

D-CARE Project

Advancing Smart Care in the Danube Region





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Imprint

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Danube Transnational Programme

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1. The Challenge

With the Covid pandemic the strain on health and care systems in Europe and, even the world, has come to a collective awareness. Yet, the underlying pressure on health and care services has not only accelerated since the start of the pandemic. There has been a longstanding lack of funding as well as personnel capacities in the majority of health care systems in Europe. With the demographic shift the mismatch of demand and availability of care services will further exacerbate in the next years, especially hitting rural areas where the geographic dimension negatively affects the accessibility of health and care services. As younger, working adults largely move to urban areas rural regions are left with a low density of doctor practices as well as care providers. At the same time, older adults are staying in rural areas by themselves with few or no family members to rely on for care and daily support.

With an increasing life expectancy chronic and civilization diseases are on the rise, adding another facet to the challenge of providing accessible and high quality care to all citizens equally across regions. While different parts of Europe or the world might be exposed to these challenges in various intensity, urgency, or might have different priorities, they pose themselves uniformly to countries due to their transnational and systemic nature.

Digitalization and technologically supported services offer a high potential for mitigating the impact of these developments. Yet, in many countries the overall level of digital infrastructure and even more so, digitalisation in social services is very low. This is likewise reflected in the widely lacking digital literacy of the population, especially among older generations. This makes integrated, time and resource efficient as well as highly effective approaches all the more necessary. The D-CARE project focused on providing a holistic response to these challenges in a concerted effort across nine Danube countries.



2. The D-CARE Approach

The D-CARE project aims to tackle these challenges through the **advancement of smart care**. With smart care we mean integrating technological with social innovations, building smart care skills and supporting policy progression for better, accessible and sustainable health care provision. Over twenty organisations from nine Danube region countries of various sizes and expertise fields such as innovation ecosystems, academia, health and care, user integration and education or policy making have joint forces under this objective in the D-CARE project. Our project countries are, following the river downstream: Germany, Czech Republic, Austria, Slovenia, Hungary, Bosnia and Herzegovina, Romania, Bulgaria and Moldova. While all being part of the Danube region the countries depict a wide range of favorable or challenging preconditions for smart care innovation. Through mutual learning, high infrastructure development and skills levels could be exploited to their full benefits and disadvantages mitigated at the same time. The central mechanism to successfully advance smart care in the Danube region thereby is the quadruple helix approach.

2.1. Quadruple Helix Innovation Model

Innovation for interdisciplinary societal challenges needs a collaborative approach. The D-CARE project successfully employed **the quadruple helix model** to create regional and transnationally connected cooperation structures which generate and foster innovation, build skills and capacities and drive policy development for the complex field of health and care innovation. Drawing from the Silicon Valley experience the quadruple helix model centers around user needs and feedback while including academia, policy makers and businesses as well as investors into the innovation process from the start.

The society is therein divided in **four helixes, namely users/civil society, businesses /industry, researchers/academia and policy makers/governance** whose joint participation in an innovation process is necessary to generate useful solutions which can prevail in the market.

Since involving actors from all four helixes ensures that the innovations which successfully pass through the development cycle will be fit for user needs, have a working business model, benefit from past research data and insights and are compatible with existing policy.

Therefore, the Quadruple helix model:

- is supposed to play an important role in promoting the transition from technical to social innovation;
- can complement and enhance innovation development through 'bottom-up' insights from civil society to complement 'top-down' views from university, industry and government in regional development;
- supports the creation of social innovation and provides the legitimation and justification of an innovation;
- exerts a strong influence on the generation of knowledge and technologies through its demand function (Roman, Varga, Cvijanovic, & Reid, 2020)
- is considered to strengthen democratic structures in decision-making on regional research and innovation strategies;

In this way, the quadruple helix model is especially apt to generate user-centered, “disruptive” innovations which cater to the needs of all stakeholders involved in innovations located in a public field – such as health and care. For such innovation to happen, the cooperation of quadruple helix stakeholders needs to be coordinated through a collaboration framework or structure.

2.2. Smart Care Labs

We convened our quadruple helix stakeholders in eight regional smart care labs as local catalyzers for the advancement of smart health and care. Our Smart Care Labs follow the concept of Living Labs. A living lab can be defined as a “Public-Private-People Partnership (4Ps) of companies, public agencies, universities, users and other stakeholders, all collaborating for the creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts” (Westerlund and Leminen 2011, p.20). Thereby users are getting a new role in the process of innovation as co-producers when developing new services and new use cases for devices and infrastructures. This user-centered innovation development is materialized in a co-creation process (Compagnucci et al, 2020).

Activities in Living Labs

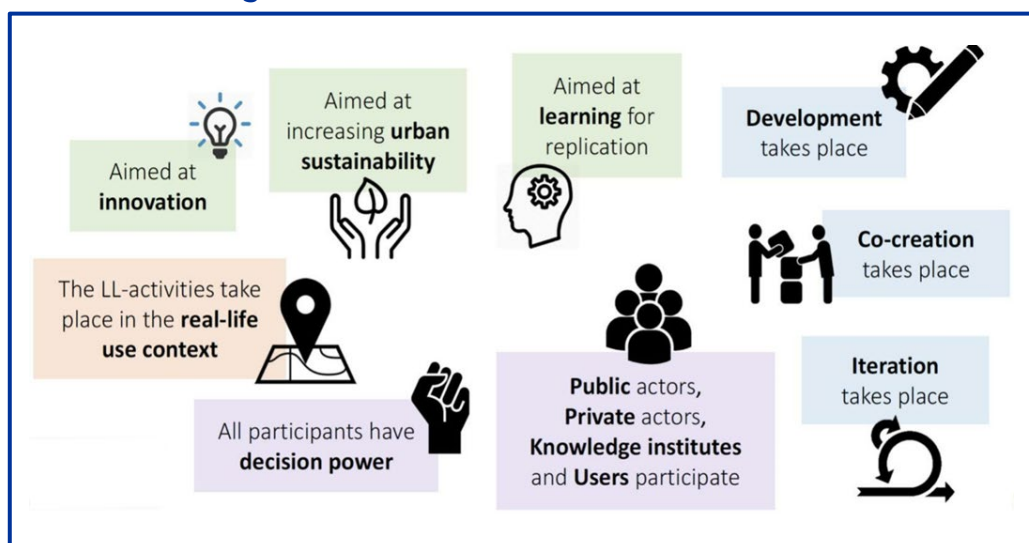


Figure 1: Source: Prof. Dr. Ellen van Bueren, Power Web Conference 2019, Delft, 2019

For the D-CARE project, we defined the Smart care labs (SCL) as environments/mechanisms serving as **cooperation structures** in which Quadruple Helix stakeholder engagement takes place. The overarching long-term goal of the labs is to **co-create disruptive innovative solutions** all along the value chain of integrated care for older adults and medical services, including technological solutions and social innovations, **improving competences, and generating new business models**, new businesses, new jobs and new skills. The smart care labs therein serve as the operational framework for creating, testing and validating smart care solutions, develop necessary skills for their broad-range implementation and **engage in policy dialogue** to create favorable conditions for the advancement of smart care. They were involved in the development of our Innovative learning platform and the training programmes and likewise benefited from the collected knowledge; they took a steering function in the regional innovation contests, the selection of pilot smart care solutions as well as the pilot phase itself; lastly smart care lab members jointly elaborated regional action plans as locally tailored advisory documents to advance effective policy for smart care. While the composition of the lab members as well as the specific regional challenges they prioritized differed across our project countries the overall goals remained the same. The national Smart Care Labs were connected through recurring transnational exchange formats as well as the D-CARE project platform.

2.3. An Integrated Response to an interdisciplinary challenge

The challenges confronting health and care systems are interconnected, and, thus, need an integrated approach. As described in the roles taken on by smart care lab members the D-CARE project oriented itself towards three interventions for systemic progress in older adult care:

1. **developing smart care skills for caregivers, older adults, their support networks as well as potential lateral entrants:**

To this end Innovative Learning Environments in each country were set up, bundled in a transnational digital platform. The main output were smart care learning programmes for various target groups (see chapter three)

2. **Scouting, testing and validating smart care solutions accurately tackling regional priorities:**

The D-CARE innovation programme scouted, tested and validated smart care solutions through regional innovation contests and pilot projects

3. **Pushing for policy development and policy learning regarding smart care:**

The D-CARE transnational policy learning center encompasses a transnational smart care strategy, regional actions plans as well as best practice studies to allow for policy makers to learn from each other and coordinate their efforts on regional and transnational levels

By combining bottom-up with meta-level, top-down activities we avoided deadlocks through discontinuities in different horizontal and vertical areas of the health and care system. The activities of the project included stakeholders from all four societal helixes and enabled continuous exchange between users and developers, regional and national policy levels, local and transnational efforts.



3. Innovative Learning Environment

3.1. ILE – Definition

Learning environments are, in most cases, designed to **support the development of skills and knowledge in a particular field**. The learning environment is larger than a particular class, school, workplace, or learning programme. It includes learning activities and outcomes, learner characteristics, teaching and learning objectives, assessment measures that support learning, etc., and is not just a place where learning takes place (e.g., a classroom) – it is a space where learners feel safe, supported, and inspired. Shared governance allows for design decisions to optimise learning for participants (OECD, 2017; Bates, 2019).

Learning environments are, thus, in their very structure apt to incorporate innovative learning methods, adapt efficiently to user needs and employ different channels of knowledge transfer. It is therefore not too big of a step towards innovative learning environments. Innovative learning environments are **learning ecosystems built on the principles of agile and dynamic education and training** and are designed to enable a variety of collaborative, participatory, and independent approaches to teaching and learning. They typically consist of interconnected spaces with a high degree of visibility within and across different learning environments (Young, Tuckwell and Cleveland, 2021). In the pedagogical context, an innovative learning environment can be understood as a combination of an innovative space that supports a wide range of learning needs and situations, often through the provision of highly flexible interior and purpose-built furniture and innovative teaching and learning (Bøjer, 2021). It can develop and adapt as educational and learning practices do, being future-focused in its structure. If you are interested in the details of how innovative learning environments are serving as skills and knowledge bridges, see our publication.

The D-CARE project established **nine innovative learning environments** in its project countries focusing on the development of skills, knowledge and capacities in the field of smart care among older adults, their support networks, formal care givers, medical practitioners and health administration officials.

3.2. The D-CARE ILE platform

To bundle the knowledge collected and learning content developed in all regions we established the **D-CARE E-Learning Platform**. It complements the innovative learning environment structures in each project country. The basis of the D-CARE E-Learning Platform is the ILIAS open-source web-based learning management system (LMS) which supports online classroom teaching. Besides many functions, ILIAS offers course management settings, communication options, evaluation and test/assessment opportunities. The D-CARE Platform has two main surfaces: the platform where training modules are uploaded and the ILIAS system where related tests and learning progress checks can be completed. To represent the transnational diversity of the project, the platform is available in all national project languages: Romanian, Hungarian, Bulgarian, Czech, German, Serbian and Slovenian as well as English to facilitate further translation and accessibility.

The platform offers **24 training modules** of a wide range of topics and tailored to different target groups. Each of the interactive learning modules has an automatically graded self-checking quizz at the end of the section. Learners can therefore access the content at individual times and regardless of their location, pace the speed of learning according to their needs and check their learning progress anytime. The learning programs have been developed in joint cooperation by our project partners. The Platforms is available under the following registered domain: <https://d-care.ifka.hu/>

To accommodate regional priorities in capacity building, eight national training programmes have been composed: 1) Bulgarian National Training Program, 2) Romanian National Training Program, 3) Slovenian National Training Program, 4) Bosnian National Training Program, 5) Austrian National Training Program, 6) German National Training Program, 7) Czech National Training Program, 8) Hungarian National Training Program

3.3. Smart Care Training Programmes

The training programmes focus on the **main skills necessary for persons to work with or use smart care services**. In exchange with local stakeholders national skills gaps have been identified that should be tackled primarily. The national training programmes have then been assembled in this light.

Generally, the training modules provide valuable knowledge for a wide range of stakeholders; older adults 55+ (mainly with chronic physical or psychological impairments), formal and informal care givers, doctors, hospitals and clinics, local public authorities, regional public authorities national public authorities, sectoral agency interest groups such as NGOs, higher education and research education/training center and schools, SMEs. The training modules address four main areas: 1) Digital skills for delivering and implementing smart care services programmes; 2) Digital skills for older adults benefiting smart care services program; 3) Data analytics and monitoring processes for developing and delivering smart care services programmes; 4) Smart care skills for delivering social services and Smart care skills for delivering healthcare services, including monitoring. The 24 developed modules were then arranged in our national training programmes which are fully available in the respective national languages. The platform and innovative learning environments are supported by stakeholders from all regions who ensure their sustainability and longevity beyond the project duration.



4. Smart Care Labs and the Innovation Programme

4.1. The role of the Smart Care Labs

The Smart care labs (SCL) served as cooperation structures in the D-CARE project in which Quadruple Helix stakeholder engagement took place. Eight SCLs within the D-CARE project therefore invited regional stakeholders from businesses, academia, user representatives and policy makers who signed a Memorandum of Understanding and agreed to cooperate in the project with their insights, time and knowledge.

The SCLs were then the context in which all three main interventions of the project – skills development, creation and validation of disruptive innovations and policy development – took place. Our Smart Care Labs have a key strategic document - the Smart Care Lab Strategy - with defined goals, approaches and an action plan to achieve them. It also provides an overview of how to set up a lab, carry out activities within the lab and maintain its sustainability. While focusing on pressing regional challenges related to social and health care, the eight Smart Care Labs followed the same four strategic goals:

1. to engage and motivate stakeholders to collaborate and to build strong e-Health and e-Care ecosystems through “fit for the region” smart care models by connecting and establishing strong cooperation among stakeholders;
2. to explore and evaluate new ideas, foster innovation, and the usability of innovation in the health and care sector in the Danube region;
3. to provide a working environment for: the creation, development, prototyping of new ideas, services, products, and business models through co-creation and testing and validating the innovation in real environments with real users and
4. to create new business opportunities in the eHealth and eCare sector.

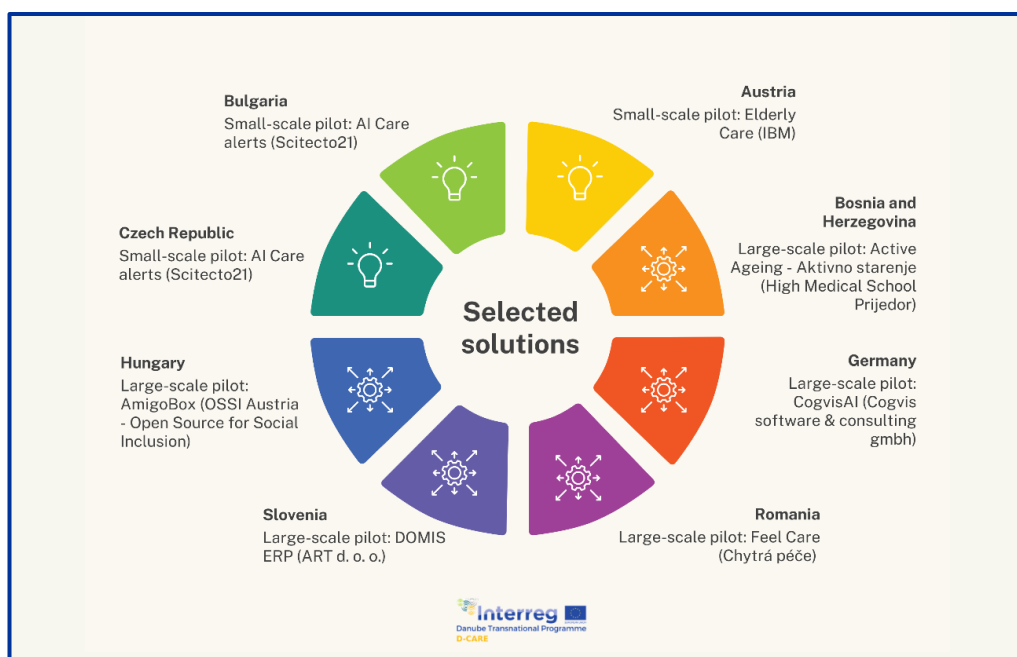
4.2. The Innovation Programme

To scout, test and validate innovations that tackled each regions urgent health and care challenges we set up a project level innovation programme and country specific innovation contests facilitated by each Smart Care Lab. The goal of the innovation programme was to identify innovative solutions and organizations whose products and services respond to regional challenges in the field of health and social care. The contests were open from December 1st 2021 through to February 7th 2022, followed by an evaluation conducted in a decentralized manner by the national partners of each project region together with the members of the respective Smart Care Lab.

29 companies applied for the innovation competition in all eight regions (the majority of applicants applied in more than one region). Most countries selected one solution to test, Austria selected three and continued with one after the co-creation phase, and Hungary selected four solutions - one on a large scale to test with end users and the other three to support solution development through mentoring programmes.

A total of seven selected solutions subsequently entered a co-creation process involving solution owners, end users, and complementary stakeholders from the Quadruple Helix. Through co-creation, we promoted a user-centric view as opposed to the traditional "company-centric" view, and end users became part of the value creation process. The solutions were further tested in regional Smart Care Labs to give regions, decision makers, service providers, and ultimately end-users insight into how they worked, their benefits, and potential barriers to wider adoption. Depending on the region's as well as the developers' resources the co-creation and testing was conducted as a large scale pilot – testing with end users in a real life environment – or in a small scale pilot – testing the solution in a workshop setting and providing business counseling. This process allowed companies to better understand end-user needs (by putting the user in the real-world environment), increased the opportunity to develop a sustainable solution, increased the exposure of the solution to target audiences and better understand how products perform from a technical point of view in a real-life setting. For end users it meant enhanced access to services, adapted solutions to their needs and an increased awareness about different products available at the market.

The selected solutions in our eight project regions were:



4.3. The Innovation Programme in our project countries

The following chapter presents the innovation programme in our project countries in more detail. Briefly, the respective regional focal challenges, the response rate to the innovation contest, the selected solution and the reasons for selection are described. Subsequently, you can gain some insights into the national co-creation and pilot phases as well as the outcomes and lessons learned in each region.



WE WANT YOU!

D-CARE Innovation Prize
application time: until 31st January 2022

You have an idea or solution to tackle the most pressing issues in health and care in the Danube region?

Innovative mastermind?
Experienced health care expert?
Passionate about sustainable societal development?

Apply with your solution to advance smart health and care in the Danube region under:
<https://www.ika.si/DCareInnovationCall>

Project ID: DTP656 | Project co-funded by European Union funds (ERDF, IPA, ENI)

National Innovation Contests in our project countries

-  Austria
-  Bosnia and Herzegovina
-  Bulgaria
-  Czech Republic
-  Germany
-  Hungary
-  Romania
-  Slovenia



Austria

Focal challenges

“In Austria, solutions are sought that target several aspects of the daily lives of older adults with frailty and living isolated either in their remote homes or care facilities. Services and products shall focus on improving social inclusion, engage older adults in the community and prevent accidents at home, monitor medical conditions and alert in case of emergencies. These tools and solutions should be designed to be rolled out on a large scale to reduce healthcare and social costs in the long term with a rising number of older adults in need of care services.” (D.T2.2.2)

The innovation contest

In total, six companies participated in the call. The submitted documents were evaluated according to the project requirements. Three solutions were selected for co-creation.

The selected solutions

MeineHILDA (by Hilda GmbH). The solution deals with the prevention of dementia focusing on prompting participants with questions to everyday life as well as past experiences accompanied by music to foster cognitive capacities of the users. Due to the demographic shift in Austria and the rising numbers of older people at risk for dementia this solution could be very beneficial for the target group.

IBM elderly care (by IBM Österreich Internationale Büromaschinen Gesellschaft GmbH). The proposed solution offers the possibility for people in need of care to stay at home longer. And thus, addresses the main objectives of D-CARE.

Elly (by Opus Novo GmbH). Elly is targeted towards older adults via a lighting system in their own homes to prevent accidents. Also, relatives and informal carers can be updated on emergencies via the smartphone-app of the solution.

Co-Creation

All three-winner solution were invited to the co-creation process. They presented their solutions in front of a jury followed by discussion in a co-creation workshop in May 2022. The solutions received recommendations for improvement as well as feedback on the market readiness from the experts e.g., concerning the number of interfaces, used in the solution, notifications in case of emergency and further testing of the solution (especially in terms of the speech recognition of one solution).

The pilot testing

“The goal of the IBM Elderly Care testing was to explore possibilities for synergies of various technologies and service products. The objective of the testing was to elaborate a “Smart Care Service Model” involving multiple devices and service offers.

The testing of the pilot was planned on the basis of a business game. Various scenarios within the service cycle were jointly illuminated, discussed and reflected upon. As a method, a table-top exercise was designed.” (DT2.4.2)

Key findings: potential for more safety within the own four walls is given, though more interdisciplinary collaboration and research is needed. (DT2.4.2)

What follows from the pilot? What are Lessons learnt?

Higher technology readiness level and sound service infrastructure is required for user studies under real live conditions.

In order to collect and analyse data using artificial intelligence, a sound knowledge of possible consequences is essential. For example, if irregularities of the movement habits are detected the resulting action or strategy (including medical treatment) must be clear, otherwise the action would be considered as unethical.

Players in the healthcare sector must be conscious of possible unwanted side effects of actions. Technology impact or health impact assessment can help to mitigate unwanted consequences. Decisions must be well balanced and in consent with the recipient.

As the VPC and BMC have shown, it may be worthwhile in terms of future revenue streams to look more into rental services and potential insurance reimbursements. The unit costs are too expensive for the mediate target group and would just allow a high income driven revenue model, which is in terms of inclusion something to reject. Benefit of a rental model is, from experience with personal emergency alert systems ("Hausnotruf") that units can provide service over a very long period (10 years and more) as long as they are not software driven. Electronics can last longer and improve the revenue over time.

Early procurement is also a benefit if the technology can be used for later customers as the valorisation of hardware costs over the years (inflation adjusted) lowers the costs in the following years, as prizes raise because of inflation within a couple of years by up to 35%.

Conclusion: potential is given, though more interdisciplinary collaboration and research is needed.



Bosnia and Herzegovina

Focal challenge and response rate to the innovation contest

Support of the development of smart care services for older adults. A special focus was set on physical therapy and rehabilitation services. Four applications were submitted.

The selected solution

The selected solution “Aktivno starenje” (Active Ageing) refers to the regional problem of poor availability of digital solutions in the field of physical therapy, is easy to apply and cheap to develop, and the creators of the solution are organizations with references and expertise.

Goal of the pilot “Aktivno starenje” is to develop the prototype of the service and test it in real environment. Service consists of internet-based video material containing visual and verbal instructions for conducting different series of exercises. It can also contain video guides for the use of some medical equipment or even instructions for safety of older adults living alone.

Co-creation and pilot testing

A Co-creation workshop (April 15th 2022, Prijedor) has developed the Value Proposition and a Business Model Canvas for “Aktivno starenje”.

The Testing phase was conducted from June to the end of October 2022 as follows:

1. further developing the prototype;
2. establish the testing panel and procuring the external expert for managing the testing process and external IT expert for testing of the platform;
3. the testing: (a) IT testing of the platform <https://aktivnostarenje.emedicina.online/> in the area of technical performances and (b) service testing (the video contents and usability) with real users;
4. delivering and validating the testing report.

What follows from the pilot? What are Lessons learnt?

Based on the testing results, Aktivno starenje can be developed in several directions. Due to the issues of ownership and choice of the business model, all parties that contributed to the development of the prototype will arrange a cooperation agreement and set the terms of further use of the platform and allocate roles of each partner. Thereby, the sustainability of the solution is guaranteed as well as the continuous influx of expertise.



Bulgaria

Focal challenges

The focus in Bulgaria lies on improving social inclusivity and community for older adults who are unable to self-care and/or have fallen into isolation due to their remote place of residence. Solutions should provide digital means to engage older adults, help them to acquire digital skills and use smart care tools to directly improve their daily living conditions.

The innovation contest

In Bulgaria, we received 7 eligible applications (2 companies from Hungary and 5 from Bulgaria), 5 solutions were approved for small/large scale piloting and 1 D-CARE Finalist award was granted for an innovative solution.

The selected solutions

The evaluation committee selected 5 solutions that are indicated as best fit for Bulgarian and regional needs. The emphasis was on solutions that could bring great added value to the target group of the project.

- **Kelvin Health:** Aim is to develop a widely accessible non-invasive diagnostic tool, based on thermography imaging AI;
- **Hydrovitality:** Hydrogen therapy of various diseases. Self-care solution for the geographically isolated. Voice activated, can connect to smart devices Care hub – can establish a connection between the device and a relative's home
- **SkillToolkit!** e-learning platform, improving various digital skills of older people.
- **AI Care Alerts:** System for smart video surveillance and communication
- **Mental cloud:** Programme for stress management and monitoring. Includes testing, monitoring and remote access to specialized psychological assistance

Co-creation

Launch meetings were organised with all winners and stakeholders, followed by in-depth interviews with the stakeholders. The next step was to consult with each company separately what would be useful for their work and what we can include in the co-creation process. The two solutions needing the most support, Water Fuel and Scitecto, received direct counseling and were supported in network building and fund raising.

The practical result of the interviews supported the companies to adjust their business and marketing plans and to devote more time in the right direction. As with the case with Scitecto, the interviews showed that in fact the solution needs a practical testing with the stakeholders, but also a in depth discussion with the stakeholders from the local, regional, and national authorities in order to be in line with the up-to-date legislation and EU directives on the matter. This was not envisioned in the beginning of the co-creation process, but now it is part of the company strategy and risk mitigation plan.

The pilot testing

Scitecto's solution on smart care alerts was firstly checked through the business model canvas. The real life testing was conducted with a number of user representatives supported by a wide network of education experts, business association representatives as well as administration officials. Their perceptions of the interaction were captured as qualitative data which could later be evaluated. The testing clearly showed the need for further technical development of the solution as well as long-term financing.

What follows from the pilot? What are Lessons learnt?

The market access plan through the association of the Blind in Bulgaria was validated.

Technical improvements for the reduction of false cases is needed; to this end the software needs to be feeded with more reliable and representative data.

Potential overlap and/or cooperation potentials with a similar solution from Israel should be explored through in-depth market research and outreach to the Israeli developers.

Government or large-scale investors should intensively be sought.



Czech Republic

Focal challenges

To tackle mobility impairments, loneliness, and poor quality of life.

The innovation contest

In the Czech Republic we received 8 eligible solutions applications to the Innovation contest (5 for small scale testing and three for large scale testing).

The selected solution

The solution “AI Care Alerts” of Scitecto21, was selected as a winner of the Innovation Contest in the Czech Republic because it meets the expectations of our stakeholders in Ústí nad Labem region in terms of an innovative solution to improve the lives of people with disabilities, for whom this innovation promises a significant improvement in their quality of life. It is expected to enable them to lead a safe social life for people with visual impairments. Its use can contribute to reduction of feelings of loneliness or isolation and, on the other hand, to an increased the living comfort of this target group.

Co-creation

First, project partners selected participants for three co-creation workshops. The participants were selected on the basis of their in-depth knowledge of regional environment and context. The first workshop dealt with the issue of “How the problem is solved today”, i.e. how jobs are done. The following workshop was focused on market barriers and the third workshop was about dissemination of the selected technology. Different co-creation methods were applied such as the blue-sky card format to involve all types of participants.

The co-creation process generated very useful outcome and results. Key outcomes and achievements are following:

User target group are people with impaired vision. In the first phase the team should focus on young people.

Target customers also include families of people with vision limits.

Probably it will be better to provide service not product, because of expected high price of the product.

The solution is already quite well developed. In the next phase the team should solve how to implement the solution and how to provide a sustainable service.

Solution addresses an important need – feeling of being safe.

The pilot testing

The solution “AI Care Alerts” of Scitecto21 is not in a prototype stage that could be safely tested with end users. The validation in cooperation with regional stakeholder should help the innovator to better understand needs, potential and barriers and thus to increase chances to succeed on the market. The piloting and validation were based on developing a Lean Canvas, which a modified version of Business model canvas created by Ash Maurya. The lean canvas was validated based on the data from target groups and during the validation workshop facilitated by expert on start-up and business.

What follows from the pilot? What are Lessons learnt?

The selected solution is quite ready for market entry. However, there are still two main hurdles:

demand. The maximum size of the target group is 40 000 people in Czechia. However, probably only the young people in the target group will be the first adopters of the technology, because of their more openness to new technologies. Moreover, the team should focus on family members who need to take care of their loved ones.

team. Persons implementing the solution in practice are missing. They must build a supporting team that will not only implement the solution but also provide service for users. There are two options; to build their own supporting team or to set up joint-venture with local providers of technological solutions for people with disabilities.

The lessons learnt by Czech project partners:

In the future, it should be anticipated that the whole process will require interpretation, as many stakeholders do not speak English, and language levels may vary.



Germany

Focal challenges

To develop integrated and integrative solutions for smart homes as well as stationary smart care.

The innovation contest

Eight solution providers applied to the national innovation contest (two small scale and six large scale applications). Out of those three solutions were selected which all entered the first stage of the co-creation phase to then choose the best fit solution for pilot testing. Those three solutions were IBM Elderly Care (integrated smart home system), Cogvis AI (smart fall detection and prevention) and the Omnibot (multifunctional support robot for physically impaired).

The selected solution

CogvisAI was selected for further piloting. The solution provides 3-D-sensor based fall prevention and detection for a care home setting. As the sensors do not process images they comply with data protection and privacy while at the same time combining the functions and benefits of several existing fall and absence detection devices. Moreover, the solution is already highly developed so that testing can be conducted with older adults in real life care home settings within the project timeframe.

Co-creation

The co-creation phase firstly consisted of in-depth interviews with the solution providers as well as quadruple helix stakeholders. The focus laid on care homes as well as senior representatives to analyse the user needs and concerns regarding an intelligent fall prevention system. In a co-creation workshop in May 2022 together with potential testing institutions, the solution developers and further smart care lab members the conditions for the testing and especially hindrances in terms of funding and legal status of such services in Germany have been explored.

The pilot testing

Pilot testing started in August 2022 in two care homes, one being a private institution and the other managed by a philanthropy organization. Nine sensors were placed in rooms of older adults at high risk of falling. The piloting lasted until the end of the year, while a mid-term evaluation was conducted by two researchers from a leading local university through qualitative interviews. Generally, perceptions of the sensors were good while concerns regarding the long-term financing of the solution as well as technical issues with false alarms remained.

What follows from the pilot? What were Lessons learnt?

More focus needs to be put on generating the legal and financial conditions to foster and roll out smart care solutions.

High-tech solutions like the CogvisAI sensors require some time and personnel resources especially at the beginning to properly get acquainted with the solution and only then be able to exploit its advantages.

Lacking digital literacy and affinity for learning depicts a challenge for the advancement of smart care solutions.

Both institutions were interested in using the sensors long-term but the purchasing of the service depends on funding.



Hungary

Focal challenges

- 1) Social isolations as well as cognitive decline. Solutions should directly help assisted and independent living of elderly people (65+).
- 2) Digital solutions helping the administration load of caregivers especially in homecare.
- 3) Alert and emergency systems for home care and elderly care homes.
- 4) general assistance in everyday life for older adults, that can be easily developed and produced by local companies.

The innovation contest

6 solution providers handed in their application for the innovation contest in Hungary (5 small-scale and 1 large-scale testing application).

The selected solutions

After the evaluation process the Hungarian D-CARE project partners selected 4 solutions to start the co-creation process.

1. **AmigoBox: communication equipment and technology for elders (OSSI Austria Association) – smart and older adults friendly communication tool including with supporting organisations.**

AmigoBox tackles loneliness issues and contributes to independent living for older adults.

2. **SkillToolkit: adaptive e-learning platform for elders**

SkillToolKit offers individualised as well as standardised e-learning contributing to skills and capacity building for older adults and their independence in life.

3. **Continest: Safe visitor Container Center**

Continest's solution allows for flexible and safe contacts for older adults with caregivers, doctors or relatives especially during the pandemic. The solution is flexible and environmentally friendly compared to competitors.

4. **Terra95 Bt.: App for self-care at home for older adults**

Terra95 Bt.'s solution supports older adults living at home to work against physical decline and apply medical aids correctly. Thus, it supports independent living in old age.

Co-creation

The outlines of co-creation process were discussed with all relevant stakeholders. To cater to the different needs and application fields of the solutions, each selected applicant was allocated a mentor. Out of the 4 finalists, finally 3 solutions were invited to enter the piloting phase:

Ossi Austria – large scale; SkillDict – small scale and Continest – small scale

While both Continest and SkillDict received counseling and support with networking the focus lay on OSSI Austria. During the co-creation phase on-site testing was planned involving stakeholders from the testing institutions. Documents were also prepared for starting the testing, like info package for testers and the proposed testing schedule was set.

The pilot testing

Real-time testing was organized on two test sites, Kecskemét and Kaba. Private persons and residents of a care home would be participating in the pilot. Relatives and caretakers of older people will also be involved as well as institutes.

The testing objectives focused on obtaining feedback on the effectiveness and sufficiency and acceptance of the solution. The evaluation was based on both quantitative and qualitative measures. It returned that the solution is ready to use in a real-life environment. The usability was a good fit especially for older adults and their relatives but the technical stability of the solution impacted the user experience negatively. The NFC functions were not used as not deemed necessary.

What follows from the pilot? What were Lessons learnt?

The AmigoBox is a scalable product, especially by cooperating with bigger organizations and offering multi-user devices. By that costs for the single user can be lowered and organizations can offer an easy-to-use communications device to their residents. Privacy and technical issues need to be eliminated to the best possible and a pricing model needs to be developed, so that organizations and also private people can effort using the services of the AmigoBox. The solution needs further technical development to improve quality, stability and the range of features offered.



Romania

Focal challenges

Improving the quality of life of older adults with medical conditions and social conditions applicable in senior care facilities, disease management for hospitals, nutrition and medication, alert, and emergency systems (IoT, AI), increased access to socio-medical services from remote areas, virtual nursing and doctors, memory training apps or VR solutions to interact with objects, prediction and alert solutions, and also oncological patient management therapies.

The innovation contest

Ten solutions providers applied to the national innovation contest (seven small scale and three large scale testing applications). One solution was selected for co-creation and piloting

The selected solution

The FeelCare solution is an intelligent system alerting in case of medical emergencies in a care home setting. It reduces the reaction time to medical emergencies such as falling, heart attacks and similar and therefore improves the overall quality of medical care that can be provided to care home residents.

Co-creation

Members from all four helix branches, especially from later testing institutions convened in a digital co-creation workshop to develop testing protocols, use scenarios as well as functioning business models. Cooperation protocols were set and two use case scenarios developed which were later tested during the pilot phase: one addressing the reaction time to medical emergencies in care home settings the other exploring the accessibility of older adults living alone for medical emergency services.

The Pilot testing

Piloting was conducted in two care homes subsequently over the period of two months each starting in July 2022. Both institutions purchases wearables and devices to implement the solution, the configuration of which was then performed by a FeelCare team at the beginning of each piloting phase. The testing included eight doctors, three nurses and 25 older adults. The use of the device significantly improved the general health condition of older adults, the ease of monitoring and reacting to alerts and improved the delivery of care protocols. It highlighted the need for special training for care givers especially due to a reluctance in using digital tools due to lacking digital literacy.

What follows from the pilot? What are Lessons learnt?

The solution is effective in delivering its objective. Yet, it can be improved through adaptation to national requirements for emergency care interventions and daily monitoring using digital solutions.

Further develop automatized and available reports and data allocation through dashboards to support medical and care decisions by caregivers. Low digital literacy of care personnel compromises both the use of available data as well as the subsequent care decisions.

Training programmes need to be expanded and improved, especially to include information and contact options with relatives.

The number of compatible IoT-devices can be further increased to support wider usability and roll out of the solution.



Slovenia

Focal challenges

Optimize work processes in social care institutions saving time for employees and, consequently, more time for social contact with patients.

The innovation contest

Five applications were received for the national innovation contest (two large scale and three small scale applications). The Slovenian partners identified DOMIS programs which includes digital labelling of services in social care institutions as the best innovation in the competition of D-CARE project.

The selected solution

The program DOMIS allows residents to be treated holistically, from registration to confirmation or rejection of the request to admission to the retirement home. The Program provides support to all social services (haircutting, changing clothes, shaving ...), medical services (wound cleaning, blood pressure measurement, incontinence aids ...), physiotherapy and exercise schedule. Electronic labelling enables the optimization of services in social welfare institutions. The solution improves the standard in remote care available to older adults and eases the transfer of patient information and, thus, workload on caregivers.

Co-creation

In the co-creation phase, we defined the main objectives of the testing, the way the testing will be carried out, we set a timeline and, together with the representatives of the Quadruple Helix, we drafted a rough outline of the business model.

The pilot testing

The testing has been conducted in one retirement home and on social welfare institution including 23 employees and 30 clients and 5 employees and 10 clients respectively. The solution speeded up the usual communication flow between working groups in the organization, but it also contributed to more time for communication of the employees with their clients. Furthermore, the service shortens the procedures and lessens the time necessary for conducting bureaucratic and information exchange procedures; it also significantly releases the employees from the mental stress of having to remember the date before inputting them in the computer), which is another of the observed benefits. From the point of view of management, the IT tool also contributes to the overview of the workflow as well as the services that have been performed. The testing returned that while the openness to the solution was not affected by digital literacy, employees with less expertise with digital tools needed more support.

What follows from the pilot? What were Lessons learnt?

The solution improved the organizational processes relating to administrative and bureaucratic aspects of social and health care, but it is noticed during the study that only certain aspects are acknowledged by the management of the organizations (such as accountancy aspect and to a certain extent also human resource management aspects).

There are several opportunities of upgrading the sole IT solution with additional consultancy in organizational and managerial matters (for example, how to plan human resources according to the data provided by the scanned workflow).

Enhanced training is necessary for employees with lower digital skills.

The solution leads to a notable stress relief for care givers.



5. Transnational Policy for Smart Care

5.1. The D-CARE Transnational Smart Care Strategy

To expand the impact of efforts on national levels, coordination and common approaches on transnational level are necessary to advance smart care systemically in the EU. While the implementation of common goals or priorities has to remain a regional endeavor it is effective to unite under a list of shared areas of intervention. In the D-CARE project we worked together intensively with members of our smart care labs and regional and national policy makers to develop a transnational guiding strategy document.

As this field is only in its beginnings on transnational level there is no forum we were able to address directly nor issue action advice for a specific committee on supranational level. The strategy accordingly serves primarily as an instrument for smart care and smart health stakeholders in the Danube region. Secondly, it may serve as an impetus or inspiration for ideas on how to overcome the common challenges in the care and health sector in the entire Danube area as well as other geographical regions in Europe or elsewhere, especially for policy makers.

The strategy has been developed through a combination of top-down approaches – discussions on project and transnational level in two designated conferences – and bottom-up contributions – inputs received from different project regions' smart care labs. In this way it was possible to find the appropriate detail for the transnational level while bearing in mind that due to the lacking addressee on transnational level all measures will have to be implemented on regional level.

The strategy aims to support the following vision:

Ensuring **compatible and integrated smart care services and eHealth** for every person in Danube Region through

- effective promotion and exchange of knowledge
- know-how and experience among stakeholders
- fostering the development of digital technologies
- improving digital skills and competences of all interested parties
- and ensuring clear procedures and financial resources from public and private sources.

To work towards this goal we defined five transnational priorities, i.e. topics that are important in all our partner countries and, thus, offer a great potential to jointly work towards to.

Through several open workshops with Smart Care Lab members of all regions and transnational partners the following common priorities were identified:

- **Capacity building:** improve the readiness of organisations and institutions to implement smart care models; increase skills among employees as well as attractiveness of jobs in the smart care sector
- **Health and wellbeing:** Improving physical and mental conditions of older adults as well as their general quality of life, dignity and independence
- **Technical and social innovative support/AAL:** use of ICT to create a supportive and inclusive environment for active and healthy ageing
- **Digitalization:** improve work processes and the quality of care through digitalised working and communication methods
- **Policy:** establishing a sustainable environment for smart care models to be discussed, tested, validated and implemented (including funding)

Those transnational priorities have been translated into concrete action plans on regional level. This ensures the implementation of measures that will jointly advance the Danube Region and Europe as a whole towards the envisioned state.

5.2. Regional Action Plans for Smart Care Policy

The regional action plans have been developed in national workshops with stakeholders from each project region's smart care lab and beyond, especially focusing on the inclusion of policy makers in the development process.

They analyse and define priorities for policy action in their region, elaborating concrete measures to advance smart care. Thereby, they build on the experience gathered in the D-CARE project as well as related research and implementation activities. The regional action plans equip the transnational priorities with steps to be taken in the respective region to progress in these transnationally defined areas. As some regions had already defined strategic document it was possible for several project partners to tap into these processes and enrich them with the inputs gathered in the project and smart care labs. Others were breaking new ground with a policy advice document on regional steps for the advancement of smart care.

Some of the regional main action points are:



Austria

- Improve coordination among smart health stakeholders on planned projects and clear roles in the joint pursuit of objectives
- Implement common standards and monitoring measures to ensure compatibility and comparability of systems and solutions
- Integration of existing solutions and services on national level into a health portal



Bosnia and Herzegovina

- Supporting the development of smart services in the care of the elderly and exploit opportunities for business in this area; Further develop IZIS – care management system in Republika Srpska;
- The update of the Strategy for the Improvement of Position of Older Adults in Republika Srpska for the Period from 2019 to 2028 will be discussed with the Smart Care Lab Republika Srpska in order to build upon the results of D-CARE
- Smart Care Lab RS can be considered as a main stakeholder in the regulation amendments in the area. The Innovation Support Program is a practice applicable to potential forms of subsidies of the Ministry



Bulgaria

- Increase digital skills and capacities for the provision of smart care services among care givers and social workers
- Develop measures at regional level to ensure the sustainability of social and smart care projects; ensure a diverse sourcing of funding for these measures
- Integrate existing digital platforms into a national e-Health platform; here the example of Hungary can be taken as an inspirational best practice



Czech Republic

- Active and facilitated discussion and cooperation of various stakeholders at horizontal and vertical level, inclusion of various experts and a broader public to gain better awareness and acceptance for new solutions (using the quadruple helix, human-centered and co-creation principles).
- Promotion of existing technologies with a focus on Smart Care and Smart Home concepts, as well as their development and subsequent implementation to facilitate the lives of target groups.
- Building institutional capacities and abilities with decision and policy makers and at the level of care providers - by applying the concept of “learning organizations”, cooperating with the innovation community, using good practices from partners in order to be more responsive to needs and be able to use the potential of innovation and digitalization.



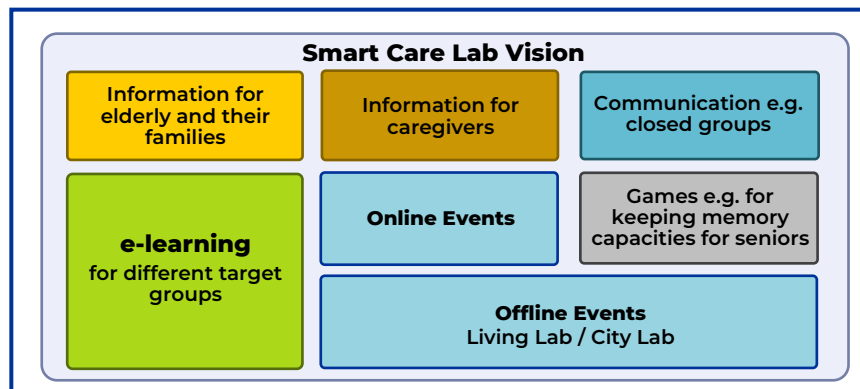
Germany

- Generate opportunities for smart care solutions to successfully pass from the innovation state into broad roll out; advance legal regulations of smart care models, generate funding opportunities, increase knowledge
- Increase smart care capabilities among formal and informal care givers; increase knowledge about existing smart care solutions, enhance digital literacy and affinity
- Enable more co-creative solution development that include end-users (caregivers, care institutions, older adults and their support networks) from the beginning



Hungary

- Setting up a multifunctional online platform (expanding the Smart Care Lab) for older adult care
 - The platform can be a regional center of a territorial unit, a larger municipality, a regional center, an online space for information and interactive content and a communication space,
 - The development of elderly care requires the building of a municipal ecosystem for:
 - sharing information,
 - stakeholders and interested parties to find a common solution,
 - supporting innovation,
 - ensuring effective communication,
 - up-to-date knowledge of the emergence of new methods and technologies,
 - prevention for older people not yet covered by care.



Slovenia

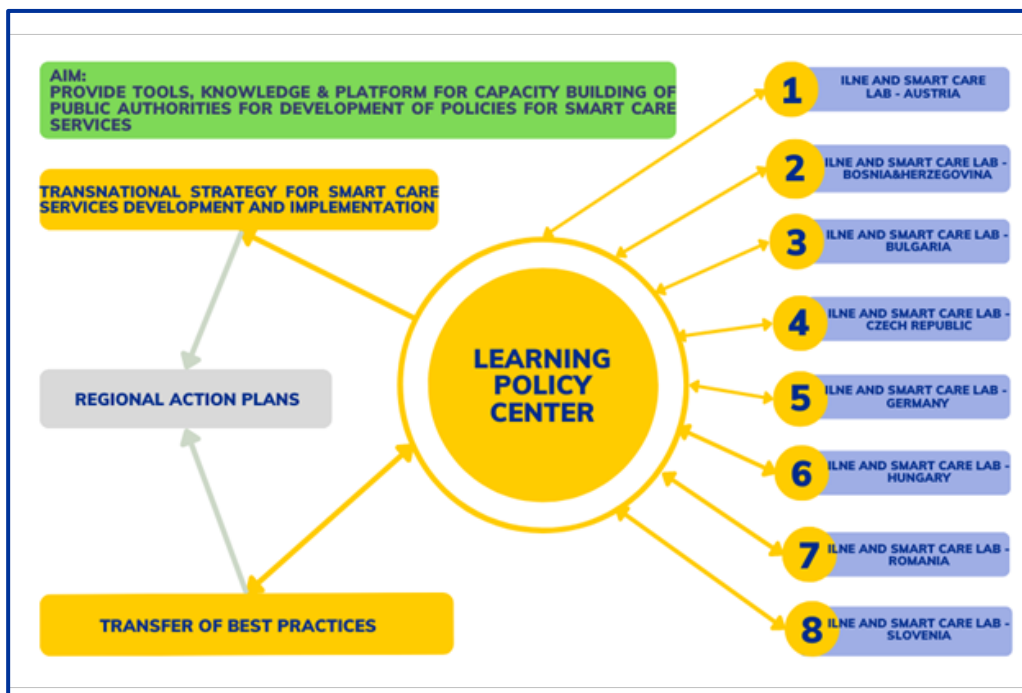
- tackle social exclusion through the empowerment of informal carers, providing mobility support and further support in daily lives
- support older adults in claiming public benefits to improve their living situation and access to care and support services

While the action plans are not binding they do have the support of a broad range of quadruple helix stakeholders in each region. Hence, their implementation is continuously supported and demanded.

5.3. Watch and learn – Best Practices for Smart Care Policy

The Role of best practices for the advancement of smart care policy

Drawing on the experiences from the D-CARE pilots as well as related projects, we collected representative best practices as inspirational examples for public authorities to create policy tools that respond better to smart care demand and challenges, including to the development or implementation of smart care services. They allow to inform oneself about possible ways forward to foster smart health and care, learn from successes and challenges of others and ensure a sound decision basis for regional and national policy makers on smart care regulations.



The D-CARE Best practice manual

Seven insightful best practices covering a broad range of approaches and application contexts have been collected in the D-CARE Best Practice Manual. The manual is based on the methodology followed by the D-CARE project for analyzing, selecting, describing and evaluating good practices. It comprises seven case-studies focused on digital healthcare skills, smart care services, elders care, social innovation models and successful policy tools that implemented public programs related to it. Case studies are developed based on the data and information collected from the owners of synergic or complementary outputs with D-CARE: INDEED, I-CARE-SMART, DIGITAL LIFE4CE, NICELIFE, HOCARE 2.0 and other identified projects/sources.

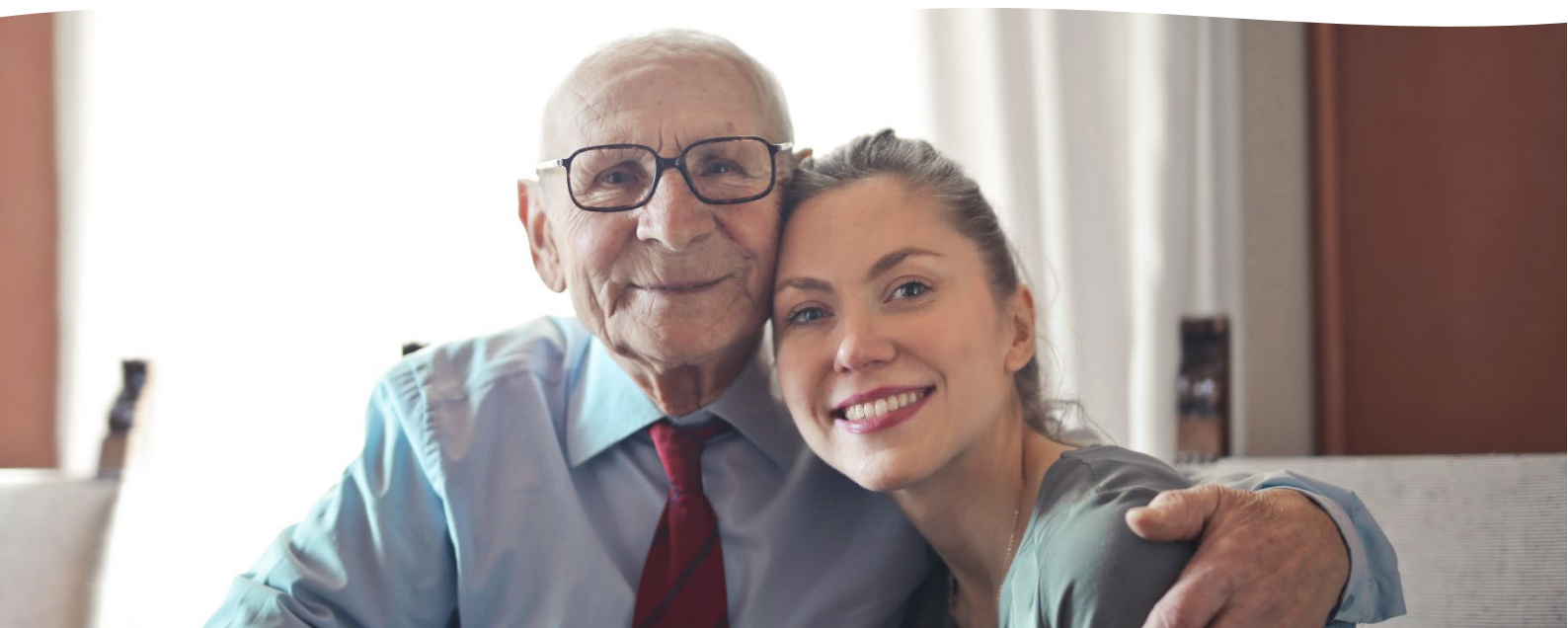
The first part of the Manual outlines the methodology followed by all Project Partners for the identification, selection and description of good practices for policy tools for smart care support. The second part provides a description of 7 good practices evaluated by Project Partners. They are listed per country in alphabetical order and per internal numbering defined per each country.

No	Title of the Good Practice	Owner of the Good Practice	Country
1	Wiener Active and Assisted Living TestRegion – WAALTeR	UIV Urban Innovation Vienna GmbH (LP)	Austria
2	Lebensphasenhaus	University of Tübingen, Ministry of Education and Social Services Baden-Württemberg	Germany
3	National eHealth Infrastructure (EESZT)	National Directorate General for Hospitals	Hungary
4	Active Ageing Strategy/ Strategija dolgožive družbe	Ministry of Labour, Family, Social Affairs and Equal Opportunities	Slovenia
5	Simbioza BTC City Lab	Simbioza Genesis, Social Enterprise	Slovenia
6	Lokaal+: future proof education programme for vocational health care students in an aging society	Summacollege Eindhoven	Netherlands
7	SMARTCARE - ICT-supported integrated care	Health Authority of Trieste	Italy

The best practices have been presented in two transnational events. A more detailed description of the good practices can be found in the D-CARE Best Practice Manual.

The Policy Learning Center

The strategy, regional action plans, the D-CARE Best Practice Manual as well as our Knowledge Diffusion Toolkit for Smart Care have been collected in a Transnational Policy Learning Center. The aim of the center is to provide policy makers on all levels of administration and governance as well as interest groups working to advance smart care policy in their region with tools, knowledge and best practice insights from other countries. While already coming to life in the development of the output documents of the D-CARE project in national and transnational exchange conferences and events the digital location of the learning center provides continuous access to the collected expertise on the D-CARE platform.



6. Smart Moves for the future or What's next to do?

In our D-CARE project we have successfully worked to advance smart health and care for older adults in the Danube region through a three-pronged approach: we built learning environments connected through an e-learning platform that offers knowledge and skills training for various target groups in smart health and care, including older adults themselves. This supports the implementation potential of smart care solutions we scouted, tested and validated through our innovation programme in each project region. The experiences hereof enriched the discussion around policy priorities on national and transnational level. With our smart care strategy we provide a guiding document for policy makers as well as other quadruple helix stakeholders engaged in the field of smart care and health to progress towards a Europe of the future that offers sustainable, accessible and equally qualitative smart health and care services to all citizens.

The challenges pertaining to health and care will remain and further exacerbate in the upcoming years, especially in countries that are facing a severe demographic shift. Tackling those challenges can only be a common endeavour: on regional, national and transnational level.

Regional actors from all four helix branches need to cooperate closer to identify challenges and potentials for their regions, foster smart care innovation and support the implementation and roll out on a broader level. National smart care actors, especially policy makers and funding structures need to acknowledge the necessity and potential of smart care solutions deeper and generate favourable conditions in regulatory as well as financial terms to develop and use smart care solutions. On transnational level, exchange between all levels of society needs to be facilitated to leverage the potential of mutual learning and cooperation. With our D-CARE project we were able to generate synergy effects in advancing smart care in the Danube region. As an inspirational example and through the network established our work can have spillover effects. Yet, as all such transnational public-funded projects we need the cooperation of transnational actors to further and disseminate our activities and provide fora for this work to unfold its full potential.

Making smart care a European priority with dedicated task forces, political institutions and allocated budget will support national and regional efforts to secure active and healthy ageing and, thus, a dignified and qualitative life for all our citizens.