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World-class research and education

EIC

E-health Innovation Center



**Innovative systems and services that enable people
in need of healthcare, nursing and rehabilitation
to remain at home to a greater extent
while ensuring a high quality of life.**

Healthcare and nursing irrespective of time and location

E-health Innovation Center is hosted by Luleå University of Technology, which is located in the county of Norrbotten in northernmost part of Sweden. The center generates innovative products, services and processes, firmly based in a unique applied research environment combining Health Science, Computer Science and Electrical Engineering. It has a strong track record in international R&I projects, and is aiming for industrial growth and spin-offs. It is known internationally as a competence center within healthcare and wellbeing, where mainstream information and communication technology (ICT) is exploited to bring the best care to people within their homes, or wherever they need to be.

In the Future...

...the ability to provide healthcare independent of distance and time will be radically different than today. Research-based solutions for healthcare will enable people to remain at home longer, while ensuring a high quality of life. The e-health research at Luleå University of Technology will be a leading international environment for research on home-based healthcare. An e-health test bed in the county of Norrbotten will be a significant resource for validation of new e-health solutions, and support wide dissemination through education and collaboration with a thriving global e-health industry.

Bringing Support and Autonomy to an Aging Population

The industrial world is witnessing a significant change in the age profile of the population, that will challenge the ways that caring and rehabilitation are provided, especially to older people. The increased prevalence of healthcare problems and instances of chronic conditions – while having less available staff – implies that more needs to be done with less resources. Research shows that the lives of people with disability or chronic illnesses are strongly influenced by challenges to find ways to manage their everyday life.

Studies show that the use of ICT has been experienced as evidently helpful for ill people living in their homes, their caregivers and nurses. E-health combines the usage of sensing devices, context awareness technology and communication, to support intelligent consultation and remote monitoring of vital signs for people with chronic illness in their home environment, aiming to provide continuous care support.

ICT-based solutions in home rehabilitation will enhance accessibility and intensity, and better adapt interventions to personal needs while providing enhanced safety and comfort to the clients.

It is well known that a healthier life style, with good food and regular exercise will improve the quality of life and lessen the need for health care in general. Preventive e-health solutions can provide people with means to maintain a healthy status and avoid illness.

The demographic trends are essential drivers for the emergence of e-health systems and services but naturally people of all ages will benefit from the project results achieved at E-health Innovation Center.



Why a Center for E-health?

The purpose of the center is to stimulate the emergence and growth of an innovation system for the area of e-health and to become a common platform for the fundamental activities essential for regional business growth.

Furthermore, the purpose of the center is to:

Coordinate, disseminate and use research efforts within the e-health research area at Luleå University of Technology.

Ensure clear innovation paths between e-health research and business development.

Become a central node of cooperation within a dynamic e-health innovation system.

The Vision of the Center

E-health Innovation Center is a strong driving force for **a competitive and internationally leading innovation system**, in which there are good conditions for specialisation and renewal of the business life of the region and where the caregivers are being provided with good conditions to deliver excellent nursing and care.

The center produces a steady stream of **new systems and services** as well as new and growing businesses, and enhances the competitiveness and competence base within the region.

The center in itself is an **attractive milieu** for scientists as well as for highly qualified IT and Health specialists.

Strategic Areas

Knowledge Development is performed within priority areas that form a foundation for developing new e-health systems and services. This is achieved through initiatives taken by the center, involving health and technology forecasts, client-centered concept-driven research and innovation projects, and by integrating system research and business development within well defined structures that increase the outflow of commercially viable products.

Process Innovation (renewal work) is based on a needs analysis process, which directly involves the care receivers. Researchers and business developers are involved at early stages to seek potentially viable solutions for addressing the needs of the care receivers. The solutions are tested and piloted in running operation by the caregivers. Successful tests initiate preparations for making commercial products.

Innovation Processes are defined within the center that involves in-house competence and organised cooperation with external parties, to perform high-quality need analyses, technical feasibility studies, user readiness evaluations, field testing and business development. The center performs external analyses within the area of e-health and also supports the development of a qualified testing structure for new e-health systems and services.

Starting Points

The starting points for research and innovation at the center are:

Needs Analysis Methods development and use, as a basis for new system and service concepts, to determine focus and ensure legitimacy.

Enabling Technologies for sensing, reasoning, acting, interacting and communicating, as required for providing care at a distance, for care providers, staff, care receivers and relatives.

Information Supply systems and processes for a border-less care system, and with increased accessibility of information to clients and other citizens, about available care and treatment methods.

Regardless of the starting point, all new ideas are subjected to an integrated analysis from user, technology and business perspectives, before proceeding to the next stage.

Core Competences

The center is an essential link between innovations from research, and the practical needs for e-health solutions in medical and health care. Being a common arena for the university, the care givers and the e-health industry, the center will require some core competences. These are:

Systematic need analysis. These start with surveys of needs areas for relevant groups of clients and people close to them, followed by detailed need studies in close cooperation with care staff, researchers, and users. In parallel, market analyses are performed to see what ideas have potential to be refined and made into products, in order to strengthen the early phases of innovation.

Qualified external analyses (business intelligence) of ongoing national and international e-health developments. This is a pre-requisite to ensure that existing knowledge is utilised and refined within new research and also for process innovation and business development.

Qualified testing of e-health applications in a wider sense. The center itself and through co-arrangements with other test beds and living labs, manages a testing structure where systems and services, user benefits and commercial potential can be evaluated effectively.

Facilitation of dialogue among key stakeholders, to ensure commitment to proceed with piloting and implementation in real use of innovations, after successful field tests.

Continuous learning using pedagogical instruments for ensuring that students and practitioners will be able and willing to use the new innovations.

Network with regional businesses, by sharing results from the external analyses of the center, through regular consultations with individual companies about plans and opportunities for strategic development of new product areas and markets, and by keeping in touch with Health and IT cluster organisations.

Patient and Citizen oriented culture for development of health and medical care among the care givers by fostering concurrent participation from clients, care givers, researchers and business developers.



Major Areas to Explore

With the main objective to radically improve healthcare and rehabilitation, three particular needs areas will be targeted for exploration and intervention:

Collaboration between care givers, clients and close relatives

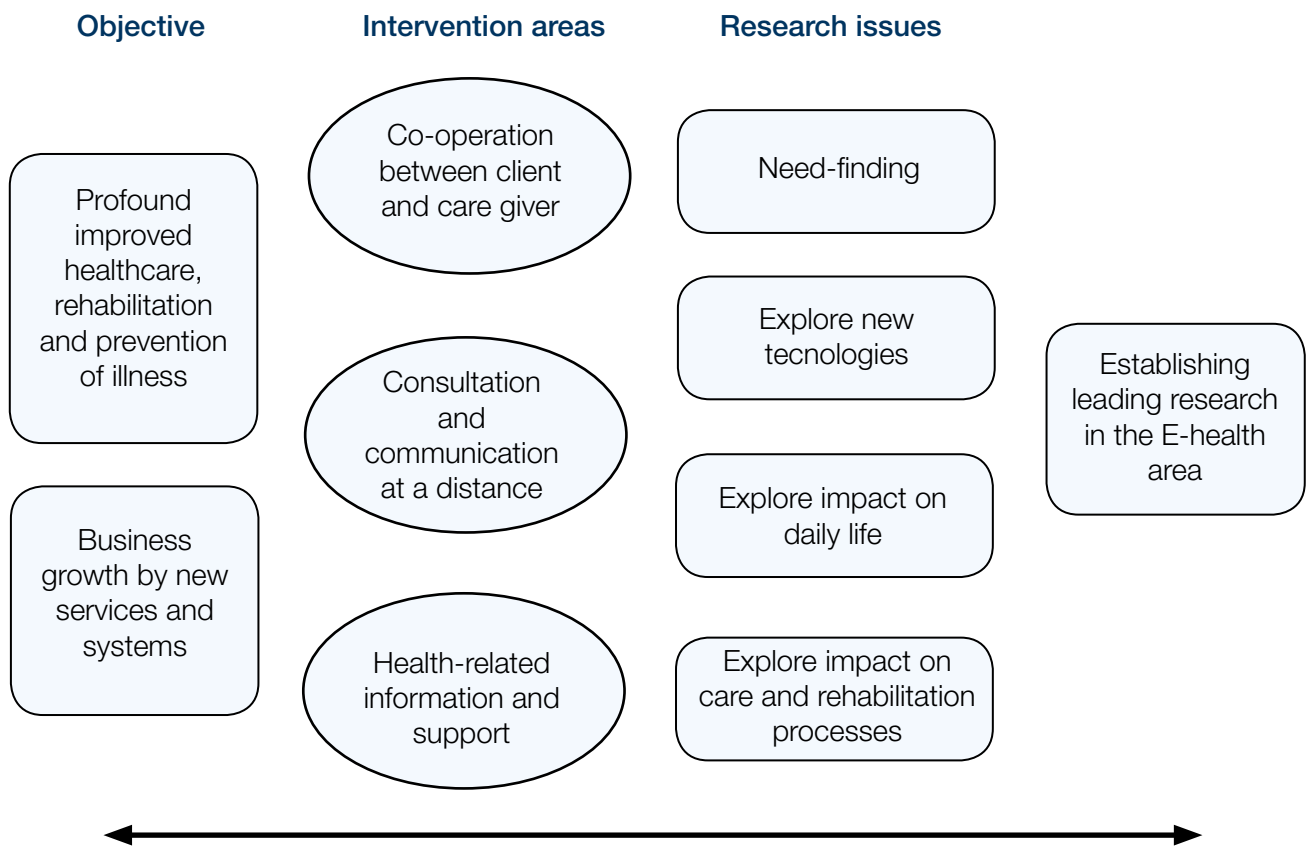
The objective of this area is to create a better interaction between different actors that give formal or informal care to the client. The aim is to increase the quality of care and to make more effective use of resources.

Remote Consultation and communication

The objective of this area is to make it possible for information to move to the place where the client or a specialist is. It provides increased opportunities for correct diagnoses so that the appropriate measures can be administered to the client in a safe manner. Such consultations can relate to a variety of interventions, ranging from highly specialized care, to intense rehabilitation and overall to increase the availability of health care in the homes of clients and citizens.

Health Information

The objective of this area is to extend availability and ease of access to health related information and support for the citizens, and to make it possible for the clients to perform self-care actions.



An Innovative ICT Region

The E-health Innovation Center is hosted by Luleå University of Technology, which is located in the county of Norrbotten, at the northernmost part of Sweden. Norrbotten is the most sparsely populated region of the European Union, with a population density of just 2.6 inhabitants/km².

This means that many have to travel far to reach primary care clinics and hospitals. This creates *a demand* for health care with high client availability, medical safety, quality of care and productivity. Due to the long distances the health system must enable the care providers to deliver the same quality of care no matter where the client lives.

Faced with this *geographic challenge and a rapidly growing number of elderly people* (the oldest in Europe) with an increasing dependence on healthcare, the development of ICT solutions within the healthcare sector has high priority. However, these challenges are being turned into opportunities rather than disadvantages, as Norrbotten is already a hotbed for distance bridging solutions, and this position will be exploited within e-health. The distance bridging solutions are also applicable to densely populated areas, where they can contribute to higher productivity and people's quality of life.

There is an advanced ICT infrastructure in the region. Nine out of ten inhabitants have internet access through broadband connections. Most Swedish homes have a home computer and the Swedes have a high degree of ICT awareness and a willingness not only to use existing forefront technology, but also to test new solutions, which provides a fertile breeding ground for new ideas.



The extensive use of ICT in healthcare and medical care has enabled *improved services for citizens and clients*, as well as organizational and cost benefits. E-health solutions make it possible to provide healthcare to everyone, anywhere and at any time. The aim is to empower clients – to make it possible for them to access their own medical records, to communicate with the healthcare system in a safe way – even from the home or whenever necessary. This small revolution is made possible by a persistent introduction of interoperable ICT solutions that support clients and professionals with proper information throughout the healthcare processes. The key elements are Interaction, Distance bridging and Accessibility.

To further improve the health care systems and to *boost regional economic growth* considerable investments are made in new e-health research and innovation projects. The region is also realising more e-health implementation projects including interoperability of health information systems and interoperable exchange of electronic health records within and between health care providers.

Finally, e-health solutions are *climate-friendly*, since they reduce travel for care staff as well as for clients and their relatives. It provides better access to leading-edge expertise at *lower costs*. It is a wise use of human and economic resources.

Research Environment and Infrastructure

The e-health research program is managed by the Department of Health Science at the university, coordinating multidisciplinary research actions with the Department of Computer Science and Electrical Engineering under a joint e-health research umbrella.

Health Science, Nursing and Physiotherapy

The department of Health Science is fairly young but rapidly evolving. It has its roots as a Healthcare College that became a department of the Luleå University of Technology in year 2000. There are currently four professors in the disciplines of Nursing, Physiotherapy and Health Science. Good-quality research has been performed, and the ratio of peer-reviewed publications vs. research funding is high.

Embedded Systems, Media Technology and Biomedical Engineering

The research at the department of Computer Science and Electrical Engineering directly relevant to e-health currently comprises four professors. Within Embedded Systems the e-health focus is on low-power communication technologies, such as Bluetooth based ad-hoc sensor networks. Within Media Technology the e-health focus is on using sensors to inform a user of his or her physical condition on a mobile terminal, and also context reasoning and prediction based on sensor readings. Within Biomedical Engineering the focus is on medical sensors and systems for monitoring and interpreting physiological and pathophysiological conditions in humans.



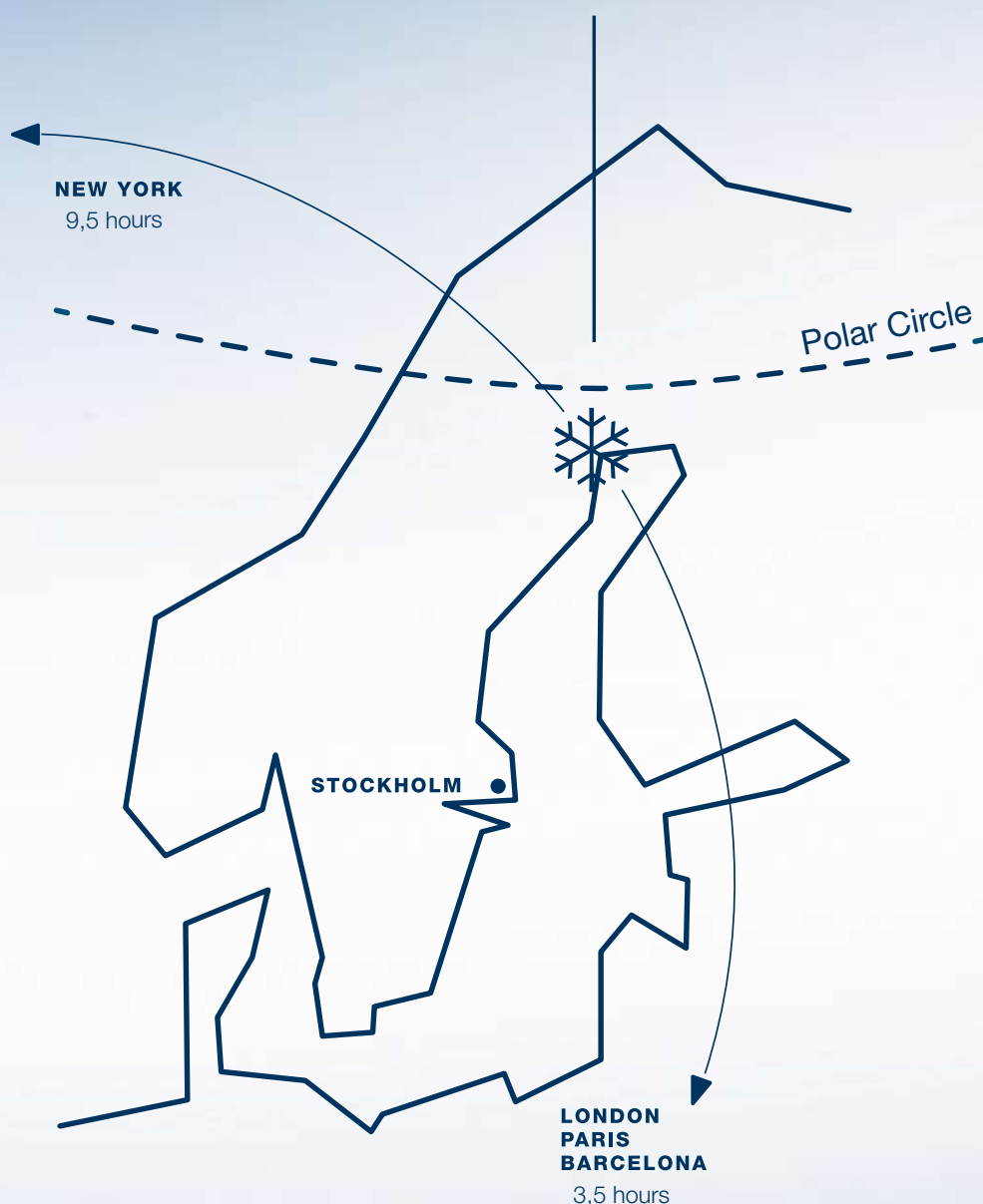
Project Track Record

E-health Innovation Center has extensive experience from projects, from local and regional ones to inter-regional and large-scale international projects. There has been a mix of own funding and funds from the Framework Programmes (FP7), CIP and European Regional Development Funds (North, Northern Periphery and INTERREG). The center has a good track record from participating in internationally competitive collaboration projects, and is frequently invited to participate in international project consortia. The Center has regular project and research collaboration with universities, care organisations and e-health research organisations in Norway, Finland, Denmark, Northern Ireland, The Netherlands, Germany, Austria, France, Italy, Greece, Spain and Malta.

The center was the scientific coordinator of the FP6 project COGNOW www.cognow.eu, with eleven parties from seven European countries and is the managing part of the Periphery Program project My-Health@Age www.myhealth-age.eu, which also is a pilot project in the Large Scale Pilot CIP project “Renewing Health”. The university is one of 14 core partners in FP7 CA AALIANCE www.aaliance.eu, which provides key roadmaps and strategic research agenda materials for the Ambient Assistance Living Alliance and the 7th Framework Programme. Some previous key projects were E-home Healthcare @ North Calotte and the FP5 project Mobihealth.

Where to Find Us

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