

User experience evaluation tool and the results from the Finnish surveys

Johanna Viitanen

Assistant professor, D.Sc.(Tech)

Department of Computer Science, Aalto University, Finland



JOHANNA VIITANEN

(former Kaipio)
D.Sc.(Tech)



Current position

Assistant Professor, Department of Computer Science, Aalto University, Finland

Previous positions

2019 – 2022 Professor of Practice, Aalto University

2012 – 2019 Postdoctoral researcher, Aalto University

2017 – 2019 ICT specialist at Central Finland Health Care District, Jyväskylä, Finland

2015 – Adjunct assistant professor, School of Health Information Science, Victoria University, Canada

2013 – 2015 Usability specialist at Apotti programme, City of Helsinki, Finland

Degrees

2011, Doctor of Science (Tech.) (usability research),
Department of Computer Science, Aalto University

2009, Licentiate of Science (Tech), Helsinki University of
Technology

2005, Master of Science (Tech.), Helsinki University of
Technology

Department of Computer Science and Engineering

Usability in
Healthcare:
Overcoming the
Mismatch between
Information
Systems and Clinical
Work

Johanna Kaipio (nee Viitanen)



Research group:

HUMAN-CENTRED HEALTH INFORMATICS (HCHI)



Aalto University

Key research areas

- Human-computer interaction (HCI)
- Health informatics

Research themes

- **Usability** of health and social care IT systems
- **Human-centred design** of eHealth services
- **Patient experience**
- **Usability** in IT procurement

Department of Computer Science

Human-centred health informatics (HCHI)

The HCHI group brings together research enthusiasts from various fields such as engineering, design, medical, nursing and psychology.

Our research group focuses on

design of electronic health (eHealth) services

Electronic health record (EHR) systems

Systems of health and social care professionals

System procurement

Collaboration with healthcare providers, health IT companies and research groups in health informatics, health sciences and health management.

Future research include usability of client information systems, implementation and evaluation of EHRs as well as customisation of eHealth services for improved user experiences.

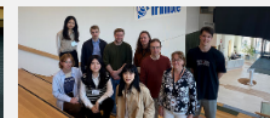


News



Researchers develop better treatment methods for kidney disease patients

HUS, Aalto University, the
19.6.2023 | News



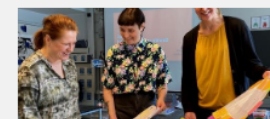
Usability is a critical factor in IT systems – Aalto students and companies collaborate for better digitalisation

19.6.2023 | News



Public defence in Usability Research, M.Sc. (Tech) Mari Tyllinen

Process for Usability Evaluation
18.8.2023 12:00–16:00 | Events



Empathy in design and digitalisation – Aalto University researchers hold workshops for students at Arabia Comprehensive

2.6.2023 | News



Service design contributes to ensuring the quality and suitability of digital services

Principal University Lecturer

21.3.2023 | News



A healthy dose of usability

Digital health services have emerged as cost-efficient options for healthcare, but better user

25.10.2022 | News

Human-Computer Interaction (HCI)



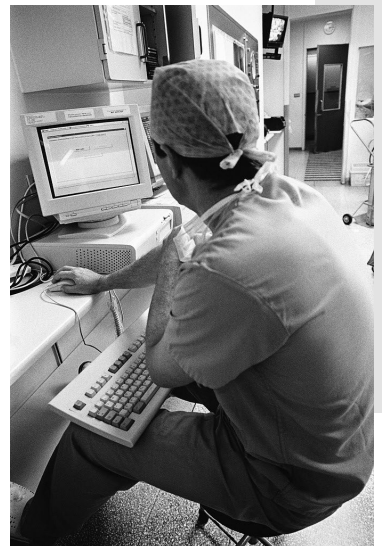
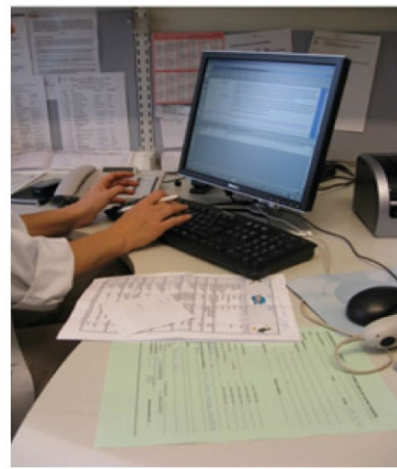
Usability
(ease of use)
Effective to use
Few errors
Learnability

User experience
Engagement
Motivating
Pleasure

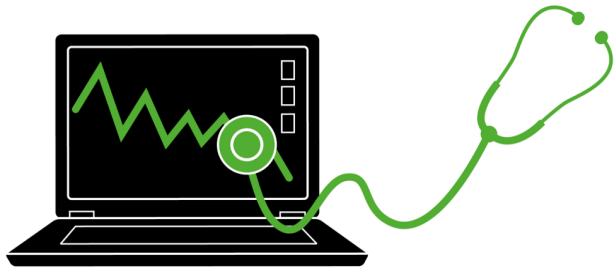


Usability of health information systems (HISs)

- The usability of HISs refers to the ability of the systems to have a positive impact on patient care by supporting physicians in achieving their goals with a pleasant user experience.
- The dimensions of HIS usability include:
 - compatibility between the systems and physicians' tasks
 - HIS support for information exchange, communication and collaboration in clinical work, and
 - interoperability and reliability.



National usability-focused surveys in Finland



Electronic Patient Record systems
as physician's tools in 2010

Survey for Physicians



2014*
N=3781

2017*
N=4018

2021*
N=4682

2025

- Individual email links for a web-based questionnaire
- All physicians <65 years of age and currently living in Finland
- Email addresses from the register of the Finnish Medical Association.

Nurses:
2017*, 2020*, 2023

Social welfare
professionals:
(2019), 2021*

*The studies were part of STePS project funded by National Institute for Health and Welfare, Finnish Ministry of Social Affairs and Health

National Usability-Focused HIS Scale (NuHISS)

Factors

- Ease-of-use
- Technical quality
- Benefits
- Feedback
- Cross-organizational collaboration
- Information quality
- Internal collaboration

Dimension (reliability 2014/2017) and short name	Item on the questionnaire (with 5-point Likert scale: 1=fully disagree, 5=fully agree)	Factor 2014/2017
Technical quality (alpha=.82/.80)		
Stability	The systems are stable in terms of technical functionality (does not crash, no downtime)	0.76/0.76
System errors	Faulty system function has caused or has nearly caused a serious adverse event for the patient	0.65/0.65
Reaction speed	The system responds quickly to inputs	0.77/0.77
Unexpected actions	In my view, the system frequently behaves in unexpected or strange ways	0.69/0.69
Missing info	Information entered/documented occasionally disappears from the IS	0.56/0.56
Information quality (alpha=.61/.62)		
Medic list quality	The patient's current medication list is presented in a clear format	0.45/0.45
Summary view	The EHR system generates a summary view (eg, on a timeline) that helps to develop an overall picture of the patient's health status	0.56/0.56
Order completion	The system monitors and notifies when the orders given to nurses have been completed	0.47/0.47
Patient-provided info	Measurement results provided electronically by the patient (eg, via patient portal) help to improve the quality of care	0.40/0.40
B2C collaboration	EHR systems support co-operation and communication between physicians and patients	0.54/0.54
Feedback (alpha=.88/.88)		
Suggestion implementation	The system supplier implements suggested corrections and amendments as wished	0.93/0.93
Vendor interest	The system supplier is interested in feedback from users	0.78/0.78
Implementation speed	Suggestions for corrections and amendments are implemented sufficiently quickly	0.83/0.83
Ease of use (alpha=.87/.86)		
Logic	The arrangement of fields and functions is logical on computer screen	0.75/0.75
Terminology	Terminology on the screen is clear and understandable (eg, titles and labels)	0.71/0.71
Documenting	Entering and documenting patient data is quick, easy and smooth	0.77/0.77
Operating info	The systems keep me clearly informed about what it is doing (eg, saving data)	0.69/0.69
Straightforward tasks	Routine tasks can be performed in a straight forward manner without the need for extra steps using the system	0.75/0.75
Needed patient data	It is easy to obtain necessary patient information using the EHR system	0.68/0.68
Nursing record	The information on the nursing record is in easily readable format	0.59/0.59
Benefits (alpha=.85/.81)		
Care quality	ISs help to improve quality of care	0.83/0.83
Care continuity	ISs help to ensure continuity of care	0.74/0.74
Guideline adherence	ISs support compliance and adherence with the treatment recommendations	0.70/0.70
Medication errors	ISs help in preventing errors and mistakes associated with medications	0.60/0.60
Duplicate tests	ISs help to avoid duplicate tests and examinations	0.62/0.62
Care needs and impacts	The EHR system provides me with information about the need for and effectiveness	0.72/0.72

JOURNAL OF MEDICAL INTERNET RESEARCH

Original Paper

Developing the National Usability-Focused Health Information System Scale for Physicians: Validation Study

Hyppönen et al

Hannele Hyppönen¹, PhD; Johanna Kaipio², PhD; Tarja Heponiemi¹, PhD; Tinja Lääveri^{3,4}, MD; Anna-Mari Aalto¹, PhD; Jukka Vänskä⁵, MSocSci; Marko Elovainio¹, PhD

¹National Institute for Health and Welfare, Helsinki, Finland

²Aalto University, Espoo, Finland

³Helsinki University Hospital, Helsinki, Finland

⁴University of Helsinki, Helsinki, Finland

⁵Finnish Medical Association, Helsinki, Finland

Results (1/4)

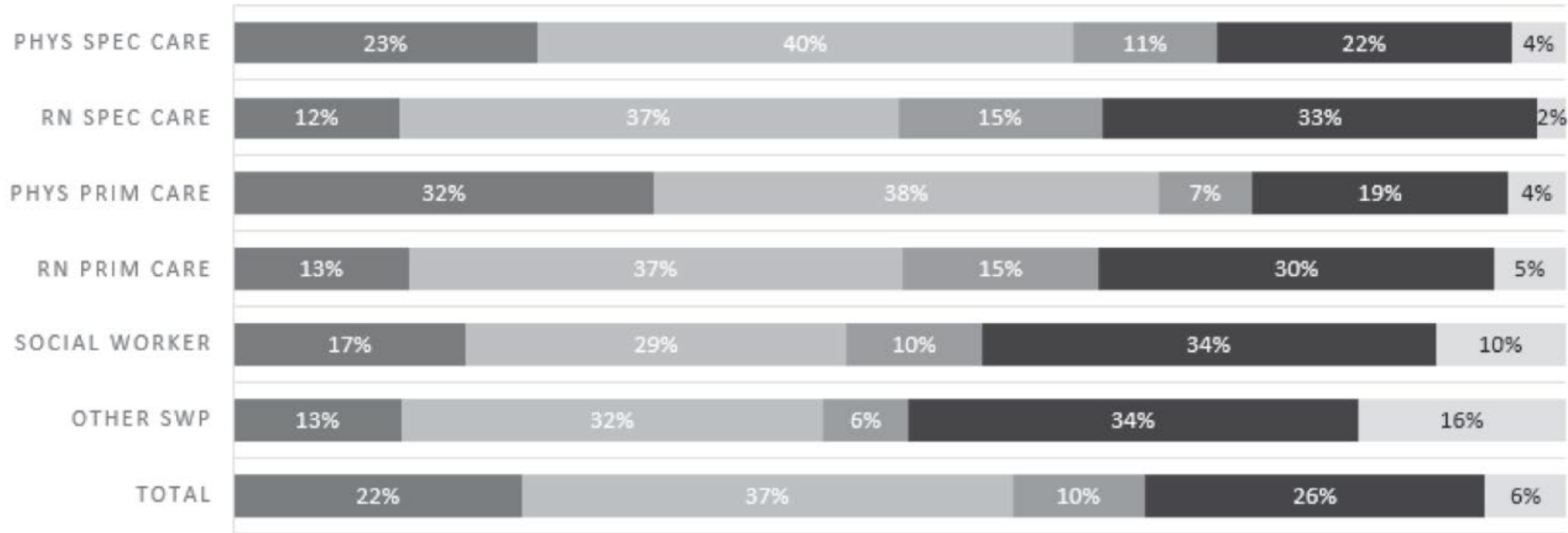
Finnish physicians' perceptions of EHR usability 2010-2011 (public sector)

		2010	2014	2017	2021
Q1. The system responds quickly to inputs.					
Hospital ^{a,b,c,d,f}	Agree (%)	36.9	28.7	36.3	53.4
	Disagree (%)	45.7	56.2	49.9	34.3
Health centre ^{a,b,e,f}	Agree (%)	47.4	35.0	33.2	47.8
	Disagree (%)	36.8	51.4	53.7	40.8
Q2. Faulty system function has caused or has nearly caused a serious adverse event for the patient.					
Hospital ^{a,b,c,d,e,f}	Agree (%)	42.6	41.6	37.2	42.3
	Disagree (%)	30.6	36.8	41.4	40.4
Health centre ^{a,c}	Agree (%)	28.4	30.8	36.6	28.0
	Disagree (%)	42.7	44.4	43.6	51.4
Q3. The arrangement of the fields and functions is logical on the computer screen.					
Hospital ^{a,b,c}	Agree (%)	36.5	43.7	48.5	39.4
	Disagree (%)	44.4	42.2	38.1	53.3
Health centre ^{a,b,e,f}	Agree (%)	44.1	40.4	40.5	52.6
	Disagree (%)	38.5	47.0	47.9	36.5
Q4. Terminology on the screen is clear and understandable (for example, titles and labels).					
Hospital ^{a,b,c}	Agree (%)	39.9	39.9	41.7	40.4
	Disagree (%)	39.8	42.9	41.1	51.9
Health centre ^{a,b,e,f}	Agree (%)	54.1	44.8	43.0	58.0
	Disagree (%)	27.3	39.5	41.5	30.1
Q5. Routine tasks can be performed in a straightforward manner without the need for extra steps.					
Hospital	Agree (%)	28.1	28.2	30.3	33.7
	Disagree (%)	57.0	61.3	60.1	59.7
Health centre ^{a,b,e,f}	Agree (%)	36.6	26.0	24.2	39.2
	Disagree (%)	50.3	63.6	68.1	49.9
Q6. Information systems help in preventing errors and mistakes associated with medication.					
Hospital ^{a,b,c,e,f}	Agree (%)	19.1	37.7	37.7	32.5
	Disagree (%)	60.3	43.7	45.1	50.0
Health centre	Agree (%)	45.7	51.4	49.4	44.9
	Disagree (%)	36.7	34.3	38.1	39.0

p<0.05 between years: ^a2017–21; ^b2014–21; ^c2010–21; ^d2014–17; ^e2010–17; ^f2010–14

Physicians vs Nurses vs Social welfare professionals

ROUTINE TASKS CAN BE PERFORMED IN A STRAIGHT FORWARD MANNER WITHOUT THE NEED FOR EXTRA STEPS USING THE SYSTEM



PHYS SPEC CARE = Physician specialized care, RN SPEC CARE = Registered nurse specialized care, PHYS PRIM CARE = Physician primary care, RN PRIM CARE = Registered nurse primary care, OTHER SWP = Other social welfare professional

Fully Disagree
 Somewhat disagree
 Neither agree nor disagree
 Somewhat agree
 Fully agree

Results (3/4): Comparison between Australia and Finland

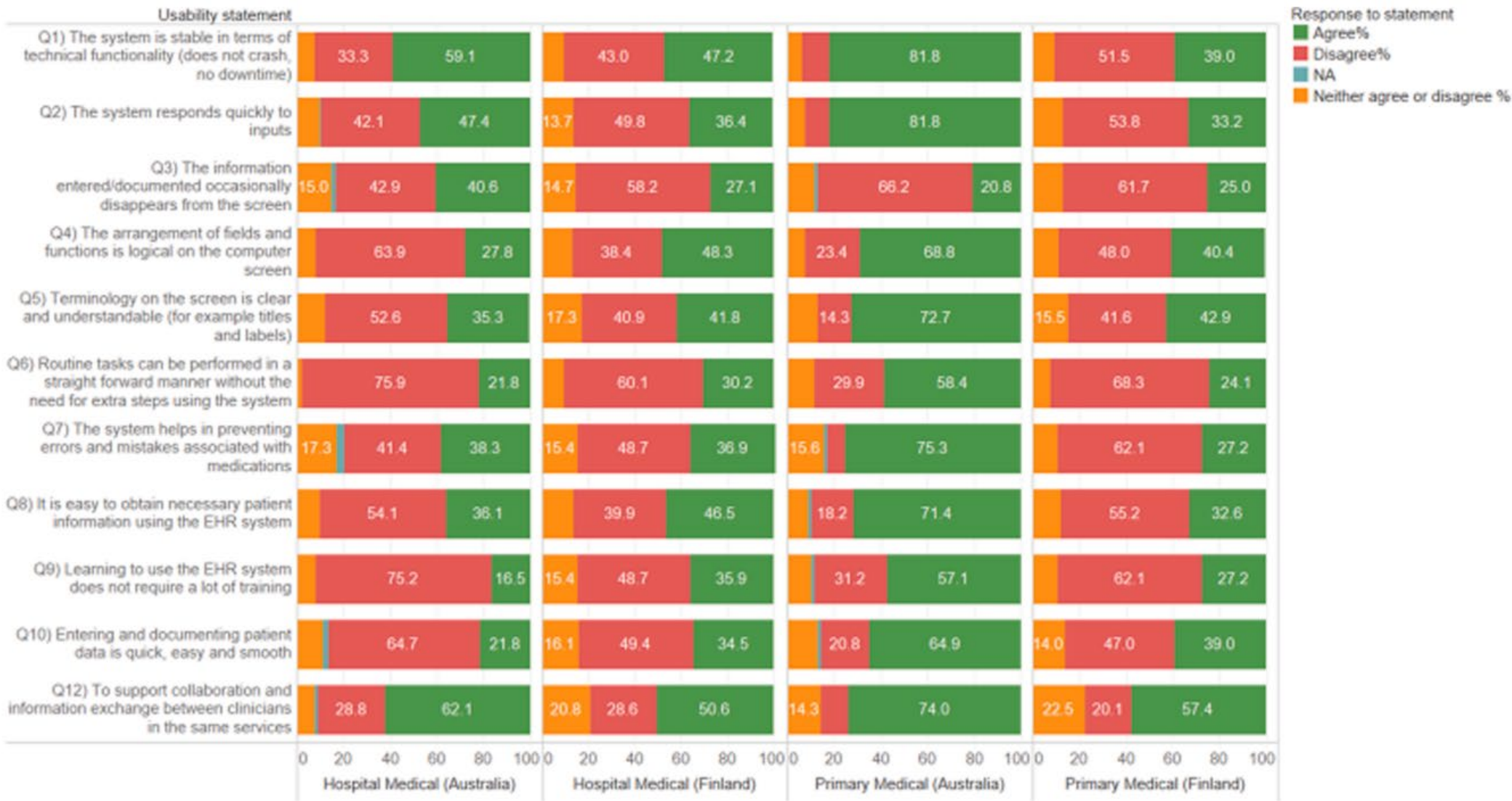


Fig. 3. Medical hospital and primary/community care sectors: Australia and Finland.

Results (4/4): End-user participation in health information systems (HIS) development: Physicians' and nurses' favorable ways of participation

	< 35 yrs		35 - 44 yrs		45 - 54 yrs		55 - 64 yrs	
	N	%	N	%	N	%	N	%
A. I'd be interested in showing software developers how I work and describing my software related needs.	404	41.8	443	43.2	492	37.0	398	33.6
B. I'd be interested in participating in a development work group made up of system end users.	200	20.7	239	23.3	275	20.7	191	16.1
C. I'd be interested in providing suggestions and feedback about how the software can be designed and changed to the vendor on a website.	201	20.8	185	18.0	224	16.8	150	12.7
D. I'd be interested in providing suggestions and feedback about how the software can be designed and changed to the vendor via email.	298	30.8	293	28.6	368	27.6	253	21.4
E. I'd be interested in telling the physician in charge of information systems development for the organization about usage-related problems.	547	56.6	548	53.5	719	54.0	593	50.1
F. I am not interested in	139	14.4	153	14.9	204	15.3	276	23.3

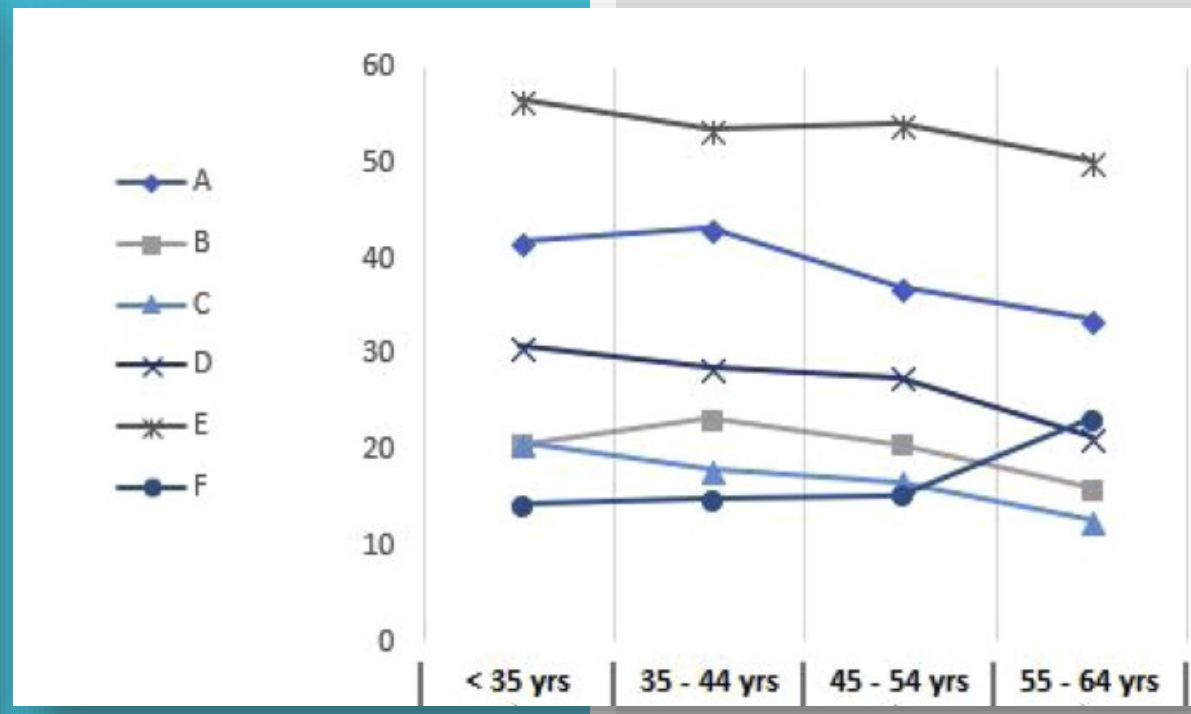


Fig. 6. The impact of age on favorable ways to participate among physicians and nurses, sorted by age group.

Martikainen, S., Kaipio, J., Lääveri, T. (2020) End-user participation in health information systems (HIS) development: Physicians' and nurses' experiences. International Journal of Medical Informatics, 137, 104117. <https://doi.org/10.1016/j.ijmedinf.2020.104117>

NuHISS related surveys in other Nordic countries

Denmark

- Themes: Clinicians' use and experience with use of HIS
- In all five regions
- Every year from 2010 to 2018
- Respondents: Physicians, nurses and medical secretaries
- Surveys distributed by the professional unions
- In 2022 the NuHISS framework was used in two of the Danish regions (for monitoring the management of the implementation of a new EHR system)

Iceland

- Themes: Usability and UX
- National surveys
- In 2014 and 2019
- Respondents: Physicians, nurses and physicians' aids
- Conducted by the Directorate of Health

Norway

Surveys 2015-2018:

- Themes: Professionals' experiences on usability, functionality, and satisfaction of HIS
- Participants: Physicians and nurses

Survey in 2021

- Themes: NuHISS and Work related Quality of Life (WrQOL)
- All professions in hospitals

Since 2018, studies have been part of Norwegian Centre for E-health Research's National Implementation-research Network eHealth (NINE).

Conclusions (1/2)

Nordic collaboration

- Common indicators of usability and UX are needed to gather comparable data from the countries
- Research-based monitoring of HIS development across Nordic countries
- Evidence on eHealth development to policy makers

Nordic eHealth Research Network (NeRN)

Duration:

15.2.2012 –

Unit at THL:

Health and Social Care
Systems Department

On other websites:

The Nordic eHealth Research Network (NeRN) was set on 15.02.2012 by the Nordic Council of Ministers (NCM) as a subgroup for NCM eHealth group. The NeRN group work is supported by a 2-yearly mandate from the NCM eHealth group. See “Organization and network participants” for the core network and ways to participate in the work.

[Nordic Council of Ministers](#)

[Organization and network participants](#)

Aims and Results of the Network

The group searches and develops common Nordic indicators for eHealth functionalities and services. Furthermore it tests them to produce Nordic eHealth benchmark data for use by national and international policy makers and scientific communities to support development of Nordic welfare.

Conclusions (2/2)

HIS in Finland

- The Finnish national studies have reported overall dissatisfaction with the use of HIS among physicians and other professional groups → **efforts are needed to improve usability and user experiences!!**
- The Finnish eHealth strategy from 2015 listed a national-level eHealth usability survey as one strategic means to reach the strategy objectives:

Strategic objectives by 2020

Professionals in social welfare and health care have access to information systems that support their work and its operating processes.

The usability of systems and tools is improved and the decision support and process management provide

better support for professionals in their work, which contributes to the quality and effectiveness of the work as well as the experience of the professionals regarding the meaningfulness of their work.

→ Important to **continue systematic research-based monitoring the HIS development** from the end-users' perspective

References

- ISO - International Organization for Standardization. (2019). ISO 9241-210 Ergonomics of human-system interaction -- Part 210: Human-centred design for interactive systems.
- Viitanen, J., Hyppönen, H., Lääveri, T., Vänskä, J., Reponen, J., Winblad, I. (2011) National Questionnaire Study on Clinical ICT Systems Proofs: Physicians Suffer from Poor Usability. *International Journal of Medical Informatics* 80(10), 708-725. DOI: <https://doi.org/10.1016/j.ijmedinf.2011.06.010>
- Hyppönen, H., Kaipio, J., Heponiemi, T., Lääveri, T., Aalto, A.M., Vänskä, J., Elovainio, M. (2019) Developing the National Usability-Focused Health Information System Scale for Physicians: Validation Study. *Journal of medical Internet research*, 21(5), p.e12875.
- Martikainen, S., Kaipio, J., Lääveri, T. (2020) End-user participation in health information systems (HIS) development: Physicians' and nurses' experiences. *International Journal of Medical Informatics*, 137, 104117. <https://doi.org/10.1016/j.ijmedinf.2020.104117>
- Lloyd, S., Long, K., Alvandi, A.O., Di Donato, J., Probst, Y., Roach, J. and Bain, C. (2021) A National Survey of EMR Usability: comparisons between medical and nursing professions in the hospital and primary care sectors in Australia and Finland. *International Journal of Medical Informatics*, 154, p.104535.
- Viitanen, J., Tyllinen, M., Tynkkynen, E., Lääveri, T. (2022) Usability of information systems: Experiences of outpatient physicians, outpatient nurses, and open care social welfare professionals from three large cross-sectional surveys in Finland. *International Journal of Medical Informatics* Vol 165, 104836, ISSN 1386-5056. <https://doi.org/10.1016/j.ijmedinf.2022.104836>
- Lääveri, T., Viitanen, J. (2023) Physicians' Perspectives on EHR Usability: Results from Four Large Cross-Sectional Surveys from 2010-2021. In *Context Sensitive Health Informatics and the Pandemic Boost* (pp. 16-20). IOS Press. <https://ebooks.iospress.nl/doi/10.3233/SHTI230360>

Thank you!

Johanna Viitanen



*Assistant Professor, D.Sc. (Tech)
Department of Computer Science,
Aalto University, Finland*

johanna.viitanen@aalto.fi

+358 505936822

Human-Centred Health Informatics (HCHI) research group
www.aalto.fi/en/departement-of-computer-science/hchi

