The status of eHealth in Finland

& research examples from Åbo Akademi University and University of Oulu

Heidi Enwald, Information Studies
University of Oulu & Åbo Akademi University

Themes

Finnish health care system in a nutshell

Situation of eHealth

Examples of research

- **HIBA from Åbo Akademi**
- **University of Oulu**

Couple words about the eHealth-related education

Finland

Finland is a relatively sparsely populated country (5.5 million inhabitants, with an average population density of 18 persons/km2) with a highly advanced technological infrastructure.

In the eastern and northern parts of the country the population density is especially low and distances are long.

Finnish healthcare system in a nutshell

The healthcare system in Finland is mainly based on public health care providers. Municipalities, through taxes, finance most of the health care and the government is providing additional support.

There are additional private services based on insurances and service fees. Occupational healthcare.

Public primary healthcare services are either produced by the municipalities themselves or provided in cooperation with other municipalities or purchased from private or public providers.

Challenges

Finland's population is aging faster than that of many other countries.

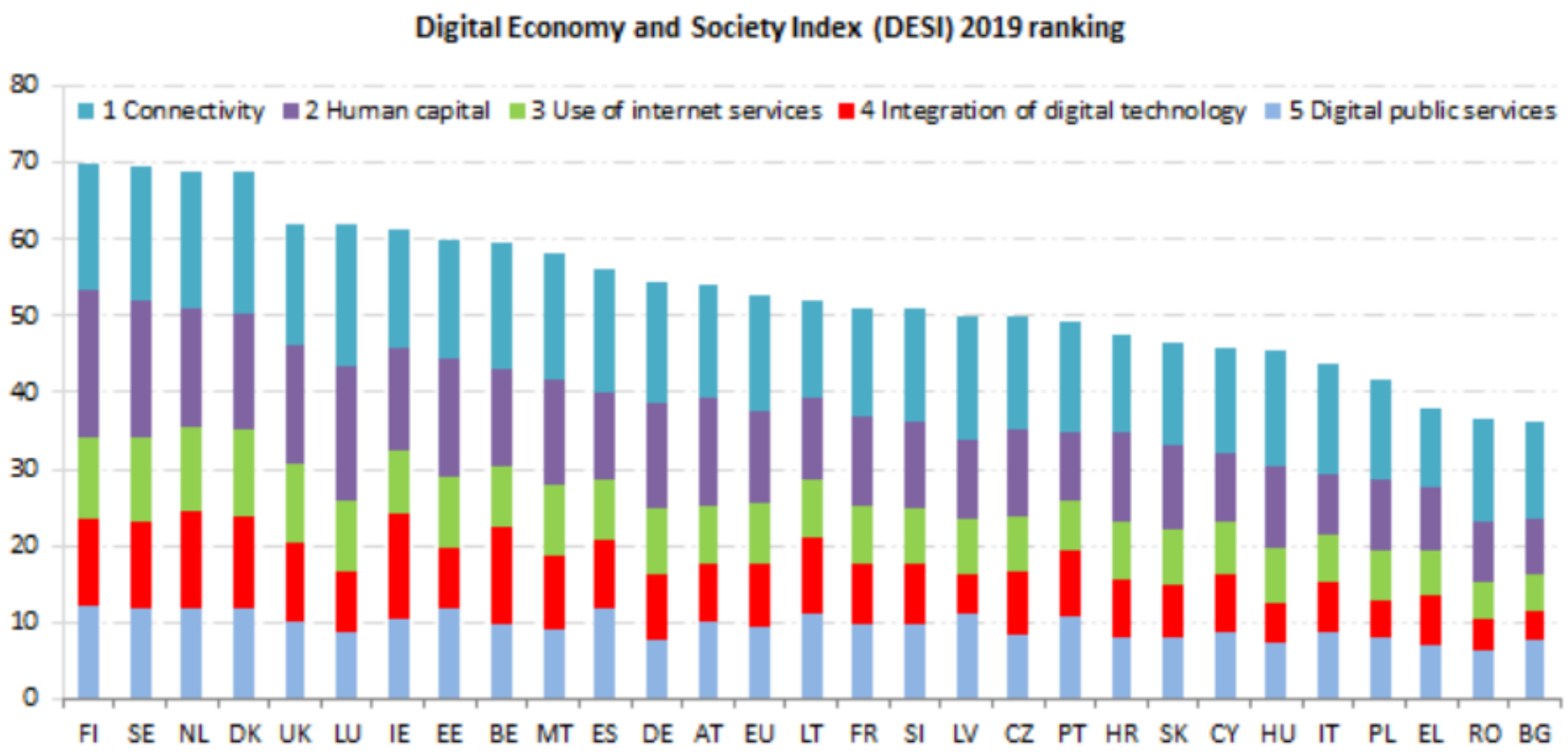
Demographic and regional diversification is increasing e.g., due to urbanization.

The municipal and service structure is in a state of transition since the current structure cannot bear the challenges of the ongoing demographic changes.

A health and social care reform has been on the agenda of several appointed governments. A suggested reform by prime minister Sipilä's government was not approved by parliament in 2019.

The Digital Economy and Society Index (DESI)

DESI 2019



https://ec.europa.eu/digital-single-market/en/desi


eHealth

eHealth situation

Today in Finnish healthcare, the documentation of patient data is carried out by electronic means at all levels of care.

All the primary healthcare centers, secondary and tertiary hospitals as well as private service providers obey the same general healthcare and medical treatment guidelines and patient documentation policies, which has contributed positively to the opportunities offered by Telemedicine and eHealth.

National Supervisory Authority for Welfare and Health (Valvira) guides and follows

https://www.valvira.fi/web/en/healthcare/telemedicine-services

eHealth and eSocial Strategy 2020

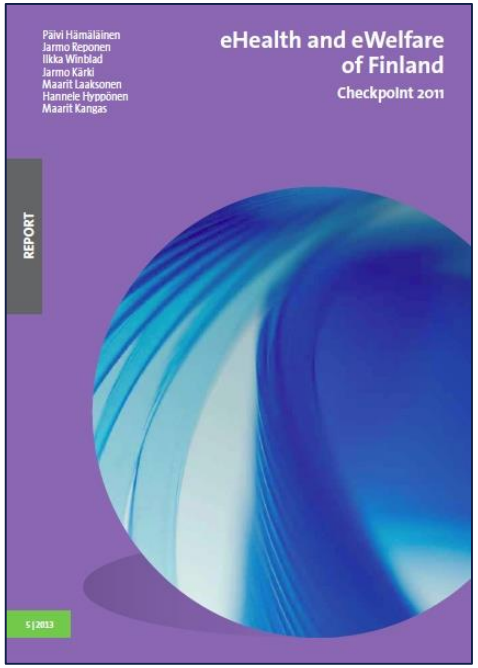
http://julkaisut.valtioneuvosto.fi/handle/10024/74459

Ministry of Social affairs and Health (2015)

The objective of the strategy is to support the renewal of the social welfare and health care sector and the active role of citizens in maintaining their own well-being by improving information management and increasing the provision of online services.

”Socially Sustainable Finland 2020”

Monitoring of eHealth situation in Finland



https://www.julkari.fi/bitstream/handle/10024/138244/RAP2019_7_e-health_and_e-welfare_web_4.pdf

By National Institute for Health and Welfare (THL)

- **Ministry of Social affairs and Health has since 2003 regularly commissioned THL to assess status and trends of e-services on a national level in Finland**
- **The THL-led studies have been conducted in close collaboration with universities:**
- **E.g., University of Oulu – responsible for eHealth availability surveys**
- **The survey instruments have been kept as similar as possible to enable comparison to previous data collections, but updated each round with questions related to new eHealth functionalities.**
- **Next data collection round in 2020 – introducing a further user experience study focusing on social workers**

Finnish national storage for health data

- **The Finnish ICT infrastructure for health and social care is based on legislation from 2007 and all its later ammendments (Act 159/2007).**
- **It currently includes KANTA services hosted by Social Insurance Institution (KELA):**
  - My Kanta pages
  - Prescription service
  - Pharmaceutical database
  - Patient Data Repository
  - Archiving of old patient data

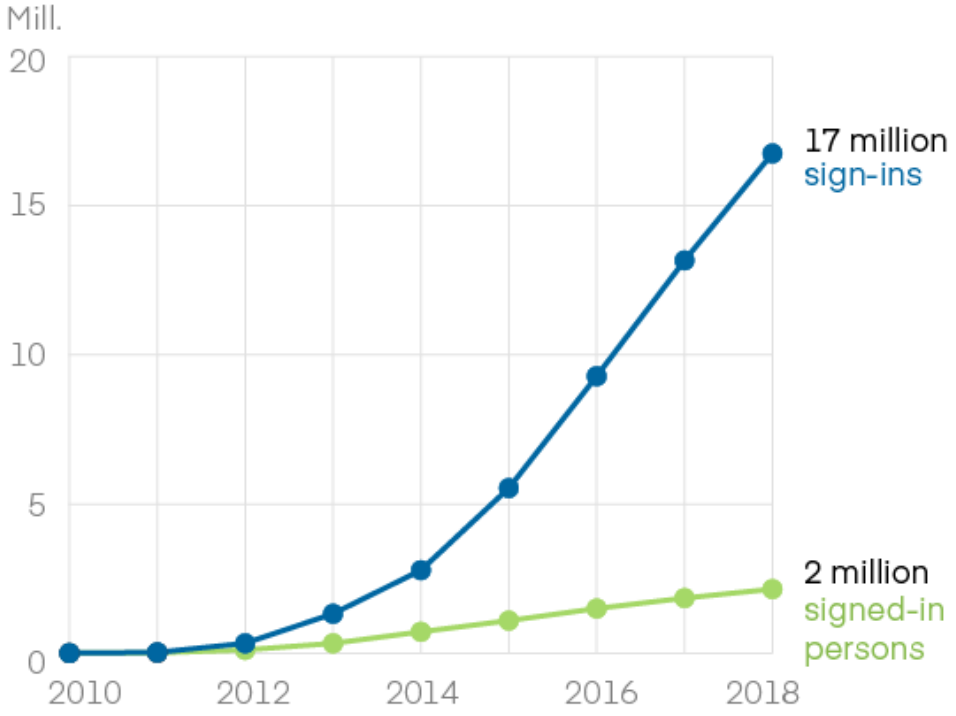
My Kanta: Patient accessible national electronic health record (PAEHR)

- My Kanta pages give citizens access to their electronic patient records, laboratory tests and e-Prescriptions.
- Patients can access log data on the usage of their data.
- Manage their consents – e.g. Giving or refusing medical staff access to the data
- Organ donation testament

More info on My Kanta: *https://www.kanta.fi/en/my-kanta-pages*

Kanta services in 2018

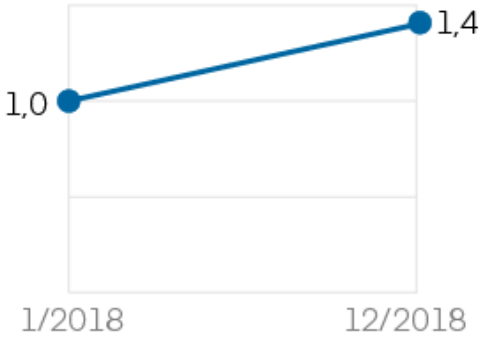
Sign-ins and number of persons signed into My Kanta 2010–2018



Total number of persons having used My Kanta 2010–2018
2.8 million

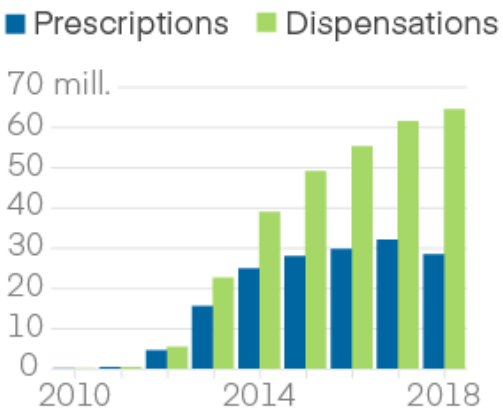
Number of requests for prescription renewals made via My Kanta 2018
2.2 million

Documents in the Patient Data Repository 2018, billion documents*



*Records on service transactions and treatments

Prescriptions and dispensations 2010–2018



Kanta

- **63% of adults had accessed the PAEHR (cumulatively from 2010) by the end of 2018.**

https://www.kanta.fi/en/citizens

eHealth at home: Virtual hospital 2.0, all university hospitals involved

- Specialiced care services available in net.
- **Terveyskylä.fi** (Health village) –web pages provide professional services in various speciality domains, ”virtual houses”.
- By the end of 2018, more than 30 different **advisory virtual houses in operation**, from mental health services to pain management, from rehabilitation to emercengy guidance.
- Open services and general guidance without registration.
- **Digital care pathways** (more than 80 in 2018), prescribed out-patient clinic services.
- **Terveyskylä PRO**, tools for research and quality guidance for health professionals

https://www.terveyskyla.fi/
http://kunnat.net

Twitter: @reponenjarmo

Research

HIBA

#healthinformationbehaviour
#healthinformationliteracy
#consumerhealthtechnologies
#ehealth
#olderadults

Taking Health Information Behaviour into Account

implications of a neglected element for successful implementation of consumer health technologies on older adults

Åbo Akademi University collaboration with Oulu University and Uppsala University

Financed by the Academy of Finland 2015-2020

Lead by professor Isto Huvila

Åbo Akademi University

Research questions

1. How do older adults (born 1946–1960) experience the usefulness, effectiveness, trustworthiness and privacy of e-health services?
2. Do existing e-health services have an impact on issues related to older adults health information behaviour?
3. How can e-health services be tailored to effectively fit older adults everyday health information behaviour? What are characteristic features of such tailored services?

Data collected e.g., by:

- *Focus group interviews* with older adults having used patient-accessible electronic health records (May-June 2018)
- National *postal survey* of a random sample of 1,500 Finns aged 55-70 years (July 2019-Oct 2019)

ELSEVIER

Information Processing & Management

Volume 54, Issue 3, May 2018, Pages 394-407

Anticipating ageing: Older adults reading their medical records

Isto Huvila [a], Heidi Enwald [b], Kristina Eriksson-Backa [c], Noora Hirvonen [b], Hai Nguyen [c], Isabella Scandurra [d]

Show more

https://doi.org/10.1016/j.ipm.2018.01.007

FinJeHeW Finnish Journal of eHealth and eWelfare

SCIENTIFIC PAPERS

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www.tsv.fi/tunnus

Taking Health Information Behaviour into Account in the design of e-health services

Isto Huvila[1,2], Stefan Ek[3], Heidi Enwald[1,4], Kristina Eriksson-Backa[1], Noora Hirvonen[1,4], Helena Känsäkoski[1,4]

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Relationship Between Everyday Health Information Literacy and Attitudes Towards Mobile Technology Among Older People

Heidi Enwald[1,2,3](✉), Noora Hirvonen[1,2,3], Maarit Kangas[4], Niina Keränen[4], Timo Jämsä[3,4], Isto Huvila[2], and Raija Korpelainen[3,5,6]

European Conference on Information Literacy

ECIL 2018: Information Literacy in Everyday Life pp 136-143 | Cite as

Differences in Health Information Literacy Competencies Among Older Adults, Elderly and Younger Citizens

Authors | Authors and affiliations

Isto Huvila, Noora Hirvonen, Heidi Enwald, Rose-Mharie Åhlfeldt

Health information seeking, beliefs about abilities, and health behaviour among Finnish seniors

Kristina Eriksson-Backa, Heidi Enwald, Noora Hirvonen, more...

Show all authors

First Published May 6, 2018 | Research Article | Check for updates

https://doi.org/10.1177/0961000618769971

Article information

Altmetric 0

Abstract

The paper presents a study that examines older Finnish adults' self-perceived capability to access, evaluate, understand and use health-related information, and their perceived ability to influence their health themselves, and the relationship between these factors and their current health, health behaviour and information seeking. Questionnaires were mailed by post to 1000 Finns aged 65–79 years, and a total of 281 completed questionnaires (28%) were returned. Of these, 273 were

Some preliminary results

- Focus group studies:
  - EHRs are perceived to still be under construction when taken into use and hence lack information and features that users require, which might increase frustration and hinder use.
- National postal survey:
  - >2/3 had accessed the My Kanta Pages
  - >2/3 of users of digital health services were positive and thought they are useful, increase awareness of own health, help to manage own information, increase knowledge and help to seek more information.
  - More than 80% of all respondents claimed that most important features of digital health services are credible, actual and consistent contents, ease of use, that they contain needed information, and contain information that is easy to understand and can be readily used.

EHR –professionals´user experience (UX) studies, 2010, 2014, 2017, ca. 4000 phycisians and 3600 nurses

Potilastietojärjestelmät tuotemerkeittäin arvioituna vuonna 2014

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International Journal of Medical Informatics

ELSEVIER

journal homepage: www.ijmijournal.com

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User experiences with different regional health inform exchange systems in Finland

Hannele Hyppönen[a,*], Jarmo Reponen[b,c], Tinja Lääveri[d,e], Johanna Kaipio[f]

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Usability problems do not heal by themselves: National survey on physicians' experiences with EHRs in Finland

Johanna Kaipio[a,*], Tinja Lääveri[b], Hannele Hyppönen[c], Suvi Vainiomäki[d], Jarmo Reponen[e,f], Andre Kushniruk[g], Elizabeth Borycki[g], Jukka Vänskä[h]

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Next data collection will be in 2020

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journal homepage: www.ijmijournal.com

National questionnaire study on clinical ICT system Physicians suffer from poor usability

Johanna Viitanen[a,*], Hannele Hyppönen[b], Tinja Lääveri[c], Jukka Vänskä[d], Jarmo Reponen[e,f], Ilkka Winblad[f]

[a] Strategic Usability Group, School of Science, Aalto University, Espoo, Finland

Potilastietojärjestelmät lääkärin työvälineenä 2014: käyttäjäkokemuksissa ei merkittäviä muutoksia

Finnish physicians' experiences with computer-supported patient information exchange and communication in clinical work

January 2011 · International Journal of Electronic

Source · DBLP

Johanna Kaipio · Marko Nieminen · Ha

TINJA LÄÄVERI
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Yksityissektorin potilastietojärjestelmät arvioitu 2014

Twitter: @reponenjarmo

nordeu

Nordic eHealth Benchmarking

Status 2014

Feasibility studies in the real world digital environment of the Oulu University Hospital, facilitated by the OYS Testlab

Implementation of an eHealth application in oncology: a real-world feasibility study

Anna Maijala[1], Jari Haverinen[1,2], Satu Malmqvist[3], Niina Keränen[1,4], Timo Jämsä[1,4,5], Jarmo Reponen[1,4]

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INTERNATIONAL CLINICAL ENGINEERING AND HEALTH TECHNOLOGY MANAGEMENT CONGRESS

UNIVERSITY OF OULU

RESEARCH UNIT OF MEDICAL IMAGING, PHYSICS AND TECHNOLOGY

ppshp

Introduction

Text-based interaction between patients (P) and health care professionals (HCP) and real-world implementations of patient reported outcome (PRO) tools are under-reported to date in oncology.

Numerous digital solutions are taken into clinical use → need for evaluation with evidence-based information

Perspectives for outcomes evaluation: Implementation process, service and client

Twitter: @reponenjarmo

Health Technology Assessment (HTA) for digital solutions, a new Digi-HTA toolkit developed in Oulu

FinJeHeW Finnish Journal of eHealth and eWelfare

SCIENTIFIC PAPERS

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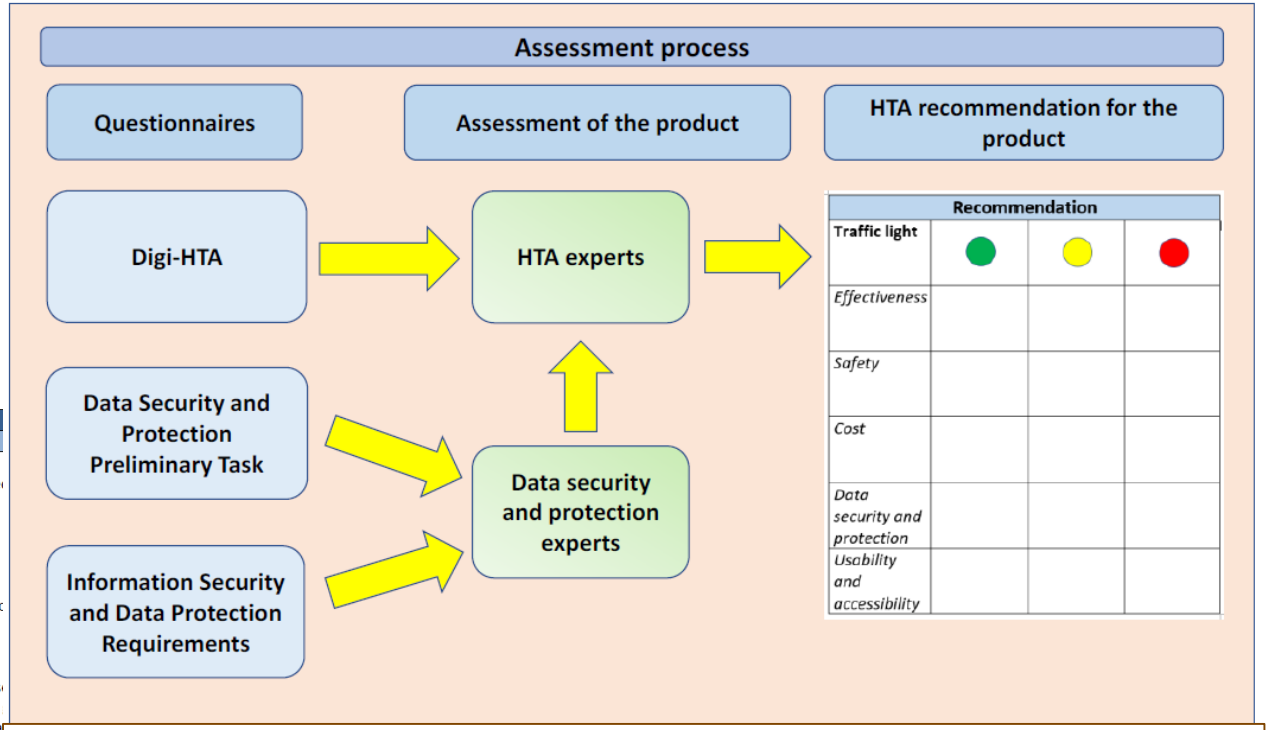
Digi-HTA: Health technology assessment framework for digital healthcare services

Jari Haverinen, MHSc, MSc[1,2], Niina Keränen, MD, MSc[2,3], Petra Falkenbach, MSc[4,5], Anna Maijala, MHSc[2], Timo Kolehmainen, MSc[1], Jarmo Reponen, MD, PhD[2,3]

HTA-Domain and Criteria	HTA-Domain and Criteria
Usability and accessibility	***Artificial intelligence***
Have all user groups been taken into account in product design, like people with visual or hearing impairments?	Exactly what defined problem is going to be solved by the AI?
Has the product been tested with real user groups?	What is the classification of AI? Visualization only, AI–assiste sis/classification/decision), or solely AI–controlled?
What kind of accessibility testing has been performed on the product?	Could the problem be solved without the AI solution?
Has the functionality of the product been tested with screen readers or other assistive technologies?	Is the solution based on machine learning or a neural network?
How have the product's users been taken into account in the product's text (clear, concrete language; the avoidance of professional language)?	Do the staff have sufficient capacity to understand the operational logic of AI additional training)?
How have the product's users been taken into account in the design of its textual content (headings, lists, and images)?	Are the conclusions and decisions of the AI solution transparent, i.e., can medic what the decisions are based on?
How does the company continue to collect feedback from users and make changes to the product based on this feedback?	Is the AI solution validated in the environment in which it will be used?
What changes have been made to the product based on user feedback?	What are the data sources for the AI solution?
How is the company going to continue to evaluate and develop accessibility?	Are the data sources used in the training of AI solutions relevant to a final us age and gender composition of training groups comparable to that of real user
Is the product compatible with the following usability guidelines (if applicable)?	Are the access rights required for the use of the data in order, and have da GDPR) and security issues been taken into account?
WCAG 2.0/ WCAG 2.1	When it comes to classifier teaching, are there enough data relative to the s class?
Papunet Design Guide for Websites	Can the AI solution use incomplete data?
EN 301 549 section 11-Software	Can the AI solution use noisy data?
Design guidelines for native application	Is retraining possible for the AI solution?
Design guidelines for progressive web application	What are the data sources for retraining?
Does the application support OS accessibility features?	How is it ensured that the system is not taught with irrelevant data?
Interoperabilty	How many tests or results are needed for the AI model?
Does the product have interfaces into the website or other software?	Is the algorithm purchased software as a service (SaaS) or its own design?
Does the product have interfaces into the following healthcare services?	What performance criteria are used?
Electronic patient records (which ones?)	Does the AI solution change care processes? How?
Finnish Kanta PHR	When does the AI solution propose an action? How, and who will actually impl
Other (what?)	Is staff's approval needed for action proposed by the AI?
Are proprietary formats used to store and transfer data?	***Robotics***
Are the definitions of the original proprietary formats openly available?	Is there any possibility that using the robot could create safety risks for healt
Does the product have interfaces for other companies' services?	customers (e.g., forces that could be destructive or collision with people)?
Can the data contained in the product be exported in a commonly used or standard format?	How have those risks been avoided in the robot's design?
Does the product use data from other systems via interfaces?	What kind of arrangements are needed to teach or program the robot to operate?
If yes, can the data produced by others be separated in the system?	If the robot is battery-operated, what are the operating, idle, and charging times?
Does the product connect with health or wellness devices?	
If yes, is it compatible with ISO/IEEE 11073 Personal Health Data (PHD) Standards?	



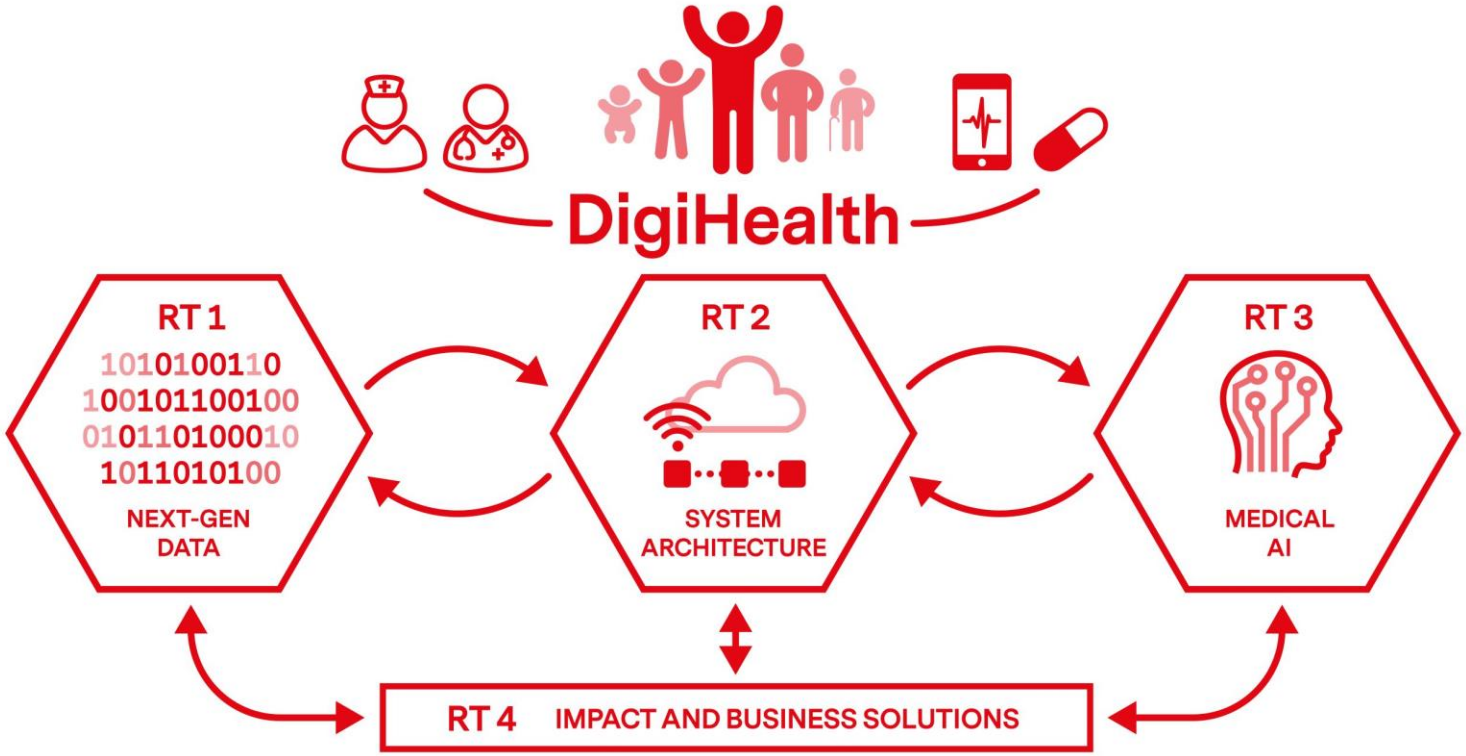
Haverinen, J., Keränen, N., Falkenbach, P., Maijala, A., Kolehmainen, T., & Reponen, J. (2019). Digi-HTA: Health technology assessment framework for digital healthcare services . Finnish Journal of EHealth and EWelfare, 11(4), 326–341. https://doi.org/10.23996/fjhw.82538

In this study, the state-of-the-art HTA methods were evaluated using a literature review and interviews. It was noted that some good practices already existed, but the overall picture showed that further development is still needed, especially in the AI and robotics fields. With the cooperation of professionals, key aspects and domains that should be taken into account to make fast but comprehensive assessments were identified. Based on this information, we created a new framework which supports the HTA process for digital healthcare services. The framework was named Digi-HTA.

Twitter: @reponenjarmo

Digitalized Solutions for Future Healthcare (DigiHealth)

Finnish Academy: University profiling
University of Oulu received 6.6 M€ for 2018-2022 and was ranked #3 among Finnish universities. DigiHealth was one of three main areas.



R1: Next-generation data for digital healthcare

R2: System level architectures for future digital healthcare

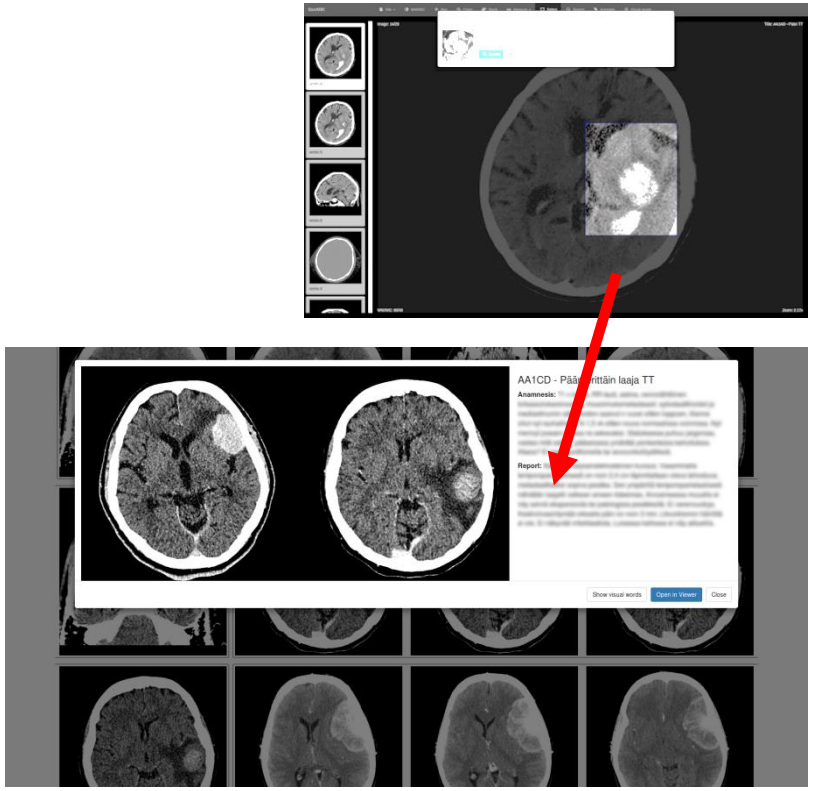
R3: Medical AI to support clinical decisions

R4: Impact and business solutions

https://www.oulu.fi/digihealth/

Artificial Intelligence research in Oulu:

CARDS: Decision Support for radiologists[1,2]



- **A helping tool, which is not making the diagnosis, but helps the radiologist by seeking similar cases from the existing hospital databases.**
- **Combines references from RIS text and PACS images.**
- **"Augmented Intelligence".**

1. Martynov P, Mitropolskii N, Kukkola K, Mutanen L, Reponen J, Mäkynen A (2016) **CARDS: the decision support tool for radiologists examining head CT images**. ECR 2016 / B-0233. DOI: 10.1594/ecr2016/B-0233.

2. BMC Medical Imaging (2017) 17:59 DOI 10.1186/s12880-017-0229-1

RESEARCH ARTICLE — Open Access

Testing of the assisting software for radiologists analysing head CT images: lessons learned

Petr Martynov[1*], Nikolai Mitropolskii[1], Katri Kukkola[1], Monika Gretsch[2], Vesa-Matti Koivisto[3], Ilkka Lindgren[2], Jani Saunavaara[4], Jarmo Reponen[5] and Anssi Mäkynen[1]


Education

Finland as a forerunner: Special ”eHealth” competence for medical doctors

- Finnish Medical Association has in 2012 established a “Special competence of healthcare information technology” for physicians. Finnish Dentists Association joined in 2015 and Finnish Veterinarians Association 2019.
- Finnish Society of Telemedicine and eHealth is in charge of its further development.
- Basicly it is a full two year study program after medical specialist exam.
- The program is targeted to medical/dental specialists, with already gained experience in medical/dental work.
- 125 doctors and dentists have enrolled to the programme, of which 72 doctors and 13 dentists have qualified (status 12/2018)
- Resposible teacher: Prof. Jarmo Reponen, Univ. of Oulu

Special competence in eHealth
2 years

Medical specialist (surgeon, radiologist, etc.

5 to 6 years
Must include administration

Medical doctor, licenced physician in Finland

Minimum 6 years of basic and practical studies

Capacity building: Digital skills for medical workforce:

- The University of Oulu started medical students´ education on eHealth and mHealth together with health companies since 2016, fifth edition in 2020.

- In 2019, the 4th edition of the eHealth Seminar gathered about 300 medical and nursing students and more than 30 digital health companies for a day full of practical testing of innovations that can improve future healthcare services.
- Hands-on sessions in small groups provided students with an opportunity to find out how they could use them in their own work with patients.

http://ouluhealth.fi/medical-students-hands-on-experience-of-digital-solutions-the-ehealth-seminar-in-oulu/

MEDigi

*4,3 M€
*3 years
*5 medical schools
*300 teachers

- **University of Oulu** coordinates the Finnish national **MEDigi** project that aims for harmonising and renewing medical and dental education in Finland by utilising **digitalization**.

- The objectives include:
  1) To specify core competencies in the medical fields
  2) To create an online service for the basic education,
  3) To produce electronic study material,
  4) To develop electronic exam and evaluation methods,
  5) To familiarize the students to **eHealth and mHealth**,
  6) To increase the digital pedagogy skills of teachers.

https://www.medigi.fi/en/home-page.html

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http://ouluhealth.fi/future-hospital/

https://oys2030.fi/english.php

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HIBA research group, Åbo Akademi:
https://blogs2.abo.fi/hiba/