies in health care systems are reflected through the possibility of electronic access to patients' health records, telemedicine, health knowledge management, mobile health care and the like. There are some good examples of such services in health system in BH, but strategy, overall communication and standardization is lacking. Moreover, privately owned service providers (private laboratories, hospitals, spas…) are more innovative but have less investment capacities than state owned sector. In large public health centers, digital technologies have been applied to a considerable extent, while in smaller areas the equipment sometimes does not meet even the basic standards of the profession, not to mention digital technologies.

Social welfare

Social welfare in BH includes services and cash benefits for vulnerable and dependent social groups including elderly people and persons with disabilities. Today, social welfare system in Republika Srpska encompasses different services and facilitates in the survival and meeting existential needs of about 5-7% of total population. Projects for elderly people targeting services for the improvement of living conditions and protection against poverty, disease and negligence are most common form of actions. Significant number of municipalities has problems in the process of application of law and raising funds for implementation of the fundamental rights. Some of these actions are supported by foreign donors on ad hoc basis.

The total number of inhabitants in Republika Srpska in 2019 is estimated at 1,142,495, and demographic indicators show a continuous process of **demographic aging**. Estimations for 2019

show the average age of the population of 43.17 years (an increase from 41.63 in 2013). The age dependency ratio of the elderly, which illustrates the workload of the working age population (15 to 64 years) with the contingent of the elderly (65+), is 30.36, and the aging index recorded a value in 2019 of 152.11.

Care for elders

Currently, Republika Srpska has 97 institutions for accommodation and care for elders. Almost 90% of them are privately owned. Just ten years ago there were no privately owned accommodation centres for elderly. This sector is one of the fastest growing service providers in the country. This can be explained by the continuous process of demographic aging.

The term smart care is recognized by care givers but the use mostly ends with the use of simple tools for digital communication, for example, elderly tenants of retirement homes with their families. Even these services were introduced by such institutions during the lock down in 2020 due to the pandemic. Gordana Lihović, director of Banja Luka Retirement Home: "*We have the need for digitalization. It would be a great improvement to be in the information system of health care in Republika Srpska. It would be nice to have a management system for communication and coordination of services that we could than efficiently offer to users at their homes.*"

Good examples

There are privately owned health institutions which have piloted project of use of digital technology in servicing, mainly in the form of promotion on digital media and the use of applications for internal company management. At the same time, state is working on implementation of large scale projects which are oriented towards management of entire health care system. Integrated Health Information System (ISIS) implemented by Health Insurance Fund of Republika Srpska will significantly improve efficiency and bring financial savings to the health system. Project will enable the exchange of medical data of patients with the formation of a single electronic health card for each, introduce electronic referrals, electronic prescriptions and electronic cards of insured persons and health care workers.

Health Centre Banja Luka is the largest institution for primary health care in Republika Srpska and is a pioneer when it comes to use of e-čekaonica (electronic waiting room). Project was deployed in summer of 2020 and is comprised of using and online application to schedule an appointment at your family doctor.

The project "Help for the elderly and citizens in a state of social need" was implemented by the Association of Citizens "DON" with the support of the City of Prijedor, and in partnership with the Center for Social Work Prijedor. This project could be upgraded by implementing training for the use and transfer of knowledge about modern technologies for various beneficiaries.

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Chamber of Commerce and Industry of Republika Srpska is coordinating the Centre for Digital Transformation. Centre is working on improving the knowledge and skills of employees in the economy of Republika Srpska, providing consulting support, promoting and providing information and advisory services in the field of digital transformation.

Smart services

On the other hand, service sectors, for example recreation and cosmetics, have been very active and are trying to keep pace with the global market trends when it comes to smart servicing. For example, there are several fitness platforms built in BH specially for servicing clients who want to exercise at home, stay fit and eat healthy. Likewise, Facebook pages are filled with more and more video content of local cosmeticians trying to educate clients on basics of cosmetics or more. Same trends are present in trade sector as more and more retail companies are building own web shops and are offering on line communication with clients and sales. This shows awareness of service providers and retailers regarding smart servicing.

Networking examples

Cluster for strengthening research and technological development in the field of medicine and health sciences "**HEALTH RTD CLUSTER**" founded in Prijedor is a non-governmental and non-profit association whose goals are: strengthening research and development capacities in the field of medicine and health sciences, directing society towards innovation and raising the general level of technologies in the economy and ensuring the competitiveness of goods and services in the domestic and world markets, establishing international cooperation for faster integration into world scientific, economic, social and cultural trends and inclusion in the European research area.

Policy approach

Smart care is also well known to the Ministry of Health and Social Care of Republika Srpska. Strategic regulations are supporting the process of improvement of care systems. Possibilities in use of smart technology Ministry recognizes, at least, in raising the quality of life of tenants in retirements homes and similar accommodation facilities as well as the efficiency of health sector. Some examples could be the use of tools for communication, supply of food, purchase in pharmacies, recreation modules …

Government of Republika Srpska has shown its strategic commitment to the process of development of information society by establishing Ministry of Scientific and Technological Development, Higher Education and Information Society specially with the aim of improvement of higher education and development of information society, encouraging innovation and economic development by use of new technologies.

Capacities and potentials

Due to the existence of over 200 geothermal and mineral springs, Republika Srpska currently has eight large spa centers with hotels and medical, care, recreational and auxiliary services. This is a fast growing sector with large investments and growth of exports. Tertiary medical care sector has several institutions rapidly developing during the last decade. One of them is the Institute of Physical Medicine and Rehabilitation "Dr Miroslav Zotović", the reference health institution in the field of physical medicine and rehabilitation, orthopedic surgery and baromedicine in Republika Srpska, in which secondary and tertiary level services are provided within hospital and as outpatient health care. It employs over 900 medical and non-medical workers, specialists, nurses, physiotherapists, occupational therapists... Daily average number of patients is 1250 and 1300. Robotics and some forms of digital communication and promotion have been implemented but introduction of smart care services is still in the process of planning. Special program introduced in November 2020 is the "Post-COVID-19 Rehabilitation Program" designed and successfully conducted in the Institute.

BH can rely on own capacities when it comes to building and implementing new solutions based on IT. The ICT industry is one of the most promising industries in and is a strategic priority in Republika Srpska. There are 450 ICT companies in Republika Srpska mainly oriented towards large global corporations.

Challenges

Some of the challenges which care and health system are facing in the process of introduction of smart services are the complexity of decision making in BH, workforce outflow to western Europe and lack of ICT workforce. On the other hand, pandemic is highlighting the benefits of distance servicing and digital technologies overall. All sectors of economy and life are facing the process of digital transformation as well as care and health system.

Main reasons for absence of smart services in elderly care sector and tertiary medical sector are lack of information, financing and skills and lack institutional support programs.

10.2 Solutions and measures leading to customized regional ILE architecture

Why do we need to innovate the learning processes?

- We need a network which capable of creating learning tools, content and training programs that will improve or develop the skills needed in project regions for delivering new smart care models/services.

- We need to improve smart care skills & competences, elder's digital skills and assure continuous learning through innovative training and educational programs.

- We need a networking framework developed for assuring the knowledge, programs and information transfer between the Innovative Learning Environments established in each project country.

- We need transnational communication network for improving learning environments.

- By establishing ILE in our country, we can use D–CARE e-learning platform as a central tool.

Where to get good and fast results?

Since the lowest levels of digitalization in care and health sector are recognized in elderly care and tertiary health care, which are on the other hand fast growing and investment ready, challenges and gaps in these sectors should be addressed primarily. Considering all mentioned potentials and obstacles, establishment of Innovative Learning Network within these two sectors and fostering their cooperation could give best and fastest results in the form of new quality services for beneficiaries and raise of skills and knowledge of care givers. Momentum of current growth in tertiary health care and lagging behind of elderly care should be combined and used as small efforts can produce large benefits. These kinds of projects, when piloted, and showing good and fast results, can be scalable and multiplicative in other sectors and other regions.

ILE would enable eco-system built upon the principle of open and flexible cooperation and education. ILE should involve main actors (for beginning) with the common interest and bond around at least one productive project which need the commitment and interaction of all involved in order to ensure motivation and grounds for development. In this way, learning content, tools, methodologies and programs are created based on the spiral of inquiry (demand of market, demand of learners etc) and based on the learner characteristics.

Support program for developing mutual projects in the form of ILE will have several benefits for the ILE members, starting from awareness raising, informing and skills development.

Based upon the experiences and expertize of Chamber regarding the associating of interest groups and advocating of their interests and considering the success of forms of networking within the medical sector, such as RTD cluster in Prijedor, ILE can follow the same methods which will guarantee its efficiency.

Quadruple helix approach will enable interdependencies of actors, resources, and activities. The aim is to understand the relationships and the value created between the actors and then to create value to civil society, for example, new jobs or smart services for improved elderly care. Users in

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the quadruple helix framework can also be defined in several ways depending on the context of the arena.

Basic architecture – keeping it short and simple

Within the perspective, based on the atmosphere of workshops organized by D-CARE in Banja Luka and Prijedor, suggested starting architecture of ILE is the following:

Members of ILE - network for creating learning tools, content and training programs that will improve or develop the skills needed for delivering smart care models/services for elders in the area of physiotherapy and recreation	
Citizen	two public large centers for accommodation of elders, Institute of Physical Medicine and Rehabilitation
Business	IT companies, Chamber of Commerce, media
Government	City of Prijedor (local), Ministry of Health and Social Protection of Republika Srpska (entity, national)
Research	High school for education of care givers and physiotherapists
Main goal of this ILE shall be stakeholders' and users' interactions in learning processes, skills creation & development, smart care/healthcare services delivery. Users in the first phases will be tenants of retirement homes.	

Steps to follow (PPK BL administration and technical support):

1. contacting mapped members of ILE

2. engaging needed actors for establishing ILE trough organizing two open partnership seminars

3. drafting and signing ILE Partnership Agreement

4. drafting the agenda of ILE functioning during the D-CARE project (toolkits, training programs, innovation program…)

5. drafting the suggestions for ILE development

10.3 Recommendations

BH ILE will become a member of ILNE Framework which is a networking framework developed for assuring the knowledge, programs and information transfer between the Innovative Learning

Environments established in each project country. At the same time it represent a transnational communication and collaboration network for improving learning environments dedicated to integrated smart care service sectors/fields.

The central tool of the networking is e-learning platform for facilitating learning programs at transnational level (between ILE's or in another Danube regions) for assuring joint cooperation in new learning programs development and for updating the spiral of inquiry.

Further development of ILE in BH can be conducted by:

1. reaching more actors of the same interest from entire Republika Srpska - more retirement homes from public and private sectors, more secondary schools or informal education organizations, more local authorities, more IT companies…)
2. establishing ILE of the same character in Federation of Bosnia and Herzegovina and forming the cooperation mechanism of the two
3. widening ILE by adding more actors with complementary interests – such as health care centres, spas, employment agencies, care givers for other target groups etc.

11 Conclusion

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