



# Tromsø Telemedicine Laboratory - Annual Report 2010

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## 1. Summary

Tromsø Telemedicine Laboratory (TTL) is a Centre for Research-based Innovation (CRI) built around the cluster of companies and institutions making up the telemedicine and eHealth research and innovation community in Tromsø. Some of the institutions have been involved in telemedicine and eHealth for as much as twenty years.

TTL is located in the premises of the host partner, the Norwegian Centre for Integrated Care and Telemedicine (NST) at the University Hospital of North Norway (UNN HF), located in the Research Park in Breivika, Tromsø, Norway.

The telemedicine R&I community in Tromsø includes approximately 300 persons, including students and employees working with telemedicine in the partner companies of TTL. The activities of these partners are internationally oriented and comprise collaborating partners in many countries.

The main focus of TTL is on providing research that supports the development of technologies for personalised health, empowering elderly and people with chronic and lifestyle related diseases to manage their own lifestyle and health in order to unload the pressure expected to come on the healthcare services in the future, and enable treatment at the lowest effective level of care.

The research is based on three main research areas with medical informatics as an overall foundation:

- Medical Informatics
- Mathematics and statistics
- Computer-Supported Cooperative Work

Most of the 15 projects running in TTL feature contributions from more than one of the research groups.

Successful research and innovation results at TTL are expected to lead to new products, new services, and new processes and organisational models.

The first 14 SFIs are now in their midterm of the project period. TTL has now been in operation for four years. In 2010, TTL has focused on the Midterm Evaluation from the Norwegian Research Council, and the excitement whether our evaluation and the activities that are ongoing in the centre would be approved by the Research council has had its impact this year. 2010 has in the most part been marked by both the evaluation and the summary of what TTL has done so far. TTL has looked closely through its expectations towards being an SFI centre, and where we must set in extra activity the last three years.

Future plans must be made after the SFI period expires in 2014, and TTL have ambitions that the centre still exists after 2014.

TTL is now established and produces good results on a regular basis. Especially has the international network been strengthened by 8 PhD students on research stay at different institutions abroad. TTL has also attracted international attention through researchers' presentations and visits from other environments. TTL has published 29 scientific journals and proceedings in 2010, and has had focus towards journals with higher "impact factor". Among other important innovation projects, the Snow project has come quite far towards reaching its goals. In 2010, TTL has been through a thorough Midterm Evaluation by the Norwegian Research council and international experts. TTL was judged well, and will be continued, but as the other SFIs, there is room for improvement in the last 4 year period.

## 2. Visions and Goal

The Tromsø Telemedicine Laboratory's vision is to become a world-leading centre for research and innovation in the field of advanced telemedicine and eHealth systems for chronic, age, and lifestyle related diseases.

The centre aims at supplying the healthcare industry with viable and sustainable technologies that will promote global health, wellness and disease management by facilitating technological advances in the collection, processing and sharing of medical information. These will generate new products and services, as well as improved processes and workflow, within telemedicine, eHealth, and provision of health care services in general.

## 3. Research Plan and Strategy

Research activities have taken place in projects organised owned by a partner or as part of the overall research portfolio. All PhD projects are currently organised with a main supervisor at the University of Tromsø (UiT).

- Research Manager: Prof. Gunnar Hartvigsen, UiT, the Faculty of Science and Technology, Department of Computer Science, Medical Informatics & Telemedicine Group

The research is further organised into three research groups, each with a research group managers:

- Medical informatics; coordinator: Prof. Gunnar Hartvigsen
- Mathematics and statistics; coordinator: Prof. Fred Godtlielsen, UiT, the Faculty of Science and Technology, Department of Applied Mathematics

- Information systems; coordinator: Assistant Prof. Gunnar Ellingsen, UiT, the Faculty of Health Sciences, Department of Clinical Medicine

The project portfolio was further organised into five main topics, with contributions from one or more of the research groups, and one or more partners involved. This organisation is dynamic and may change throughout the CRI-period.

- Integrated Medical Sensors
- Health Terminals for Personalised Health Care
- Health Intelligence
- Computer-Aided Diagnoses
- Workflow Management

### 3.1 Innovation

The Board of Directors has spent some time to discuss innovation and how TTL can ensure a process where the results and knowledge from the research is fed into innovation processes. One of the aspects of innovation in healthcare is to improve processes and workflow.

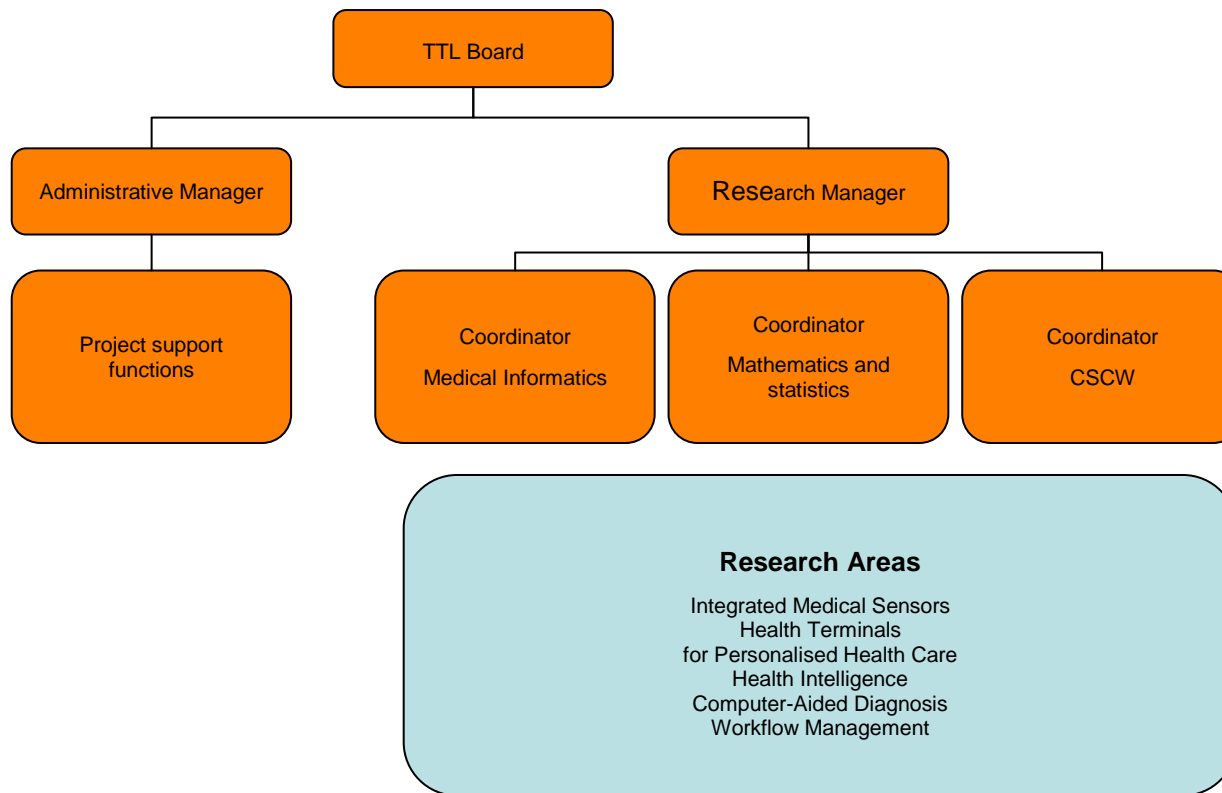
TTL has taken steps toward a more open innovation model. This means that we have pushed for greater collaboration and focused on the importance of co-localization and information sharing between the partners. We expect that this will take effect during 2011.

In 2010 the Snow system for disease surveillance went into pilot phase, and a process for bringing it to the market has been started together with Norinnova as. A cooperation with The Norwegian Institute of Public Health has been established

Another innovation is the diabetes lifestyle tools that now has gone into a clinical trial funded by EU 7FWP.

## 4. Organization

### 4.1 Structure



## 4.2 Board of Directors

### Board Members 2010

- Toralf Hasvold Chairman of the Board, , Manager for the Norwegian Centre for Integrated Care and Telemedicine, University Hospital of North Norway
- Sigurd From ,Vice Chairman of the Board of TTL, Member of the board of TTL, Research Manager, DIPS ASA
- Finn Henry Hansen, of TTL, Managing Director, Northern Norway Regional Health Authority
- Morten Thorkildsen, Member of the Board of TTL, Country Manager, IBM Norway AS
- Lars Vognild, Member of the Board of TTL, Researcher Manager, Northern Research Institute Tromsø
- Trond Are Bjørnvold, Member of the Board of TTL, Telenor R&I
- Trygve Deraas, Member of the Board of TTL, Research scholar, University of Tromsø

### Deputy Board Members 2010

- Lars Vorland, Helse Nord RHF
- Richard Wootton, NST
- Eirill P Buvik, DIPS ASA
- Tore Havre, IBM Norway AS
- Ellen Brox, NORUT IT AS
- Lilly Ann Stenvold, Telenor R&I
- Svein Tore Jensen, UiT

### Managers

- Research Manager: Professor Gunnar Hartvigsen, Computer Science, UiT
- Administrative Manager: Sture Pettersen, NST

## 4.3 Senior Research Staff

In order to achieve international recognition, we need to attract well-established researchers with a solid track record in research. In addition, we must establish co-operation with excellent research groups abroad.

(See Appendix 1 for a complete listing of the involved research staff).

#### 4.4 TTL Partners

##### **Norwegian Centre for Integrated Care and Telemedicine (NST), University Hospital for Northern Norway Trust (UNN HF) (Host)**

NST expects that TTL projects will result in research-based innovation for new telemedicine and eHealth services. TTL projects will lead to new health services that use integrated medical sensors with wireless and ubiquitous communication with different health terminals.

The research results from TTL will fuel research and innovation activities at NST, as well as provide a foundation for the advisory services offered by the NST in its role as a national centre of competence. NST is already benefitting from the raised levels in the quality and quantity of publishing in TTL.

UNN believes that by participating in TTL new knowledge will be obtained in how to improve the quality of treatment by means of an integrated out-of-hospital data acquisition system and how to reduce work-intensive screening and follow-up of large patient groups generated from these systems.

<http://www.telemed.no>, <http://www.unn.no>

##### **University of Tromsø (UiT)**

Based on UiT's participation in TTL the research in telemedicine at UiT has strengthened as well as the relationship to UNN/NST and industrial partners. Through extended international cooperation in TTL, UiT have established strong international connections to leading research groups in telemedicine and medical informatics.

Through a unique cooperation with industrial partners, we expect that research ideas and projects that originate from UiT to a larger degree will find their way to new industrial innovations and products.

Two Faculties at UiT are involved in the TTL projects: The Faculty of Science and Technology and the Faculty of Health Sciences.

<http://www.uit.no> <<http://www.uit.no>>

##### **Helse Nord IKT**

TTL will meet our need to explore different ways to utilize the total resources in a more efficient way, and bring the healthcare system closer to the patients. The clinicians will gain simpler and more uniformed access to information of his or her patient through a patient-centric architecture, and not application-centric architecture as today. This will improve workflow, cooperation and follow-up of patients outside the hospitals.

TTL and Helse Nord IKT will do research on dynamically updated, cross-institutional, patient-centric, multi modal information systems. An important aspect is to include the patient as a source of information. The innovations will prepare the ground for new products like IT supported evidence based medicine systems on an individual and epidemiological scale.

<http://www.helse-nord.no>

### IBM Norway AS

IBM wants to bring together healthcare expertise, best practices, innovation and leading edge IT technology to handle the most challenging issues within healthcare.

One of the most exciting healthcare initiatives found in this sector, is the research carried out at Tromsø Telemicine Laboratory. The laboratory focuses on areas that fits well with IBM's smarter healthcare vision, which we believe will have a massive impact on the future of patient treatment, as well as on society as a whole.

Our contribution will provide efficient collaboration tools and hardware solutions, in addition to our competency and support related to smart healthcare technology. IBM and TTL are also exploring how we can share experience, solutions and research between TTL in Tromsø and IBM's Global Centre of Excellence for Health in La Gaude, France. TTL represents a cross disciplinary consortium, which combines academia, healthcare institutions and complementary suppliers who share the same vision of a smarter planet. We are pleased to support TTL as an industrial partner.

<http://www.ibm.com/no/>

### Telenor Corporate Development

The core business of Telenor Group is telecommunications. Telenor provide voice, data, content and other communication services in 14 countries across Europe and Asia. The Telenor Group is dynamic and flexible in its business approach, always

exploring new markets and new technologies to make long-term investments.

The Department of Corporate Development is an innovation hub for the Telenor Group. With three locations in Norway and a satellite in Kuala Lumpur, Malaysia, the department employs people from more than 20 countries. We were the initiators of telemedicine in Tromsø and have for many years been an active partner in the development of this field. As TTL targets innovative solutions to health care challenges, it is natural for us to participate in the consortium.

<http://www.telenor.com>

### Northern Research Institute, NORUT Tromsø AS

Norut has been involved with technological e-health research since 1990, focusing the last years on personal health technology, serious games and exergames for health purposes, and social web and medicine 2.0. We have been working together with several of the TTL partners through the years, and is convinced that a long term partnership between industry, R&D and health-providers in TTL will lead to highly innovative technologies and services – both for the individual citizen and for all the actors in the health care sector.

Norut believe there will be a huge marked for personal health-care technologies and services in the future. Developing solutions that are easy-to-use, open and flexible, and affordable will be a vital factor for the success. Within TTL we will aim at making personal health-care technology and services that involve all levels of health-care, and provide the individual with novel and rich health services tailored to each person's needs and profile.

<http://www.norut.no>

### DIPS ASA

Participation in TTL enables DIPS to get valuable knowledge on the design of systems for improving patient flow through effective and secure interaction between the different levels in healthcare. These systems have to interact with a large base of existing hospital-based information systems, as well as possible new products developed in TTL

DIPS are a leading eHealth Company in Norway. To develop its position they need to be in the forefront when developing the new version of its "Care Plan system" Through the TTL consortium DIPS gets the unique opportunity to work closely together with researchers and the University Hospital of North Norway (UNN) in creating the "Care Plan system" for the future.

Developing a new "Care Plan system" based on standard classification is also necessary to be able to penetrate the foreign market for DIPS. This innovation will enhance the potential to establish DIPS abroad. In addition this will strengthen DIPS' position in Norway.

<http://www.dips.no>

### Norwegian Health Net SF (Norsk Helsenett SF)

TTL is expected to develop new telemedicine services, based on new technologies, and offered in residential and mobile surroundings where such services are not presently available.

It is the Norwegian Health Net's ambition that the current national health network should be extended and adapted to incorporate these new service aspects. Project participation

might provide an opportunity for the Norwegian Health Net to become more proactive with respect to evaluation and introduction of new service elements into the health network.

Demographic changes and patient empowerment is projected to change many aspects of today's health services. Some of these changes concern the way services are delivered, the environment services are delivered in, and the communication technologies involved in the service deliveries.

The TTL projects have the potential to serve as an "early warning system" for the Norwegian Health Net, providing indications of development trends and maturing services and technologies. This will contribute to the Norwegian Health Net's ability to adapt its service portfolio to match the changes in requirements from the organizations connected to the national health network

<http://www.nhn.no>

### 4.5 Collaboration between partners

The most important instrument for collaboration in TTL has been participation in the research projects. Several of the partners have one or more PhD or Postdoc projects working on research related to fundamental problems or to the development of new products, services, or processes for the partner.

An important element in the consortium agreement between the partners was to regulate the ownership of intellectual property. The current structure allows a high degree of openness and collaboration between the partners.

During 2010, the main focus had mostly been on the Midterm evaluation and the work afterward. The collaboration between the partners has been without trouble during this work

During 2010 TTL held several internal forums to further collaboration between the students, researchers, and partners. The most important forum is the student forum, as this has brought together the student across the research groups and partners, and given them a stronger voice towards the Board of Directors and the Administration.

One of the large projects in TTL, the SNOW project, achieved a major milestone when the system developed was ready for clinical trials, which maps infectious diseases by following them geographically and time measurements of epidemic development, with real data and in operative service. The SmartPhone solution for measurements of blood sugar and the registration of activity has reached an important goal when it now will be used in a large scale EU-project.

There has been established a formal cooperation with the "Senter for Brukermedvirkning og Sykepleieforskning" at Rikshospitalet, and a collaborative project got funding through the Verdikt programme from NFR. It is an important project that may be of significance for patients with long-term and chronic diseases, and integration directly between patients and specialists.

IBM has expanded their contribution in TTL and has together with the host institution, shared a full time position. One of the main activities has been establishing NICE, a Living Lab, where we can develop and demonstrate new solutions. There have been several meetings towards expanding the collaboration with IBMs research and demo centre in La Gaude, France, and a Living Lab could be a part of this collaboration. IBM has contributed with a dedicated person who has had his workplace at NST/TTL in 2010. This has increased the collaboration between IBM and NST/TTL.

The reform of integrated care, and each of the partners role towards the reform will be important signals for TTL and its development the last half period and the time after SFI-period has ended in 2014.

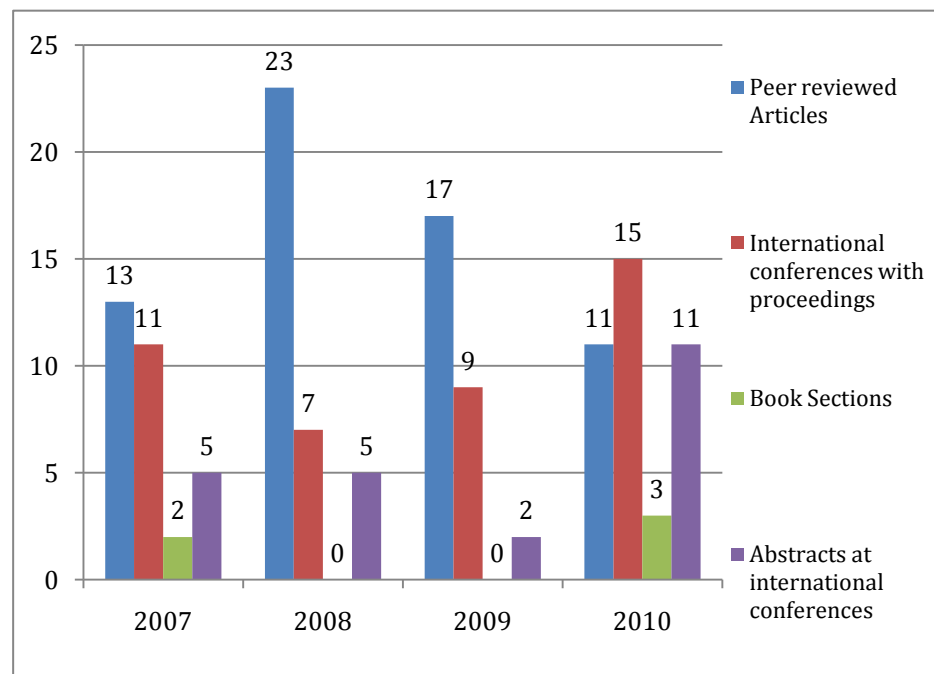
DIPS ASA has positive experiences with their PhD students with part-time positions at DIPS, and they have developed a working model where knowledge from the research front is transformed to DIPS. This has contributed to a significant research focus as basis for their development of products.

The host institution NST/UNN has been through a significant re-organization process, but does now have a clearer research focus through the establishment of a research department. This will probably enhance the activities in TTL and make the results from TTL go faster from research into implementation to the health care sector. The projects and results from TTL creates important pieces in the strategy and plans for larger priority areas for the use of ICT for collaboration between the units at the University Hospital of Northern Norway and towards the municipalities.

## 5. Research Activities and Results

Research results	2007	2008	2009	2010
Peer reviewed Articles	13	23	17	11
International conferences with proceedings	11	7	9	15
Book Sections	2	0	0	3
Abstracts at international conferences	5	5	2	11

Cooperation with master students within entrepreneurship has given an exciting input on different business models for the Few-Touch-application which is developed in the Lifestyle/diabetes project. This project does now have contracts regarding deliveries to EU-projects and other research projects next year, which gives exciting possibilities for innovation and actually implementation of products and services.



## 6. International Collaboration

Extensive international collaboration is common and necessary for small research communities.

Many of the TTL partners are used to collaborate with international partners through EU projects, academia, standardisation work, WHO, etc.

There have been several PhD students who have had a research stay abroad in 2010. Five of the students have been in USA, one in Spain and one in Australia. This is an important part of their education and gives both them and TTL experiences through participation in other projects and establishing networks outside TTLs locations in Tromsø. For TTL, this means recognition, new impulses and new contacts and network. One of our PhD students got her paper nominated "Best Paper" at the MedInfo conference 2010.

(See Appendix 1 for a complete overview of TTL's international collaborations).

### 6.1 Gender Equality

The goal set by the Board of Directors is to have at least a 40/60% gender distribution. Of the TTL or partially TTL funded PhD candidates we have a 50-50-gender distribution. In total, TTL has 33% female and 66% male PhD candidates.

The gender equality at the host institution, NST, is very even, and this has perhaps contributed to easier recruitment of female candidates.

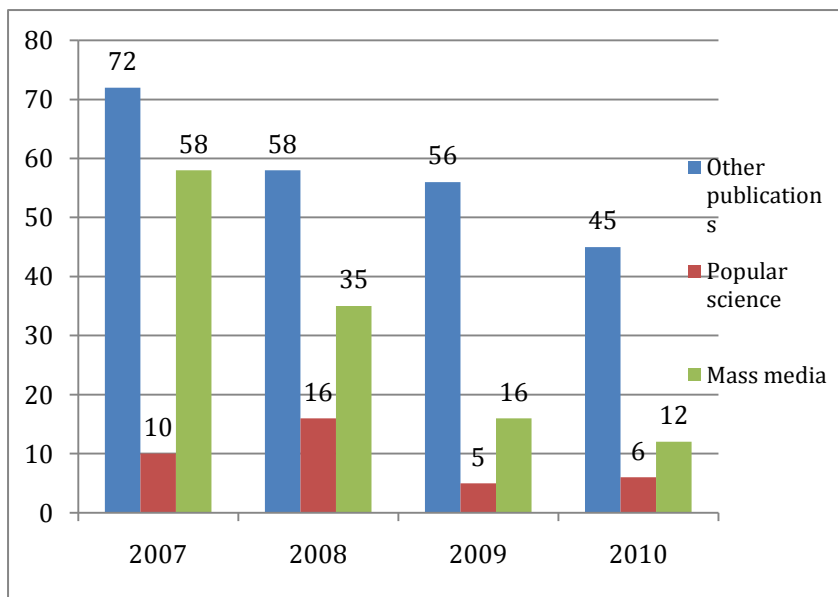
## 7. Recruitment

2010 has been a year focusing on scientific work and innovation. All positions are filled and there has not been much new recruitment.

## 8. Communication and Dissemination

The most important communication and dissemination channel is through the publications and the participation of researchers and staff at TTL in conferences and patient societies.

Communication of results	2007	2008	2009	2010
Other publications	72	58	56	45
Popular science	10	16	5	6
Mass media	58	35	16	12



In addition, the website (<http://www.telemed.no/ttl>) provides an important channel for general information and an overview of research activities and publications.

A Communication strategy has been developed and approved by the board.

TTL has developed a Communication plan for the whole centre. The Communication strategy shall contribute to that the TTL consortium reach its main goals. These are to provide research on high international level, perform research-based innovation activities that promote the partners' position in their areas, and to meet the success criteria defined by the Research Council of Norway.

The TTL communication goals are:

- TTL shall have a separate and distinct profile
- TTL shall communicate knowledge to the public
- TTL shall be characterized by good internal communication
- TTL shall stand out as an attractive partner
- TTL shall have a good dialogue with the users of those services and products that TTL aim to develop
- TTL shall be an attractive first choice for students and researchers nationally and internationally

The Communication strategy consists of the following parts: Purpose and Values; Communication goals; Success Criteria for TTL; Target groups for communication activities; The various information channels the TTL consortium have at its disposal;

Responsibility and role allocation in communication efforts; Policy statements towards the media; Graphic profile.

Communication activity is done in accordance with the Communication strategy. Internal communication takes place through e-mail distribution lists, TTL project marathon (the goal is to inform the whole centre about the current research activity), open seminars, lectures and meetings.

External communication comprises news articles which presents PhD-projects and the main research projects in TTL. The news articles are written by journalists in NST communication department. The articles are published in TTLs annual report and on TTL's and NST's web page. A lot of recourses have been used on the Annual reports. They have been considered as strategically important for our communication activity. TTL has also produced roll-ups and posters which have been used at national and international conferences and external meetings. TTL researchers have put a lot of effort into production of posters to conferences. These posters have been reused in the TTL area.

*The Norwegian Science Week:* TTL has contributed to the Norwegian Science Week in 2008 and 2009 with presentations at the Science Fair in Tromsø. In 2010, TTL presented the Few Touch system developed as a self-help system for people with diabetes.

*Website:* TTL has a dedicated website built and maintained by the communications department at NST. The site includes a presentation about TTL and its researchers, as well as news and publications.

The most important areas of dissemination of TTL research has so far been scientific presentations, scientific articles by researchers and TTL's annual report (printed version)

## Appendix 1 Personnel

### Key Researchers 2010

<b>Name</b>	<b>Institution</b>	<b>Main research area</b>
Researcher Tatjana Burkow	NST	My Health Service
Researcher Stein Olav Skrøvseth, PhD	NST	Melanoma prosjektet
Thomas Schopf, MD	NST	Melanoma prosjektet
Prof. Gro Berntsen	NST	Symptom based surveillance (SNOW)
PhD candidate/researcher Per Hasvold	NST	User-interaction in patient terminals
Prof. Richard Wootton, PhD	NST	All of NST/TTL projects
Professor Gunnar Hartvigsen, PhD	UiT, NST	Head of TTL
Senior expert Erik Johannesen	Høgskolen i Vestfold	Lifestyle project: Sensors for personalized health care
Dr.med Gerd Ersdal	NST	Lifestyle project
Dr.med Ellen Rygh	NST	Symptom based surveillance (SNOW)

Assoc. Prof. Ole Heljesen	Aalborg University, Denmark	The ICT lifestyle and health motivation project
Signe Vikkelsø	Copenhagen Business School, Denmark	Designing DIPS nursing plans
PhD Roland Bal	Eramus University, Rotterdam	Workflow systems across health organizations
Prof. Probal Chaudhuri	Indian Statstical Institute, Calcutta, India	Detection and prediction of spreads of disease outbreak based on syndromic data
Post doc Brit Ross Winthereik	IT University, Denmark	Designing DIPS nursing plans
Pernille Bjørn	IT University, Denmark	Designing DIPS nursing plans
Researcher Lars Vognild	Norut IT	My Health Service
Researcher Ellen Brox	Norut IT	The ICT lifestyle and health motivation project
Researcher Gunn Evertsen	Norut IT	My Health Service
Prof. Carl-fredrik Bassøe	NTNU	Automatic detection of infectious diseases
Assoc prof. Jesper Simonsen	Roskilde University, Denmark	Designing DIPS nursing plans
Assoc. prof. Henrik Linderoth	Umeå School of Business, Umeå University	Net based medication record
PhD Mark Hartswood	School of informatics, University of Edinburgh	Net based medication record
Professor Eric Monteiro	Department of Computer and Information Science, NTNU	Net based medication record

Norwegian University for Science  
and Technology

Ellen Balka	Simon Fraser University	Workflow systems across health organizations
Researcher Lilly Ann Stenvold	Telenor	Adoption of mHealth
Researcher Gunnvald Svendsen	Telenor	Adoption of mHealth
Researcher Bente Evjemo	Telenor	Adoption of mHealth
Professor Niels W. Lund, PhD	UiT	Information Science
Assoc.prof. Frank Siebler	UiT	Experience Sampling Method and Telecommunication
Prof. Joar Vittersø	UiT	Experience Sampling Method and Telecommunication
Assoc.prof. Gunnar Ellingsen, PhD	UiT, Helse Nord IKT	Group leader CSCW
Assoc.prof. Randi Karlsen, PhD	UiT, Norut	Computer Science and medical informatics
Professor Fred Godtlibsen, PhD	UiT, NST	Group leader Extended Decision Support
Assoc.prof. J.Gustav Bellika, PhD	UiT, NST	Computer Science and medical informatics
Professor Alexander Horsch, PhD	UiT, TU Munich	Computer Science and medical informatics

Professor Rolf Wynn, MD, PhD	UiT, UNN	Clinical Research
Prof. James Stephen Marron	University of North Carolina at Chapel Hill, USA	Detection and prediction of spreads of disease outbreak based on syndromic data
Prof. Mark Foskey	University of North Carolina at Chapel Hill, USA	Automated radiation treatment planning
Prof. Lasse Holmström	University of Oulo, Finland	Detection and prediction of spreads of disease outbreak based on syndromic data
Prof. Silvano	University of Sevilla	My Health Service
Dr Vicente Traver	University of Valencia	My Health Service
Assoc. Prof George Demiris	University of Washington, USA	Telemedicine in Private Homes
Ina Wagner	Vienna University of Technology	Workflow systems across health organizations
Dr. Jörg Polzehl	Weierstrass Institut für Angewandte Mathematik und Statistik, Berlin, Germany	Detection and prediction of spreads of disease outbreak based on syndromic data
Ole Hanseth	Institute for informatics, University of Oslo	Net based medication record
Margunn Aanestad	Institute for informatics, University of Oslo	Net based medication record
Dr. Taxiarchis Botsis	UiT	Electronic disease surveillance

### Visiting Researchers 2010

<b>Name</b>	<b>Affiliation</b>	<b>Nationality</b>	<b>Sex M/F</b>	<b>Duration</b>	<b>Topic</b>
Prof. Anton Vladzmyrskyy	Head of Department of Informatics and Telemedicine, Deputy-Editor of "Ukrainian Journal of Telemedicine and Medical Telematics", Assistant- Professor, Medical Doctor	Ukrainian	M	19 -24. February 2010	Tele-dermatology
Dr. Sisira Edirippulige	Lecturer / Coordinator - Graduate Programmes in e-Healthcare, Center for Online Health, The University of Queensland, Australia.	Australian	M	3 -7. May 2010	Online Health
Associate Professor Anne Holland	Physiotherapy at La Trobe University / Alfred Health.	Australian	F	12-16 April 2010	Recipient of Churchill Fellowship to visit "international centres that are pioneering the use of telemedicine technology for delivery of pulmonary rehabilitation

### Postdoctoral researchers 2010

<b>Name</b>	<b>Nationality</b>	<b>Period</b>	<b>Sex M/F</b>	<b>Topic</b>	<b>Funding</b>
Maciel Zortea	Brasil	01.09-01.11	M	Melanoma-project	University of Tromsø
Jeremiah Scholl	USA	09.06-02.11	M	Context sensitive systems for mobile communication inhospitals	NFR/Verdikt
Eirik Årsand	Norway	02.09-01.13	M	Collocated Personal Diabetes Data (CPDD)	Helse Nord RHF

### PhD students with financial support from the Centre budget 2010

<b>Name</b>	<b>Nationality</b>	<b>Period</b>	<b>Sex M/F</b>	<b>Topic</b>
Mr Kevin Thon	Norway	08.07-08.11	M	Detection of malignant melanoma based on lesion images
Ms Liv Karen Johannessen	Norway	12.07-12.11	F	Workflow systems across health organizations
Ms Naoe Tatara	Japan	06.07-6.12	F	User interaction patient terminals
Mr Luis Fernandes Luque	Spain	08.07-08.11	M	My Health Service
Mr Rune Pedersen	Norway	03.08-03.12	M	Nursing plans
Ms Torbjørg Meum	Norway	03.08-03.12	F	Nursing plans
Ms Kjærsti Thorsteinsen	Norway	01.10-12.13	F	Monitoring systems in home based health services

### PhD students working on projects in the centre with financial support from other sources 2010

<b>Name</b>	<b>Funding</b>	<b>Nationality</b>	<b>Period</b>	<b>Topic</b>	<b>Sex M/F</b>
Ms Monika A Johansen	Helse Nord RHF/HST	Norway	06.07-07.11	System based surveillance	F
Mr Terje Solvoll	NFR/Verdikt	Norway	09.06-02.11	Context sensitive systems for mobile communication in hospitals	M
Ms Eli Larsen	Helse Nord RHF/HST	Norway	01.07-01.11	Net based Medication Card	F

Ms Klaske van Vuurden	University of Tromsø	The Netherlands	11.07-11.11	Models for automatic detection of infectious diseases at an early stage in disease progression	F
Mr Bernt Ivar Olsen	University of Tromsø	Norway	8.04-09.08	Using display walls for improved treatment	M
Mr Jörn Schulz	NFR/eVita	Germany	01.08-1.12	INR and Tumor detection	M
Mr Kristoffer Røed	University of Tromsø	Norway	12.07-12.10	Organizational use of ICT	M
Mr Andre Serra	From the Portugals Research Council	Portugal	02.08-02.11	Patient modelling basedon epidemic and sensor data	M
Mr Marc Geilhufe	University of Tromsø	Germany	07.08-07.12	Monitoring of high risk patients by combining telemedicine and statistical methods	M
Ms Kajsa Møllersen	NST/NFR -eVita	Norway	01.09-01.14	Classification of moles - Melanor	F
Mr Kristian Hindberg	University of Tromsø	Norway	12.06-12.10	Statistical methods for spatiotemporal data	M

### Master degrees (in 2010)

<b>Name</b>	<b>Sex M/F</b>	<b>Topic</b>	<b>From</b>
John-Fredrik Solberg	M	Nursing plans"	University of Tromsø
Päivi Salminen	F	Nursing plans	University of Tromsø

Eun Ji	F	Human Computer Interface	University of Tromsø
Jonas Lauritzen	M	"Snow project "and "The context sensitive systems..."	University of Aalborg, Denmark
Aguilar, Julian Guirao	M	Master student at University of Valencia, master theses at University of Tromsø. "Breathing as user interface for pulmonary rehabilitation", June 2010, Supervisor(s): Prof G. Bellika, L.F. Luque, Prof. V. Traver	Universitetet i Tromsø
Ms. Neema Shresthe	F	Master student in telemedicine and e-health. Supervisor: Prof. Gunnar Ellingsen, UiT, spring 2010	Universitetet i Tromsø
Lee, Eun Ji	F	Arbeidsuke i forbindelse med Masterstudiet i Telemedisn og e-helse, 9.-13.nov 2009	Universitetet i Tromsø
Ravuri, Ashokbabu	M	Master student in telemedicine and e-health, UiT. June 2010. Supervisor: Prof. Gunnar Hartvigsen.	Universitetet i Tromsø

## Appendix 2 Economy

### Funding 2010

	Amount <i>Public</i>	Amount <i>Research</i>	Amount <i>Enterprise</i>	<b>Total</b>
The Research Council	9 947			
The Host Institution (NST)		11 643		
<i>Norut IT</i>		1 176		
<i>Dips ASA</i>			356	
<i>Norwegian Health Net</i>			0	
<i>Telenor R&amp;D</i>			1 221	
<i>IBM</i>			452	
<i>UiT</i>	9 700			
<i>Northern Norway Regional Health Authority</i>	148			
<b>Total</b>	<b>19 795</b>	<b>12 819</b>	<b>2 029</b>	<b>34 643</b>

Costs 2010

	Amount <i>Public</i>	Amount <i>Research</i>	Amount <i>Enterprise</i>	<b>Total</b>
The Host Institution (NST)		16 530		
<i>Norut IT</i>		1 868		
<i>Dips ASA</i>			1 727	
<i>Norwegian Health Net</i>			0	
<i>Telenor R&amp;D</i>			2 105	
<i>IBM</i>			452	
<i>UiT</i>	11 706			
<i>Northern Norway Regional Health Authority</i>	255			
<i>Equipment</i>	0	0		
<b>Total</b>	<b>11 961</b>	<b>18 398</b>	<b>4 284</b>	<b>34 643</b>

## Appendix 3 Publications

### Book chapters

Årsand, E., Tatara, N., Hartvigsen, G. Wireless and Mobile Technologies Improving Diabetes Self-Management. Handbook of Research on Mobility and Computing: Evolving Technologies and Ubiquitous Impacts. Edited by Maria Manuela Cruz-Cunha & Fernando Moreira. IGI Global, 2010.

Tjora A, Gammon D, Christiansen E, Elin J, Burkow T, Vognild L, Fernandez-Luque L, Hagen R. "Digitale pasienter" Gyldendal akademisk. (2010) Tjora A, Sandaunet A-G (red.) ISBN 9788-20-53990-99

Meum T. "Ja takk, begge deler" – Overgang fra muntlig til elektronisk rapport i sykepleien. Tapir Akademiske Forlag (2010) Margunn Aanestad og Irene Olaussen (red) IKT og Samhandling i helsesektoren. Digitale lappetepper eller sømløs integrasjon. ISBN 978-82-519-2646-1 p.179

### Scientific articles 2010

Botsis T, Bassøe CF, Hartvigsen G. Sixteen years of ICPC use in Norwegian Primary Care: Looking through the facts. BMC Med Inform Decis Mak. 2010 Feb 24;10(1):11. PMID: 20181271

Botsis T, Anagnostou VK, Hartvigsen G, Hripcsak G, Weng C. Developing a multivariable prognostic model for pancreatic endocrine tumors using the clinical data warehouse resources of a single institution. *Applied Clinical Informatics*, 2010, Vol. 1, Issue 1, 38-49. (DOI: 10.4338/ACI-2009-12-RA-0026)

Årsand E, Tatara N, Østengen G, Hartvigsen G. Mobile Phone-Based Self-Management Tools for Type 2 Diabetes: The Few Touch Application. J Diabetes Sci Technol 2010;4(2):328-336 PMID: 20307393

Møllersen K, Kirchesch HM, Schopf T, Godtlielsen F, Unsupervised Segmentation for Digital Dermoscopic Images, *The Skin Research and Technology*, 2010. 160: 242-246.

Botsis, T., Hartvigsen, G. Exploring new directions in disease surveillance for people with diabetes: Lessons learned and future plans. *Studies in Health Technology and Informatics*, 2010;160: 466-470..

Walderhaug, S., Hartvigsen, G., Stav, E. Model-Driven Traceability in Healthcare Information Systems Development. *Studies in Health Technology and Informatics*, 2010.

Gunnar Ellingsen and Kristoffer Røed. The Role of Integration in Health-Based Information Infrastructures. Computer Supported Cooperative Work (CSCW) Volume 1 / 1992 - Volume 19 / 2010, Online First, 16 September 2010  
<http://springerlink.com/content/7j2g38m335g31288/>

Johannessen LK, Gammon D. Pilot users in agile development processes: motivational factors. *Health Technol Inform.* 2010;157:47-52.

Eli Larsen and Gunnar Ellingsen. Facing the Lernaean Hydra: The Nature of Large-Scale Integration Projects in Healthcare. *Scandinavian Information Systems Research. Lecture Notes in Business Information Processing*, 2010, Volume 60, 93-110, DOI: 10.1007/978-3-642-14874-3\_7

Solvoll, T., Scholl, J., Hartvigsen, G. Physicians interrupted by mobile devices in hospitals – understanding the interaction between devices, roles and duties. *Studies in Health Technology and Informatics*, 2010;160: 1365.

Torbjörg Meum, Gro Wangensteen, Harald igesund, Gunnar Ellingsen, Eric Monteiro, Standardization – the iron cage of nurses' work? *Studies in Health Technology and Informatics*. Volume 157, 2010-11-30

### Conference proceedings

Skrøvseth SO et al. , Statistical Modeling of Aggregated Lifestyle and Blood Glucose Data in Type 1 Diabetes Patients, Proceedings at the eTELEMED 2010, in St.Maarten, Netherlands Antilles. IEEE Computer Society, pp 130-33. ISBN: 978-0-7695-3950-8

Botsis, T., Hartvigsen, G., Chen, F., Weng, C. Secondary Use of EHR: Data Quality Issues and Informatics Opportunities. 2010 AMIA Summit on Clinical Research Informatics (CRI) (March 12-13, 2010, San Francisco, California).

Olsen, B.I., Lund, N.W., Hartvigsen G. Leaving twentieth-century understanding of documents - From book to eBook to digital ecosystem. 4th IEEE International Conference on Digital Ecosystems and Technology (IEEE DEST 2010) (12-15 April 2010, Dubai, UAE). IEEE Press.

Terje Solvoll, Stefano Fasani, Ashok Babu Ravuri, Annelies Tiemersma, Gunnar Hartvigsen Evaluation of an Ascom/trixbox system for context sensitive communication in hospitals Accepted as a proceeding in SHI2010 (Aug 22-24, 2010, Copenhagen), Tapir forlag

Salvador J. Romero, Luis Fernandez-Luque, José L. Sevillano, and Lars Vognild Open Source Virtual Worlds and Low Cost Sensors for Physical Rehab of Patients with Chronic Diseases P. Kostkova (Ed.): eHealth 2009, LNICST 27, pp. 76–79, 2010. Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering 2010. ISBN: 978-3-642-11744-2

L Fernandez-Luque, R Karlsen, T. Krogstad, TM. Burkow, LK Vognild, "Personalized Health Applications in the Web 2.0: The Emergence of a New Approach", 32nd Annual International IEEE EMBS Conference, September 2010, Buenos Aires, Argentina (Invited paper)

D Cascado, SJ Romero, S Hors Fraile, A Brasero, L Fernandez-Luque, JL Sevillano, "Virtual Worlds to Enhance Ambient-Assisted Living", 32nd Annual International IEEE EMBS Conference, September 2010, Buenos Aires, Argentina (Invited paper)

Røed K. Heterogeneities and complexities in IS design – Still a need to juxtapose organizational elements and design related ideas? Long paper at OZCHI 2010, 22-26 Nov 2010, Brisbane, Australia

Geilhufe, M.; Skrøvseth, S. O.; Godtlielsen, F. (2010) : Digital Monitoring of Changes in Skin Lesions. I: Proceedings of the IADIS International Conference e-Health 2010. IADIS Press 2010 ISBN 978-972-8939-16-8. p. 229-233.

Skrøvseth, S. O.; Schopf, T.; Thon, K.; Zortea, M.; Geilhufe, M.; Møllersen, K.; Kirchesch, H. M.; Godtlielsen, F. (2010) : A computer aided diagnostic system for malignant melanomas. I: *2010 3<sup>rd</sup> International Symposium on Applied Sciences in Biomedical and Communication Technologies (ISABEL 2010)*. IEEE conference proceedings 2010 ISBN 978-1-4244-8131-6, 5 pages.

Zortea, M., Skrøvseth, S.O. and Godtlielsen, F. : Automatic learning of spatial patterns for diagnosis of skin lesions, 32nd Annual International IEEE Engineering in Medicine and Biology Conference, p. 5601–5604, Buenos Aires, Argentina, 2010.

Zortea, M., Tuia, D., Pacifici F. and Plaza, A. : Spectral-Textural Endmember Extraction, IEEE GRSS Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing, p. 1– 4, Reykavyk, Iceland, 2010.

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Plaza, A., Martin, G., Plaza, J., Zortea M. and Sanchez S.: Recent Developments in Spectral Unmixing and Endmember Extraction, Optical Remote Sensing - Advances in Signal Processing and Exploitation Techniques. Edited by S. Prasad, L. Bruce and J. Chanussot, Springer, 2010.

