SeAMK

# DEVELOPING WELLBEING TECHNOLOGIES IN RURAL REGIONS

Europe's rapidly ageing population means that better and more effective services ensuring the wellbeing of people cost-effectively, need to be developed. Digital services, the Internet of Things, artificial intelligence, and robotics offer a growing number of opportunities for wellbeing and active living in rural and remote areas.

1. Situation Analysis in South Ostrobothnia, Finland

The region of South Ostrobothnia is located in West Finland. It has 17 municipalities, of which eight have city status. The total population is around 190 000, of whom majority live in rural areas. Close to 25% of the population in the region is above 65 years of age, while the national average is 21.8% in Finland. Compared with Europe, the population in South Ostrobothnia is among the oldest. Based on the statistics of the Finnish Institute for Health and Welfare, the morbidity index in South Ostrobothnia was 107.1 during 2014-2016.

Wellbeing technologies have been piloted and implemented in South Ostrobothnia to provide smooth and cost-efficient health care service for the residents for more than two decades. Few examples include
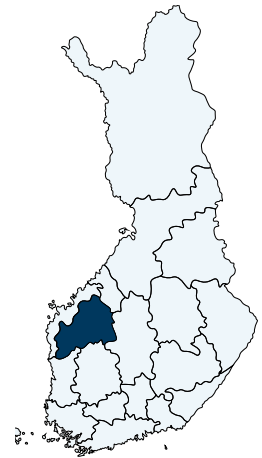
Medical doctor services from distance using remote access in Kaksineuvonen area, where four municipalities have organized their social and healthcare services jointly. Kaksineuvonen educated nurses to use technologies and distance connection. During consultation, the nurse meets the patient and connects to communicate with doctor using remote access. Nurses have possibilities to use technologies such as patient examination camera, ear camera and stethoscope.

Distance policlinic for the type 1 diabetics. During the pilot activity, the selected patient group tested a new care model which included elements of self-monitoring, electronic information delivery and virtual nurse appointments through video communication. Patients were equipped with blood pressure monitoring devices and were requested to do self-monitoring. A new electronic template was created for this purpose. This template was delivered to the patient together with the appointment information from the hospital. The patient was requested to carry out self-monitoring for a 1 week period and to deliver the template to the diabetes nurse 3 days prior to the appointment, together with their insulin pump (where applicable) and blood glucose meter results. For the delivery of such information, the electronic health care service portal "Hyvis" was used. This portal provided a possibility for data secure information delivery between patient and health care professionals. Following these steps, the diabetes nurse's appointment was arranged through a video communication solution "Vidyo". This solution enabled virtual appointments where voice and video were delivered and the nurse could also share documents with the patient. These virtual appointments replaced equivalent control visits at the hospital.

Nighttime distance monitoring (Safebed). Objective is to offer safe living for elderly at home and get important information about the daily life of elderly individuals. Nighttime distance monitoring is carried out with a solution called Safebed that is a device that is located in person's bed under the mattress, and monitors person's sleep. Through it, home care personnel can monitor the customers sleep quality as well as basic parameters such as movement, heart rate and breathing rate. This information has value when elderly person's needs for care are estimated.

Videophone service as a part of elderly home care. Videophone service is one of the ways to make home care services in municipalities. Videophone service helps to reduce overcrowding of personal visits by the home care nurses. It also offers new ways for the customers to get service to their own home. Nurses make calls to the customers' homes during times that have been agreed beforehand. Usually videophone call replaces actual physical visit by the nurse to the customers' home. Elderly need to be in a sufficient condition in order to be capable to meet the services.

Enterprise resource planning system for home care. Home care unit uses Fastroi software and mobile devices to manage shifts and controls which nurse visits which customers and when. Nurses have a straight connection to Patient Record System during the visits. Notes and reports are written with the mobile device during the visit or right after. Mobile device can work also as an e-key (via bluetooth) and nurses can access customers' homes easier and faster (no need to pick up the key). Staff nurse can operate nurses tasks with enterprise resource planning system and mobile (GPS) and organise time-effective visits. The system helps planning and managing of shifts at home care.

SeAMK is supporting the development of the wellbeing technology ecosystem in South Ostrobothnia. The vision is to develop and use wellbeing technology supporting transforming societies through education, research, and intensive use of living labs in close collaboration with academia, public, private and third sector stakeholders in South Ostrobothnia region. The aim is to i) intensify cooperation among wellbeing technology stakeholders, including enterprises, to create a joint vision and strategy for wellbeing technology transforming societies in South Ostrobothnia; ii) bring wellbeing technology to the interface of South Ostrobothnian social and health care reform; iii) enhance regional, national and international collaboration in innovation, development, research, and education in wellbeing technology. The key partners

and stakeholders include Hospital District of South Ostrobothnia, Regional Council of South Ostrobothnia, Seinäjoki University of Applied Sciences, Chamber of Commerce in South Ostrobothnia, Into Seinäjoki – Seinäjoki Business Development, Kuortane Olympic Training Center, The Federations of Municipalities in Health Care in South Ostrobothnia, The Memory Association of South Ostrobothnia, Entrepreneurs of South Ostrobothnia, Seinäjoki Joint Municipal Authority Sedu, SONet BOTNIA, and The Centre of Excellence on Social Welfare in the Ostrobothnian Area.

Health technology ecosystem development has been brisk in Finland in recent years. Various ecosystems around Finland (Health Capital Helsinki, Central Finland Health & Wellbeing, Wellbeing Technology Ecosystem South Ostrobothnia, Kuopio Health Cooperative, Oulu Health, Satakunta Digihealth, Vaasa Welfare Technology) bring together academia, public, private and third sector stakeholders to facilitate open collaboration and to accelerate innovation in health and wellbeing sector. Business Finland supports Finnish companies to develop and export competitive health and wellbeing solutions and services to global markets by utilizing the digital transformation. In Finland, health technology continues to be one of the most rapidly growing high-tech export sectors. Over the past two decades or more, the export of health technology has created a surplus of almost Eur 13 billion and plenty of jobs in Finland.

## 2. Competence of SeAMK Wellbeing Technologies

Education and Training
SeAMK is the only higher education institute in South Ostrobothnia region. In it's School of Health Care and Social Work there are five Bachelor Programmes: Elderly Care, Nursing, Public Health Nursing, Physiotherapy and Social Work. In addition, there are three Master Programmes: Advanced Practice Nursing, Social Work and Development and Management of Health Care and Social work. All the programmes have close co-operation with local hospital and health care district and therefore the discussions about the needs and necessities for future health care professionals are constant. This knowledge is taken into account in study curriculums that are updated regularly. All the study programmes in the School of Health Care and Social Work include studies with and about wellbeing technologies. These include, for example, studies about eHealth for nurses, technology and customer oriented prevention and health promotion methods for public health nurses, use of online rehabilitation for physiotherapists, gerontechnology for elderly care students and digitalisation in the fields of social work for social work students. In addition, SeAMK arranges updating training for local hospital and health care district to match the variable needs of health care professional.

Living Labs
Wellbeing technology has been under systematic development in SeAMK during the past two decades. The merge of South Ostrobothnia Health Technology Development Centre into SeAMK in October 2018 further strengthened SeAMK's expertise in adapting ICT technologies into health care sector's needs. In 2018 and 2019, emphasis has been on developing and updating the living labs. SeAMK Living Labs in Wellbeing Technology play a vital role in regional and international RDI.

Living Labs in Healthcare and Wellbeing Technology
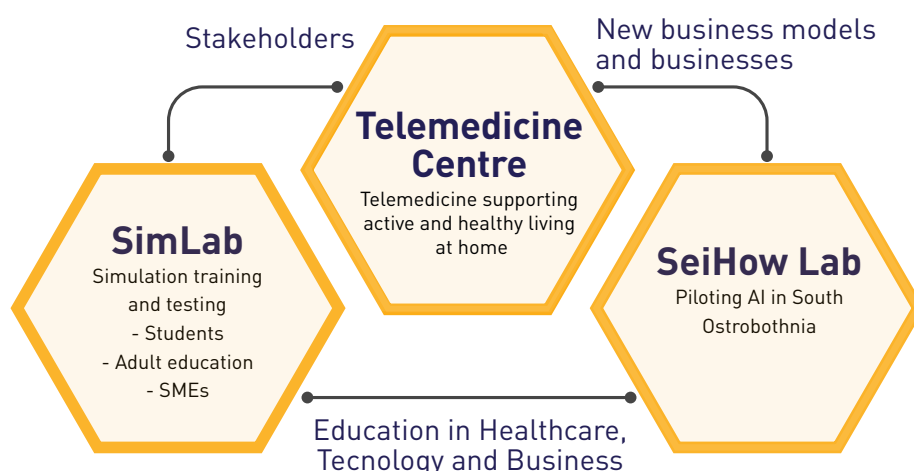
More detailed information about the living labs can be found in the following websites:

Telemedicine Centre https://www.seamk.fi/en/cooperate-with-us/rdi/wellbeing-technology/telemedicine-centre/
SimLab https://www.seamk.fi/en/cooperate-with-us/rdi/wellbeing-technology/simulation-lab/
SeiHow Lab https://www.seamk.fi/en/cooperate-with-us/rdi/wellbeing-technology/seihow-lab/

AI disease prediction models and Explainable AI

SeAMK is developing a research line based on Artificial Intelligence to build disease prediction models that allow diagnosing complex health issues with good accuracy and efficiency by recognizing patterns in health data. In addition, within the field of AI applied to healthcare, SeAMK is intensely focused on Explainable Artificial Intelligence (XAI) concept that allows healthcare experts to understand and adopt AI complex models in their diagnosis and prescriptions and therefore make reasonable and data-driven decisions to provide personalized treatment.

Development Projects

SEIL – Smart, easy and independent living – Development of Education

Aims to combine the competences of technical, safety and health care education in order to boost the technological focus in health care education by applying a cross-sectoral teaching and learning approach. SeAMK's role in the project is to i) bring the latest research and updated solutions of welfare technology to this project, and advise the partnership on current trends; ii) provide relevant networks such as Multidimensional Group for Homecare Support and the European eHealth for Regions; iii) advise on objectives to be included in the European study unit based on their wide experience in international welfare technology projects and education development; and iv) provide up-to-date simulation premises for the project's learning, teaching and training activities. The long- term beneficiaries will be future health care employees and managers, health care providers and their clients, as they will receive employees with relevant competences and ability to develop their skills in cooperation with professions with supplementary competences.

Intencive – Innovation and Technology ENhancing Customer Oriented Health SerVicEs – Development of Policies and Ecosystem supporting Wellbeing Technology in Healthcare

Aims to address the societal challenge of ageing society combined with decreasing population in rural and other remote areas. There is a dire need for new, accessible and user friendly models, practices and tools for providing different types of high quality health services accessible to all citizens not depending on their age or place of living. Combining technology to the different phases of service processes with emphasis on the customer orientation means re-thinking and replanning the health services. The overall objective of INTENCIVE project is to improve the implementation of policies and programmes in terms of health technology innovation-driven and customer-oriented health services in the partner regions (FI, HU, MT, FR, ES) and influence the ERDF policies, Regional Operative Strategies and Plans and other selected relevant policies. The project implementation follows a two-steps approach: Phase 1. Interregional exchange of experiences in that field and subsequent introduction into their policies of innovative technologies and services in e-health sector. Development of 5 action plans benefitting from peer-reviews and with intense dissemination activities in each region to increase the effectiveness of its implementation under Phase 2. Expected results: at least 20 good practices identified, 5 targeted policy instruments improved, 30 staff members will transfer new capacities in their intervention fields. Expected attendance of 270 people in dissemination events.

HyTe AI - Artificial Intelligence, mHealth and Robotics as reformers in the wellbeing sector in South Ostrobothnia

Aims to i) build a unique Living Lab (Seinäjoki Home of Wellbeing SeiHoW) environment with novel technologies as robots, artificial intelligence, and mobile technologies and demonstrate them as ground solutions to prolong safe and high quality living at home; ii) bring these novel technologies to know for wellbeing sector SEM´s in South Ostrobothnia region and to promote implementation of these technologies. This new environment serves the needs and interests of local companies in the social and healthcare, wellbeing and rehabilitation field. The SeiHoW demonstrates intelligent future home for wellbeing sector customers and patients with modern equipment and services that advance possibilities to high quality, safe and active living at home. Additionally, the project includes workshop as for local companies to increase their knowledge about the technological solutions given the possibilities to test the several devices and equipment.

Key Networks

Thanks to the close collaboration with the key stakeholders at the regional level, SeAMK is able to organize piloting activities for various domestic and international projects.

SEAMK IS ALSO A MEMBER OF THE FOLLOWING INTERNATIONAL NETWORKS:

- EITHealth Living Lab Network brings living labs to open innovation ecosystem where different start-ups across Europe can use the services to deliver solutions to enable European citizens to live longer, healthier lives

- ECHAlliance - The European Connected Health Alliance – is the global connector for digital health, facilitating multi-stakeholder connections around ecosystems, driving sustainable change and disruption in the delivery of health and social care.

- eHealth for Regions Network is an association of stakeholders in the health sector. The Network is an incubator for innovative projects, it facilitates the transnational cooperation on eHealth and wants to create a common European eHealth area.

Key Experts

Sami Perälä, Development Manager in Wellbeing Technology

Mr. Sami Perälä has degrees in nursing, operating room and anaesthesiological nursing and paramedical nursing (Seinäjoki University of Applied Sciences), as well as Master Degree in health sciences (University of Kuopio). He is also a qualified teacher in vocational education (Tampere University of Applied Sciences) and has a degree in professional development in management (University of Tampere). He worked with South Ostrobothnia Health Technology Development Centre as an expert for seven years and then as an executive director for twelve years. He was the locomotive for South Ostrobothnia becoming one of the first eHealth regions in Europe. He has a lot of experience in different projects in local, national and international level. Currently he is the Development Manager of Well-being Technologies at the School of Health Care and Social Work.

Merja Hoffren-Mikkola, Principle Lecturer in Wellbeing Technology and Health Promotion

Mrs. Merja Hoffrén-Mikkola has a PhD in Biomechanics from Department of Biology of Physical Activity from University of Jyväskylä. During her PhD studies, she investigated the effects of aging in neural control and mechanical function of muscles and tendons. Thereafter she worked as Biomechanics specialist at Kuortane Olympic Training Center helping athletes to perform their best, developing performance-testing methods including technology as well as teaching coaches and physical education instructors. She is a qualified teacher in vocational education (Tampere University of Applied Sciences). In addition, she has experience in wellbeing technology development when working for four years as Content Developer at Start-up Company Myontec Ltd that builds clothes with muscle activity sensors (EMG measurements) and inbuilt analyses to support athletes, coaches, physiotherapists and work ergonomy field. At Seinäjoki University of Applied Sciences she has worked as a Project Manager in several wellbeing technology projects and is currently teaching and conducting R&D projects in the fields of wellbeing technology, gerontology and physiotherapy.

Pedro A. Moreno-Sánchez, Ph.D (Telecommunication Eng – Biomedical Eng Spec), RDI Expert

Pedro A. Moreno-Sánchez has research and development experience in Digital Health. Since 2007 he has been working in Spanish and European research and innovation projects focused on eHealth for supporting elder adults. The projects have been funded by several programs, such as Horizon 2020, EIT-Health, AAL. He was eHealth researcher and project manager at Bioengineering and Telemedicine Group of Polytechnic University of Madrid for 9 years, and as a senior researcher at Biomedical Research Foundation of University Hospital of Getafe-Madrid (Spain) for 3 years. He has also been a lecturer of "Telemedicine" subject in Bachelor and Master degrees' courses at Polytechnic University of Madrid (Spain). He has Ph.D. in Telecommunication Engineering (Biomedical Engineering specialization) by Polytechnic University of Madrid (Spain) with thesis dissertation about "Ambient Assisted Living environments for elderly support through next-generation network services". He holds a Master Degree in "Bioengineering and Telemedicine" and Bachelor Degree in Telecommunication Engineering by Polytechnic University of Madrid (Spain). He is certified Project Management Professional at PMP® by the Project Management Institute®.

Jaana Vainionpää, Project Manager, HyTe AI Project

Mrs. Jaana Vainionpää has Bachelor's degree in health care (Registered Nurse, Oulu University of applied sciences) and Master's Degree in health sciences (Health Management, University of Oulu). She worked as a paramedic in Oulu region and with Oulu university hospital as a nurse anesthetist and as a staff nurse. Past years Jaana has been working with Seinäjoki University of applied Sciences as a project manager, concentrating on Well-being technologies, Artificial Intelligence, service robots and mobile health solutions.

SeAMK's current and emerging research and development interests

Wellbeing Technology supporting Transforming Societies

- Healthy kids and youth
- Migration and integration
- Wellbeing at work
- Promoting good physical and cognitive functioning during the lifecourse
- Co-creation

Wellbeing in inclusive societies

Smart and Healthy Living at Home

- Enabling architecture and technologies
- Mobile health
- New business models through service design in wellbeing technology
- Digital entrepreneurship in wellness and health business
- Living labs

- Reforming care experience with patients
- Predictive identification and prevention of diseases
- eServices and intelligent applications
- Living labs/testing/piloting
- Patient centered care pathway design

Smart Hospital of the Future

Active and Healthy Ageing

- Scaling up innovation
- Service platforms
- Preventing isolation
- Ensuring physical performance capacity
- ''Senior volunteers''
- Age-friendly services and enviroments

Relevant Publications

Hoffrén-Mikkola, Merja, and Sanna Valkosalo. "BaltCityPrevention: Promoting Health, Technology and Participation." Seinäjoen Ammattikorkeakoulu 2020: Osaamista Strategian Vahvuusaloilla 33 (2020): 508.

Kangasluoma, Elina, Kirsi Paavola, Mari Salminen-Tuomaala, and Sami Perälä. Health and Social Welfare Professionals' Self-rated Competence and Feedback Following a Simulation-based Coaching Intervention in Small and Medium-sized Enterprises. Sciedu Press, 2019.

Kitinoja, Helli, Jaakko Hallila, and Marika Toivonen. Exploring Perceptions Toward Home-care Robots for Older People in Finland, Ireland, and Japan: A Comparative Questionnaire Study. Elsevier, 2020.

Kitinoja, Helli. "Team Work in Home Care in the City of Seinäjoki in Finland." Japan Academy of Home Care 3 (2015): 17.

Kitinoja, Helli. Providing Assistance in Drug Administration to Elderly With Dementia and Their Families in Finland and the UK. 2016.

Leppäkangas, Elina, Mari Helena Salminen-Tuomaala, and Sami Perälä. Towards More Authentic Simulation-based Learning: Nursing Students' Experiences. Sciedu Press, 2020.

Moreno-Sanchez, Pedro A. Chronic Kidney Disease Early Diagnosis Enhancing by using Data Minining Classification and Features Selection. HealthyIoT 2020 Conference.

Moreno-Sanchez, Pedro A. Development of an Explainable Prediction Model of Heart Failure Survival by Using Ensemble Trees. IEEE BigData 2020 Conference

Moreno-Sanchez, Pedro A. Enhancing Chronic Kidney Disease Early Diagnosis through Data Mining Classification and Features Selection. IEEE BigData 2020 Conference

Mäkelä, Kari, and Sami Perälä. Technology for Elderly With Memory Impairment and Wandering Risk. 2013.

Salminen-Tuomaala, Mari. Developing Emotional Intelligence and Situational Awareness Through Simulation Coaching. Sciedu Press, 2020.

Salminen-Tuomaala, Mari. Development of Multiprofessional Simulation-based Education in South Ostrobothnia, Finland. Health Sciences Division of ATINER, 2019.

Salminen-Tuomaala, Mari. Health and Social Care Leaders' Self-rated Competence and Learning Needs in Small and Medium-sized Enterprises. Sciedu Press, 2019.

Examples of Relevant Previous and/or On-going Projects

Source of Funding	Timing	Name of the project	Beneficiary / Lead Partner
EAFRD	1.6.2020-31.12.2022	Kulttuuria Hyvinvoinnista (Culture from Wellbeing)	Seinäjoki, University of Applied Sciences
ERDF	1.1.2019-30.6.2021	HyteAI_Keinoäly, mHealth, robotiikka hyvinvoin-tialan yrityksille (Artificial Intelligence, mHealth and Robotics as reformers in the welfare sector in South Ostrobothnia)	Seinäjoki, University of Applied Sciences
Interreg Europe	1.9.2019 – 31.12.2021	Intencive - Innovation and Technology ENhancing Customer Oriented Health SerVicEs – Development of Policies and Ecosystem supporting Wellbeing Technology in Healthcare	Regional Council of South Ostrobothnia
Erasmus+	1.9.2018 – 31.12.2021	SEIL, Welfare Technology in a Cross Sectoral Learning	Mosjøen videregående skole
Interreg Baltic Sea Region	1.10.2017 – 30.9.2020	Balt City Prevention – Baltic Cities tackle lifestyle related diseases	Flensburg UAS
Interreg Baltic Sea Region	1.10.2017 – 30.9.2020	Mamba – Maximised Mobility and Accessibility of Services in Regions Affected by Demographic Change	Diakonie of Schleswig Holstein
Interreg Baltic Sea Region	1.9.2017 - 29.2.2020	ProVahealth – Product Validation in Health	University of Tallinn
ESF	1.8.2017 - 31.12.2019	Taitoja Hyvionvointipalveluita Tuottaville PK-yri-tyksille Simulaation Keinoin (Skills for SMEs producing wellfare and wellbeing services through simulation)	Seinäjoki, University of Applied Sciences
Interreg Botnia Atlantica	1.9.2015 – 31.8.2018	Nordic Telemedicine Center	Västerbottens Landsting

Contact Persons

Main contact person:

Sami Perälä, Development Manager in Wellbeing Technology,
sami.perala@seamk.fi, mobile +358 40 830 0320

Communication copied to

Katja Valkama, Research and Development Manager, School of Health Care and Social Work,
katja.valkama@seamk.fi, mobile +358 40 830 0386

Anne-Maria Mäkelä, Senior Advisor in International RDI,
anne-maria.makela@seamk.fi, mobile +358 40 830 0325

seamk.fi/rdi