Effects-Driven Participatory Design and Evaluation

Supporting Local Infrastructuring

- Seminar in Oslo, May 2018: Heavy-weight and Light-weight healthcare technologies
- Magunn Aanestad: “Innovasjon kommer ikke “ovenfra” – Utvikling skjer i reelle brukssituasjoner, design over lang tid” (Aanestad et al., 2017)
- My message to you today:
  - Clinicians are challenged by new large-scale healthcare IT
  - The work to make the healthcare IT work is ignored or heavily under-estimated
  - Strategies to do exist: *Participatory Design approaches*
  - Much more focus and resources *supporting local infrastructuring* is needed

Jesper Simonsen
Professor of Participatory Design
Dept. of People and Technology
Roskilde University
jespersimonsen.dk
simonsen@ruc.dk

Technology and the healthcare sector

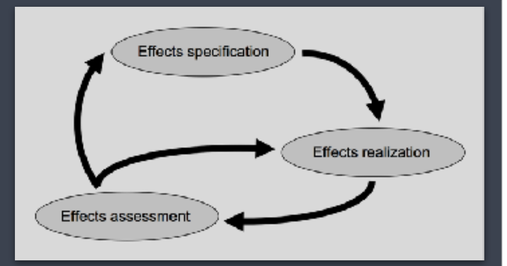
- Increasing specialization + patients flow across departments
  => increasing need for coordination
- Require reducing the complexity in articulation work
  (Schmidt and Bannon, 1992: Taking CSCW Seriously: Supporting Articulation Work)
- Information technologies in the healthcare sector:
  - Increasingly interconnected (across space & ‘disciplines’) – Information Infrastructures
  - Increasingly embracing core clinical activities
  - Increasingly configurable - though not always treated as such
  - Introduced top-down with embedded clinical process standards
  - Assumed to work “by itself” – ignoring long-term organizational implementation and follow-up: *Local Infrastructuring*

Local infrastructuring – challenges

Early Warning Score (EWS) - systematisk observation og risikovurdering af indlagte patienter samt dertil hørende handlingsalgoritme			
Udgiver	Region Hovedstaden		
Dokumenttype	SP Sundhedsplatform	Version	10
Forfattere	Harmonseringsgruppe i Region Hovedstaden og Region Sjælland	Gældende fra	07-09-2016
Fagligt ansvarlig	Regional kvalitetschef i Region Hovedstaden og Region Sjælland	Næste revision	18-03-2018

- Standard EWS algorithm (workflow & decision support) does not align with local reality (over-sensitive)
- Lack of local knowledge of how to modify EWS; not prioritized when busy; resistance to take responsibility for modification; experience of false safety.

Strategies to local infrastructuring



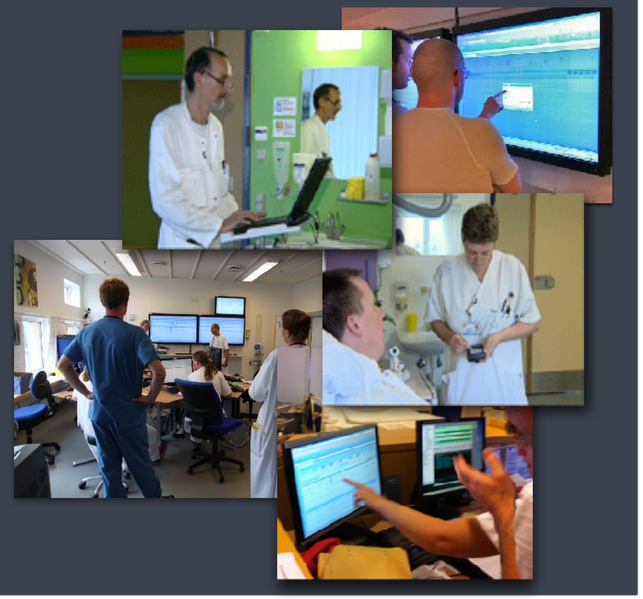
Participatory design approaches

- Local development, configuration and adaption of technologies through iterative experimentation and learning

Effects-Driven Participatory Design and evaluation

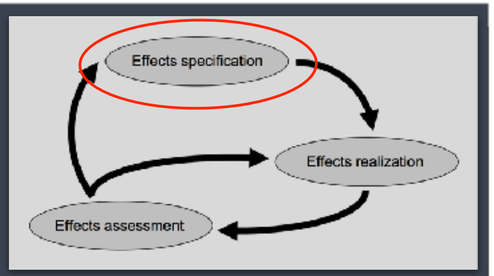
- Developed through action research projects since 2004
- IT development, configuration, pilot implementation, and local infrastructuring
- Effects are *specified locally* by clinicians — can be related to hierarchies
- Effects are *realized* through local experiments and interventions
- Effects are *assessed* from available data (formative vs. summative)

(Hertzum and Simonsen, 2011; Simonsen, Hertzum and Scheuer, 2018)



Effects specification hierarchies

Means/end	Fasting	Interruptions	Warm hands
National level (Environment: Political demands, organizational culture, national standards, legislation, etc.)	Porter's Trippel aim Value = outcomes / cost per patient	Porter's Trippel aim Value = outcomes / cost per patient	Centralized healthcare with higher specialization. More 'warm hands'
Regional level (Business strategy: Relation/ function/response to environment)	Patient-experienced *value* (less thirst) Fewer complications Shorter recovery time	Decreasing *costs* through more effective interdepartmental work flows	Optimized patient flow and logistics in and between wards
Clinical process (Business processes: Recurrent, familiar input-output relationships)	Pre-medication Pre-operative care Operation	Pre-operative care Operation Post-operative care	Improved resource coordination and prioritizing related to patient flow
Clinical activity (Work Process: Critical with regard to IT support)	Coordination regarding the patient to be operated	Communication and coordination without interrupting phone calls	Improved overview of incoming and current patients
Technology support (IT requirements: Functions, information, categories, computations, GUI, etc.)	Sharing data between emergency- anesthesia- and operation departments	Interdepartmental coordination of operations mainly through e-whiteboards	List of all incoming and current patients, resource allocation, plan, status, etc.



Given (stable) national-regional quality goals

Global goals (top-down standardization)

Local (agile) quality goals obtained by infrastructuring interventions & experiments

Local goals (bottom-up standardization)

Hierarchy inspired by Cognitive Systems Engineering (Rasmussen et al.,1994); Cognitive Work Analysis (Vicente, 1999); and bythe strategic analysis phase from the participatory design 'MUST' method (Bødker at al., 2004; 2008)

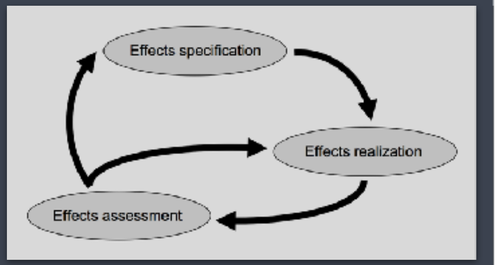
Global and local goals/standards can co-exist

(Simonsen, Hertzum and Scheuer, 2018)

Characteristic	Accreditation with PDCA phases	Effects-driven Participatory Design and Evaluation
Aim and concern	• National quality goals achieved through evidence-based or 'best practice' process standardisation	• Local quality goals achieved through realising effects aligned with national quality goals
Strategy	• Behaviour control • Standardisation of processes by indicators of the plan-do-check-act (PDCA) phases • Documenting and complying with standardised processes • Top-down control approach by external auditors	• Outcome control • Standardisation of output by specifying, realising and assessing effects • Local experimentation to realise effects • Bottom-up participatory learning approach by local clinicians
Gets people to act (Weick 2000)	• By directing attention toward documenting and learning the accreditation standards and by auditor visits every third year	• Through involving people in specifying and prioritising measurable, wished-for effects on an on-going basis
Gives people a direction (through values or whatever) (Weick 2000)	• People should learn and comply with the standards.	• People should systematically pursue the wished-for effects.
Supplies legitimate explanations that are energising and enable actions to become 'routine' (Weick 2000)	• Legitimate explanations from the 'outside' • approval/accreditation to enable actions to become routine	• Effects specified from the 'inside' • legitimate explanations that have the potential to become routine.
Skill acquisition	• Novices, advanced beginners and competent clinicians	• Novices, advanced beginners, competent, proficient and expert clinicians
Challenge	• To implement general standards in specific and concrete work contexts • Lack of motivation and engagement from local clinicians	• To generalise and distribute local processes that succeed in obtaining wished-for effects • Lack of top management attention and resource allocation
Meeting point	• Global aims, goals and standard clinical guidelines that need to be obtained/implemented locally	• Local experimentation to obtain effects as a strategy to align global aims, goals and standard clinical guidelines

Local infrastructuring

A definition for the healthcare sector

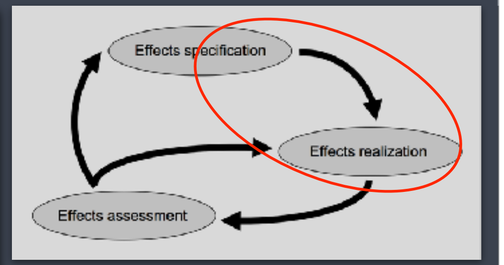


The activities taking place, when cross-departmental and heterogeneous groups of clinicians strive to facilitate their collaboration by configuring, reconfiguring, developing, and establishing local guidelines and standards for effectively using the available technologies and information systems as part of their joint collaborative practice

(Simonsen, Hertzum and Karasti, 2015)

Local infrastructuring

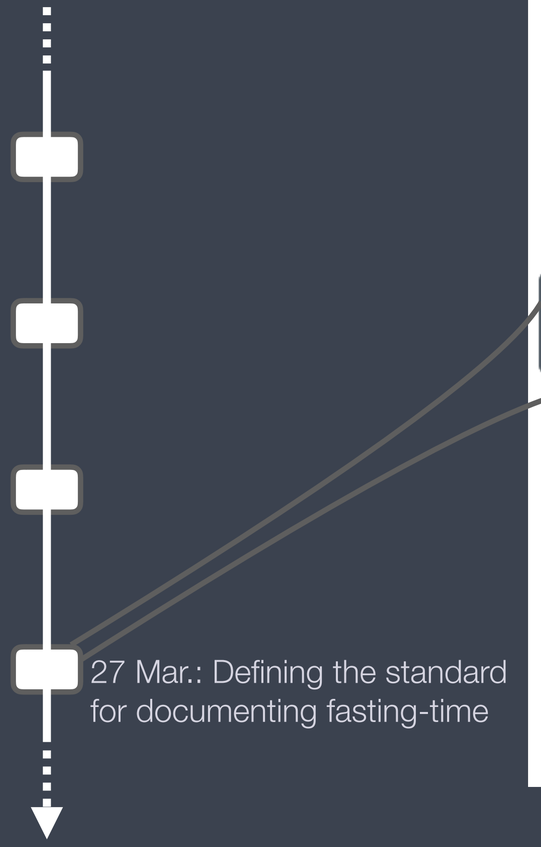
The fasting case



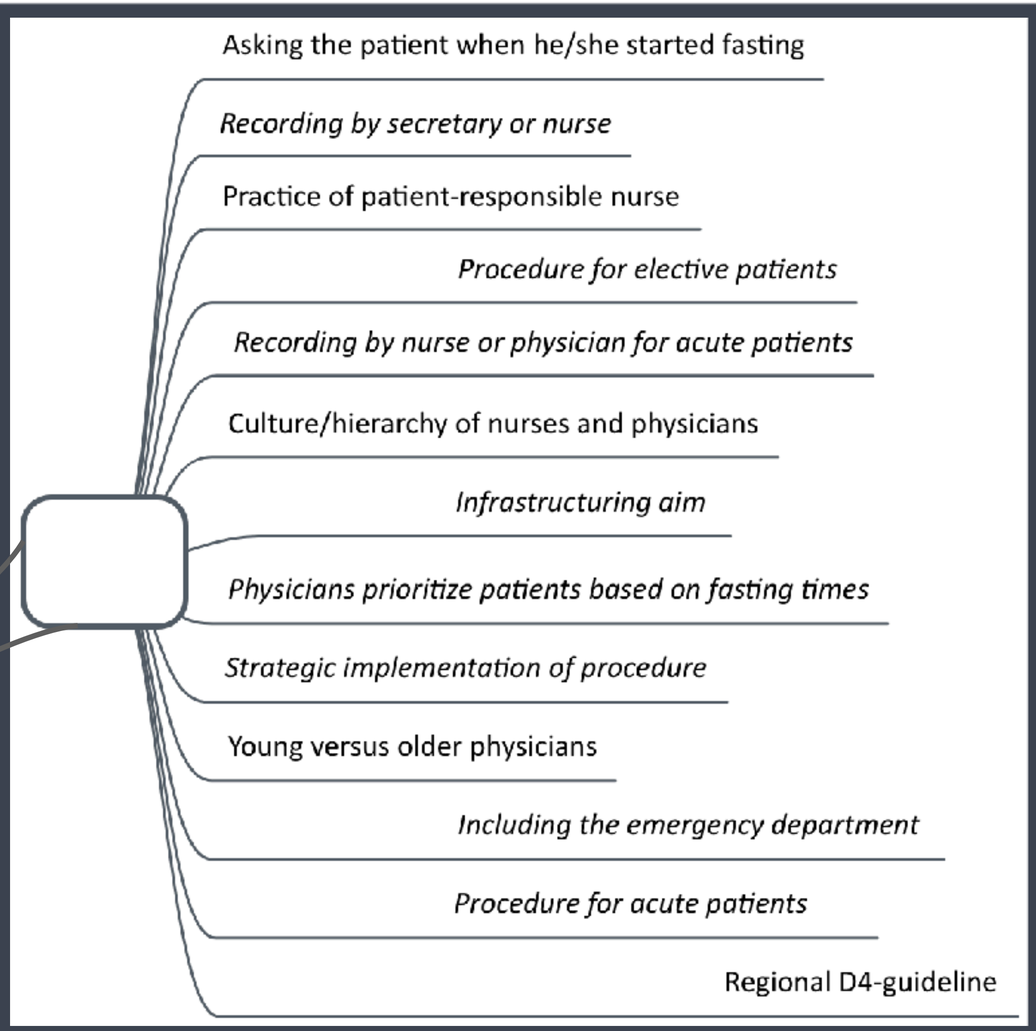
- 20 Feb.: Clarifying the concept of fasting-time and when fasting begins
- 06 Mar.: Defining fasting time and when fasting begins
- 17 Mar.: Configuring e-whiteboard fasting-time columns
- 27 Mar.: Defining the standard for documenting fasting-time

Local infrastructuring

Issues traced during the March 27 meeting



27 Mar.: Defining the standard for documenting fasting-time

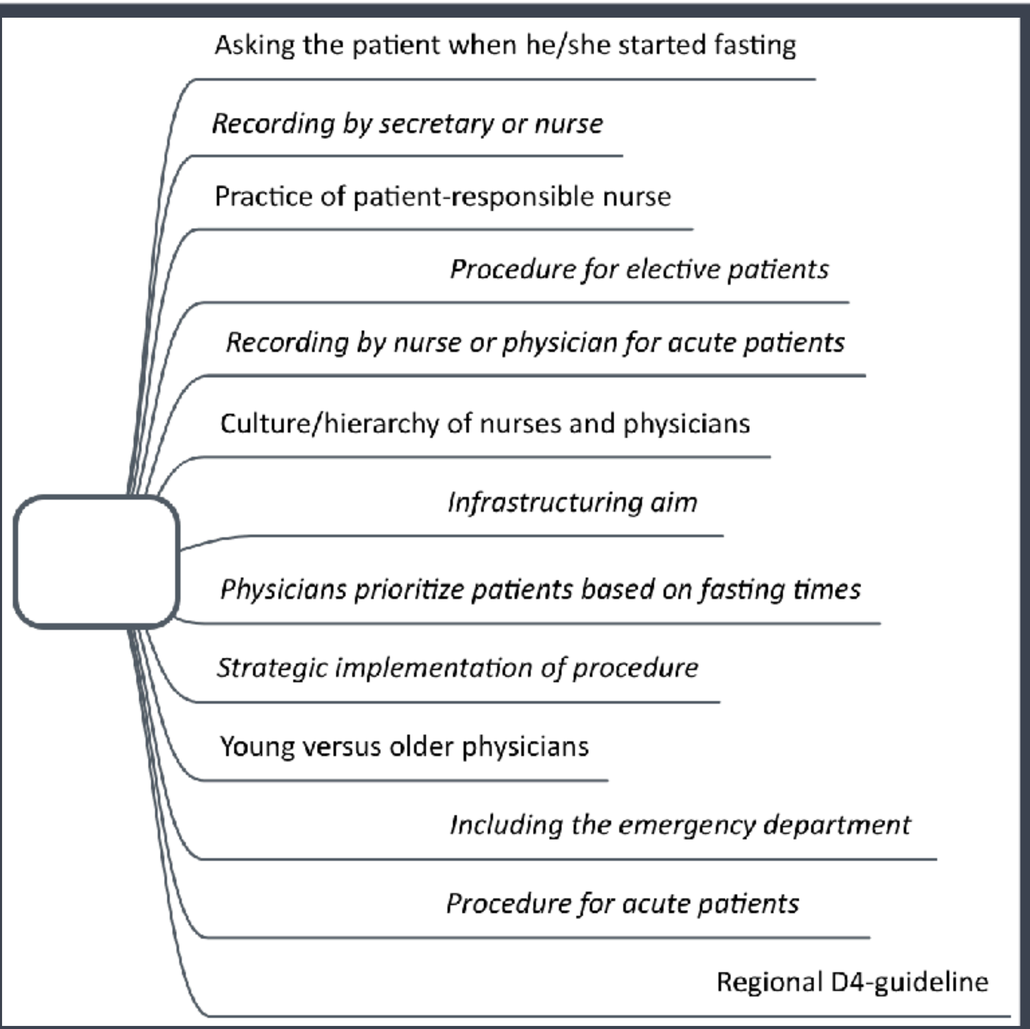


(Simonsen, Karasti and Hertzum, forthcoming)

Local infrastructuring

Characteristics and learning points

- Socio-technical dialogue
- Foregrounds a web of relations that varies in reach or scope (Star and Ruhleder,1996; Bowker and Star, 1999; Karasti 2014)
- Presuppose local knowledge
- Alternate between analysis (of current as-is) and *design (of future to-be)*
- Develops local procedures and guidelines that might evolve to global standards
- Requires specific competencies

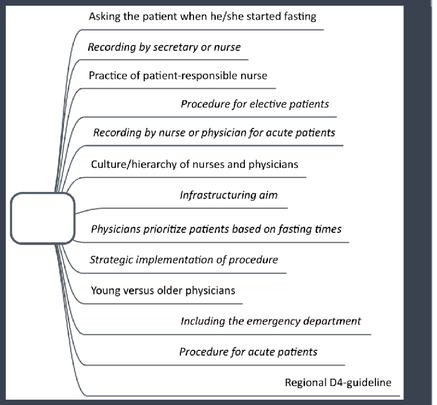


(Simonsen, Karasti and Hertzum, forthcoming)

Local infrastructuring

Characteristics and learning points

- Socio-technical dialogue
- Foregrounds a web of relations that varies in reach or scope (Star and Ruhleder,1996; Bowker and Star, 1999; Karasti 2014)
- Presuppose local knowledge
- Alternate between analysis (of current as-is) and *design (of future to-be)*
- Develops local procedures and guidelines that might evolve to global standards
- Requires specific competencies



Competence types identified through a GT analysis based on from 433 codes derived from 17 infrastructuring meetings, in total 36 hours

(Hertzum and Simonsen, forthcoming)

1. **Managing the project**: the shaping, maneuvering, and steering of the individual project activities and of the project at large.
2. **Understanding practice**: the analysis and grappling with the particulars of local practices to connect them to project activities and goals.
3. **Understanding technology**: knowledge about how others have configured the technology and knowhow about how to configure it.
4. **Preparing change**: the envisioning, modeling, and detailing of the pursued change and of the means necessary to make it happen.
5. **Making change**: the implementation of the change by informing local actors and motivating them to adjust their practices.
6. **Assessing change**: the appraisal of the new situation and reflections on what has, and has not, been accomplished.
7. **Personal traits**: the personal impact that follows from being able to talk knowledgeably and convincingly about how the change will improve local matters.

Participatory evaluation and learning

Fasting and interruptions cases

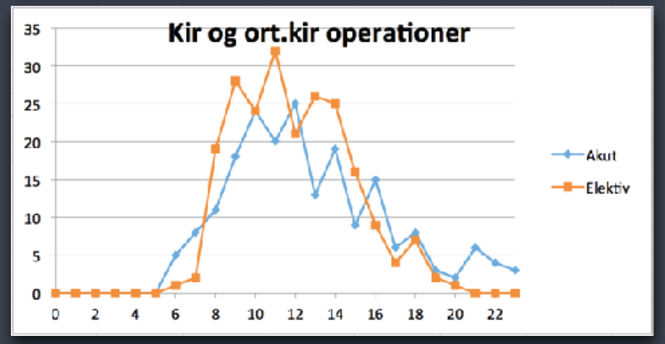
(Brandrup et al. 2017; Brandrup 2018)

Kirurgiske operationer (OP A)
Periode: 11.05 - 14.08, 2015

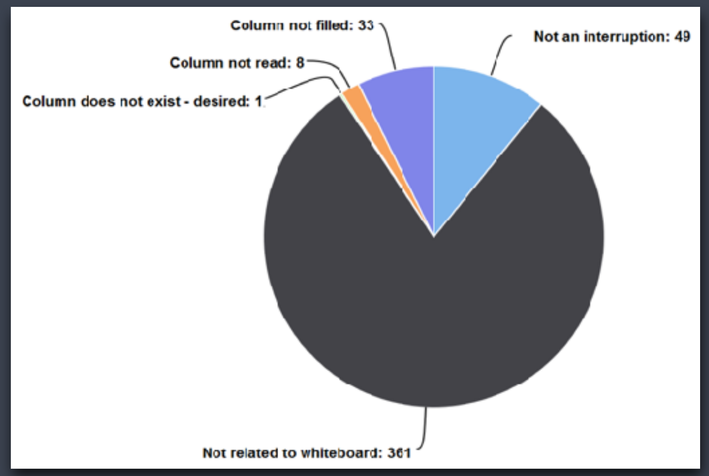
		Fastetid (timer)	Fastetid registreret		Antal operationer
Akut		**13,34**	**57**	**17%**	**345**
	Alder<70	13,49	35	15%	228
	Alder>=70	13,10	22	19%	117
Elektiv		**11,67**	**132**	**43%**	**305**
	Alder<70	11,77	103	44%	235
	Alder>=70	11,31	29	41%	70
Total		**12,17**	**189**	**29%**	**650**

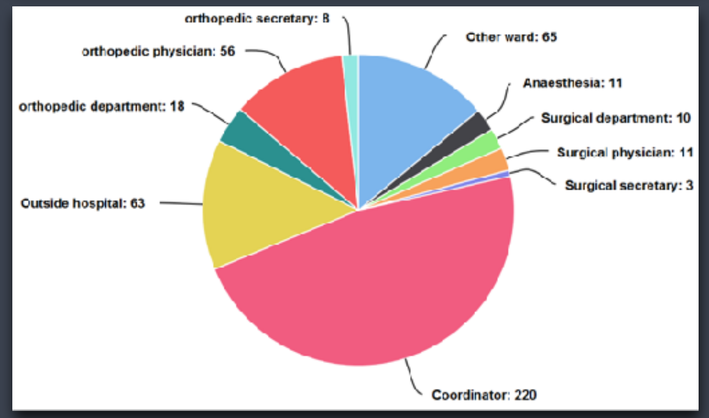
Ortopædkirurgiske operationer (OP D)
Periode: 11.05 - 14.08, 2015

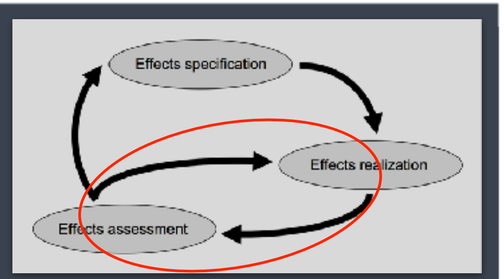
		Fastetid (timer)	Fastetid registreret		Antal operationer
Akut		**13,13**	**143**	**33%**	**434**
	Alder<70	12,73	72	29%	245
	Alder>=70	13,54	71	38%	189
Elektiv		**13,68**	**84**	**56%**	**149**
	Alder<70	13,53	36	49%	74
	Alder>=70	13,79	48	64%	75
Total		**13,34**	**227**	**39%**	**583**

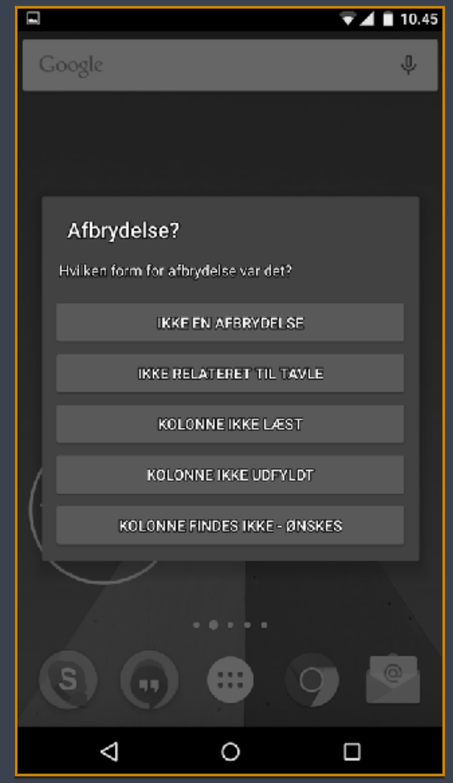


	Faste (timer)	Antal
Elektiv		**216**
	0	0
	1	0
	2	0
	3	0
	4	0
	5	0
	6	0
%	7	2
9	8	19
13	9	28
11	10	24
15	11	32
10	12	21
12	13	26
12	14	25
7	15	16
4	16	9
	17	4
	18	7
	19	2
	20	1
	21	0
	22	0
	23	0





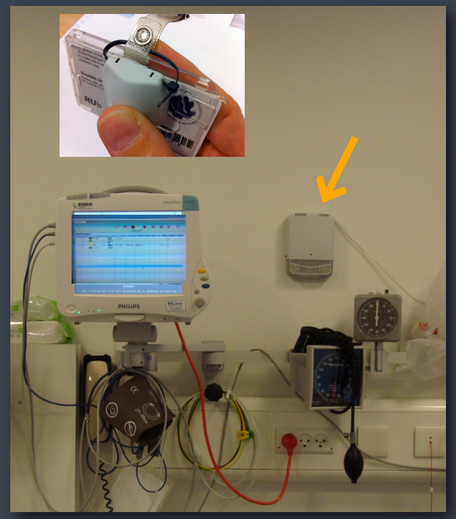


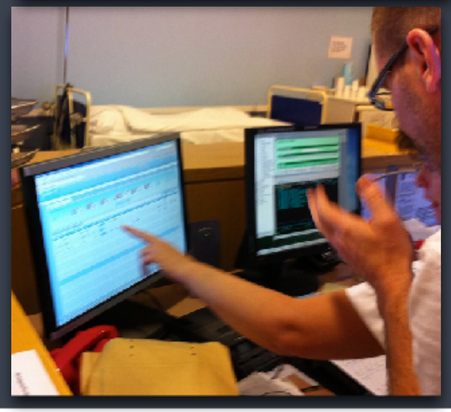


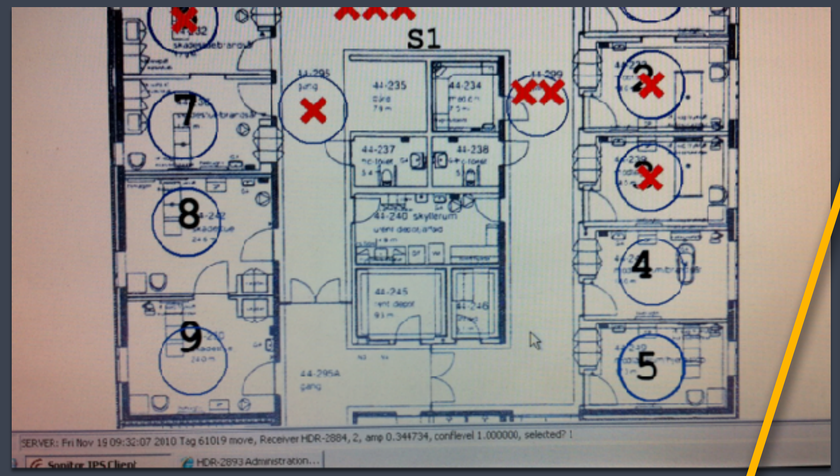
Participatory evaluation and learning

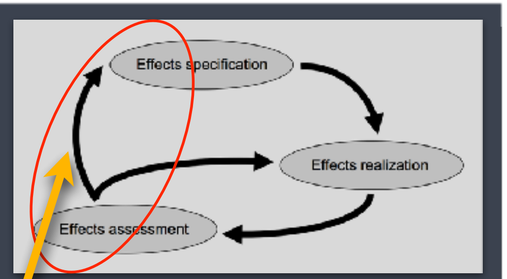
Warm hands case (Hertzum and Simonsen, 2013; 2016)

Warm hands
Centralized healthcare with higher specialization. More 'warm hands'
Optimized patient flow and logistics in and between wards
Improved resource coordination and prioritizing related to patient flow
Improved overview of incoming and current patients
List of all incoming and current patients, resource allocation, plan, status, etc.









More 'Warm Hands': 44 min/nurse/shift

$N = 663$ shifts		Physicians			Nurses	
		Before	After		Before	After
Patient room		19	20	***	17	28
Coord. Center	**	52	59	**	55	44
Other	***	29	20		27	28

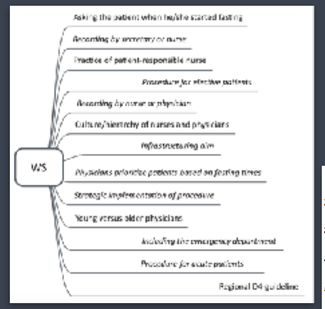
Concluding remarks

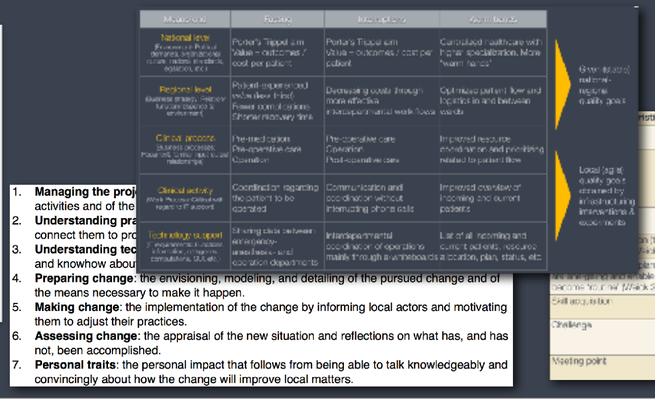
"Innovasjon kommer ikke "ovenfra" – Utvikling skjer i reelle brukssituasjoner, design over lang tid" (Margunn Aanestad)

- Clinicians are challenged by new large-scale healthcare IT
- The work to make the healthcare IT work is ignored or heavily under-estimated
- Strategies to do exist: *Participatory Design approaches*
- Much more focus and resources *supporting local infrastructuring* is needed

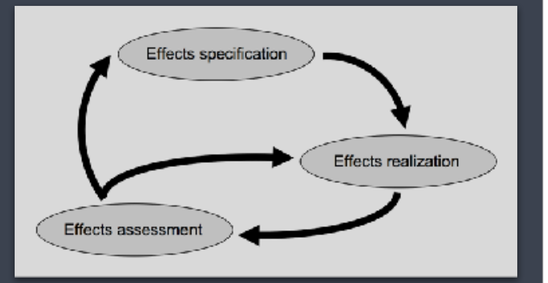
Innovation from 'below' - through Effects-Driven Participatory Design and Evaluation

- Takes time & local knowledge
- Requires specific competencies
- Can be aligned and co-exist with global goals and standards





1. **Managing the proj** activities and of the
2. **Understanding pra** connect them to pro
3. **Understanding tec** and knowhow abou
4. **Preparing change**: the envisioning, modeling, and detailing of the pursued change and of the means necessary to make it happen.
5. **Making change**: the implementation of the change by informing local actors and motivating them to adjust their practices.
6. **Assessing change**: the appraisal of the new situation and reflections on what has, and has not, been accomplished.
7. **Personal traits**: the personal impact that follows from being able to talk knowledgeably and convincingly about how the change will improve local matters.



	Accreditation with PDCA phases	Effects-driven Participatory Design and Evaluation
	• National quality goals achieved through evidence-based or 'best practice' process standardisation	• Local quality goals achieved through realising effects aligned with national quality goals
	• Behaviour control • Standardisation of processes by indicators of the plan-do-check-act ("PDCA") phases • Documenting and complying with standardised processes • Top-down control approach by external auditors	• Outcome control • Standardisation of output by specifying, realising and assessing effects • Local experimentation to realise effects • Bottom-up participatory learning approach by local clinicians
	• By directing attention toward documenting and learning the accreditation standards and by auditor visits every third year	• Through involving people in specifying and monitoring measurable, wished-for effects on an on-going basis
	• People should learn and comply with the standards	• People should systematically pursue the wished-for effects
	• Legitimate explanations from the 'outside' • Approval/acceptation to enable actions to become routine	• Effects specified from the 'inside' • legitimate explanations that have the potential to become routine
Skill acquisition	• Novices, advanced beginners and competent clinicians	• Novices, advanced beginners, competent, proficient and expert clinicians
Challenge	• To implement general standards in specific and everyday work contexts • Lack of motivation and engagement from local clinicians	• To generalise and distribute local processes that succeed in obtaining wished-for effects • Lack of top management attention and resource allocation
Meeting point	• Global aims, goals and standard clinical guidelines that need to be obtained/implemented locally	• Local experimentation to obtain effects as a strategy to align global aims, goals and standard clinical guidelines

References

- Aanestad, M, A. M. Driveklepp, H. Sørli, & M. Hertzum. (2017). Participatory Continuing Design: “Living with” Videoconferencing in Rehabilitation. In Kanstrup, A.M., A. Bygholm, P. Bertelsen, & C. Nøhr (Eds.), Participatory Design & Health Information Technology (pp. 45-59). Amsterdam, The Netherlands: IOS Press.
- Bowker, G. C., & S. L. Star. (1999). *Sorting Things Out. Classification and its Consequenses*. Cambridge, Massachusetts: MIT Press.
- Brandrup, M, K.L. Østergaard, M. Hertzum, H. Karasti and J. Simonsen (2017): “Effects-Driven Participatory Design: Sampling Insights about Interruptions”, in A.M. Kanstrup, A. Bygholm, P. Bertelsen and C Nøhr (Eds.): Participatory Design & Health Information Technology, OIS Press.
- Brandrup, M. (2018). *Designing an Evaluation Infrastructure for Effects-driven Healthcare IT Development*. Ph.D.-thesis, Department of People and Technology, Roskilde University, Roskilde, Denmark.
- Bødker, K., F. Kensing, & J. Simonsen. (2004). Participatory IT Design. Designing for Business and Workplace Realities. Cambridge, Massachusetts: MIT Press.
- Bødker, K., F. Kensing, & J. Simonsen. (2008). Professionel IT-forundersøgelse - grundlag for brugerdrevet innovation (2 udg.). Samfundslitteratur.
- Hertzum, M., and J. Simonsen (2011): ”Effects-Driven IT Development: Specifying and Measuring Usage Effects”, *Scandinavian Journal of Information Systems*, Vol. 23 , No. 1, pp. 1-26.
- Hertzum, M., and J. Simonsen (2013): ”Work-Practice Changes Associated with an Electronic Emergency-Department Whiteboard,” *Health Informatics Journal*, Vol. 19, No. 1, pp. 46-60.
- Hertzum, M., and J. Simonsen (2016): ”Effects of electronic emergency-department whiteboards on clinicians' time distribution and mental workload,” *Health Informatics Journal*, Vol. 22, No. 1, pp. 3-20.
- Hertzum, M. and J. Simonsen (forthcoming): *Configuring Information Systems and Work Practices for Each Other: What Competences Are Needed Locally?*
- Karasti, H. (2014). “Infrastructuring in Participatory Design” *Proceedings from PDC ‘14: Proceedings of the 13th Participatory Design Conference: Research Papers - Volume 1, New York, USA*, ACM Press, 141-150.
- Rasmussen, J., A. M. Pejtersen, & L. P. Goodstein. (1994). *Cognitive Systems Engineering*. John Wiley and Sons, Inc.
- Schmidt, K., & L. Bannon. (1992). “Taking CSCW Seriously: Supporting Articulation Work” *Computer Supported Cooperative Work (CSCW): An International Journal*, 1(1-2), 7-40.
- Simonsen, J., M. Hertzum, H. Karasti (2015): “Supporting Clinicians in Infrastructuring,” in Enrico Maria Piras and Gunnar Ellingsen (Eds.): *Proceedings of the Fifth International Workshop on Infrastructures for Healthcare (IHC): Patient-centred Care and Patient generated Data*, 18-19 June, 2015, University of Trento, Trento, Italy.PDC’2012
- Simonsen, Hertzum, and Scheuer (2018): “Quality Development in Health Care: Participation vs. Accreditation” *Nordic Journal of Working Life Studies*, Vol. 8, No. S3, April 2018.
- Simonsen, J., H. Karasti, and M. Hertzum (forthcoming): *Infrastructuring and Participatory Design*.
- Vicente, K. J. (1999). *Cognitive Work Analysis: Towards Safe, Productive, and Healthy Computer-based Work*. London: Lawrence Erlbaum Associates.