

Fundamental Challenges for ICT in pHealth

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John

- 44 years
- Overweight
- Risk of diabetes and cardiovascular diseases
- Engineer on off-shore vessel
- John loves his work, works hard, and is good at what he does

John

- BMI has reached a level where he risks not being allowed to work on the boat
- Employer wants John to change his diet and take more care of his body by exercising
- Employer buys a new pHealth system



John's pHealth System

- Mobile phone is “hub” for sensors and user interface
 - Step counter, bike computer via Bluetooth
 - Simple icons on touch screen to register food or get information about food products
 - Advice on recommended diet and recipes available at the “point of decision” – in the shop
- Documents activity and diet
- An automated “Behaviour Change” System provides personal motivation and encouragement

Anton

- 85 years
- Signs of dementia
- Sometimes he wanders off and gets lost
- Gets confused and forgets stove or open window
- Lives in a flat at a modern care centre



Anton's pHealth System

- Controversial system as it involves an implant that monitors physical parameters as well as location
- The decision to use this system was taken by relatives of Anton and the care home – Anton agreed while having one of his good periods



Anton's pHealth System

- The system integrates with infrastructure at the care centre and nearby area
- Warns the nurses if Anton leaves the premises
- Registers core temperature and issues a warning if not normal
- Provides Anton's location if any non-normal values are registered



Anton's pHealth System

- Personalised services may be activated
 - E.g.: in some situations music from Anton's youth plays in the room he is in to help Anton remember
- Videoconference with grandchildren via his TV-set possible on good days



Anna

- 24 years
- Student, single, no kids
- Exercises hard, competes on national level
- Good health
- Not interested in her health beyond what concerns her training and results



Anna's pHealth System

- Training diary on mobile phone with her personal health assessment and data (weight, resting pulse, etc.)
- Training info shared with coach and training mates – but not health info
- When she visits her GP she may make information available to the GP's EPR



Anna's pHealth System

- Anna participates in two research projects
 - Eating disorders among long distance athletes
 - Disease surveillance
- Anna's system can communicate with other systems
 - Professional health (GP)
 - Non-professional health (coach)
- To Anna it is important that she is in control of access and sharing of her data
 - System has traceability of shared data, i.e. Anna is notified about who opens her shared personal health information

Maria

- 9 years
- Recently diagnosed with diabetes
- Must learn what she can eat and when to take insulin



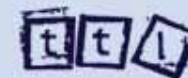
Maria's pHealth System

- Mobile phone is “hub” and interface
- Blood glucose meter with Bluetooth interface to mobile phone
- Maria can use simple icons to enter what she is eating and how much
- Reports sent to parents
- Aggregated data sent to national database



Josephine

- 65 years
- COPD; needs oxygen
- Unable to get out very much
- Used to play in a hard-core rock band
- Interested in theatre, arts, and music
- Has good computer skills



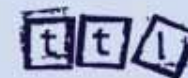
Josephine's pHealth System

- Combination of stationary and mobile devices
- The municipality provides virtual participation in cultural events via Internet
- GP receives reports from Josephine before each visit – this has improved their interaction



Josephine's pHealth System

- All physical data from her “smart bathroom” are recorded into her personal health diary, which she can share with her GP
- It is important to Josephine to be able to turn off all “smart” systems when she has friends visiting to avoid making them feel monitored



Josephine's pHealth System

- She keeps in touch with her grandson via videoconference on her mobile phone
- She composes and performs music together with her band mates over the net
- She participates in virtual exercise sessions over the net, organised by the COPD physiotherapists in the city

To reach the goal we need:

- Collaboration
- Knowledge
- Skills
- Technology
- A will to explore





Fundamental Challenges

- pHealth systems are **personal**
 - Privacy, ownership of info, access and sharing, security
- pHealth systems are **customized** to individual needs
 - Tailored systems, no “one-size-fits-all”
- pHealth systems must **enable** the user
 - Not only focus on professional health issues, but self management and empowerment
- pHealth systems must be able to **integrate** with other systems
 - Personal health info, professional health systems, non-professional health systems
- pHealth systems are **sociotechnical** systems
 - Require multi disciplinary design efforts



Fundamental Challenges

- Exception handling
 - Power, failures, error situations
- Evaluation is extremely difficult
 - Individualisation makes it difficult to learn from one case to the next
- Standard interfaces for devices and sensors
- Motivation for purchase and use
- Multi disciplinary development environments and methodologies



Tromsø Telemedicine Laboratory - Goal

To

supply the healthcare industry with viable and sustainable technologies, to promote global health, wellness, and disease management through technologic advances in the collection, processing, and sharing of medical information



Tromsø Telemedicine Laboratory

- One of 14 Centres for Research-based Innovation with 5+3 years of funding from the Research Council of Norway
- Additional funding from the partners (>50%)
- Hosted by the Norwegian Centre for Telemedicine

TTL Research Topics

- **Sensor-based systems**
 - Biomedical- biomechanical measurement, Human Computer Interaction (HCI), Personal Area Networks, Wearable and Ubiquitous computing
- **Decision support**
 - Applied mathematics, Statistics, Image and Signal Processing
- **Computer mediated collaboration**
 - Mediated collaboration, work-flow, participatory design, information systems, sociotechnical design, CSCW



TTL Partners

- The Norwegian Centre for Telemedicine at the University Hospital of North Norway (Host partner)
- IBM Norway
- Telenor R&I
- Helse-Nord ICT RHF
- Northern Research Institute (Norut)
- Norwegian Health Net
- DIPS ASA
- Well Diagnostics AS
- University of Tromsø

Sensor input:

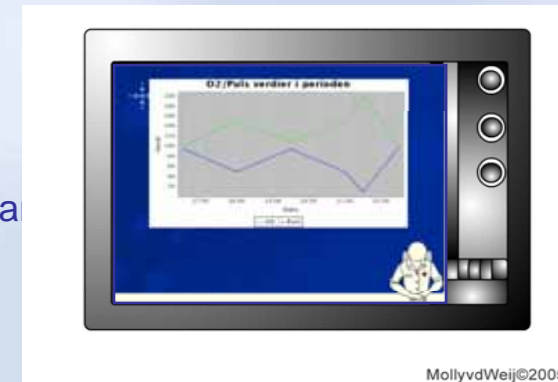
The number of steps the user walks per day and each blood glucose measurement are automatically and wirelessly transferred to the smartphone diary using Bluetooth communication.



MyHealthService

Based on the work in MinHelsestasjon

- Platform
 - TV / remote control as user interface
 - A Residential Patient Device
 - Free Open Source Software (FOSS)
- Chronic disease management for
 - COPD
 - Diabetes
- Services
 - Individual following-up
 - Group based education
 - and exercises
 - self management using a Personal Health Diary (questions and sensor data)
- A comprehensive and patient centric approach
- NRK PULS: <http://www1.nrk.no/nett-tv/indeks/72710>





Other pHealth-related TTL Projects

- The Behaviour Change Mechanism
 - Tailored advice and motivation on your mobile phone (Telenor R&I)
- Mellanor
 - Image analysis to identify malignant melanoma from photos taken with simple digital camera and dermascope
- Disease Surveillance
 - Automatic extraction of data from EPR

