

Simulations for Design and Usability Testing at Norwegian Centre for EHR

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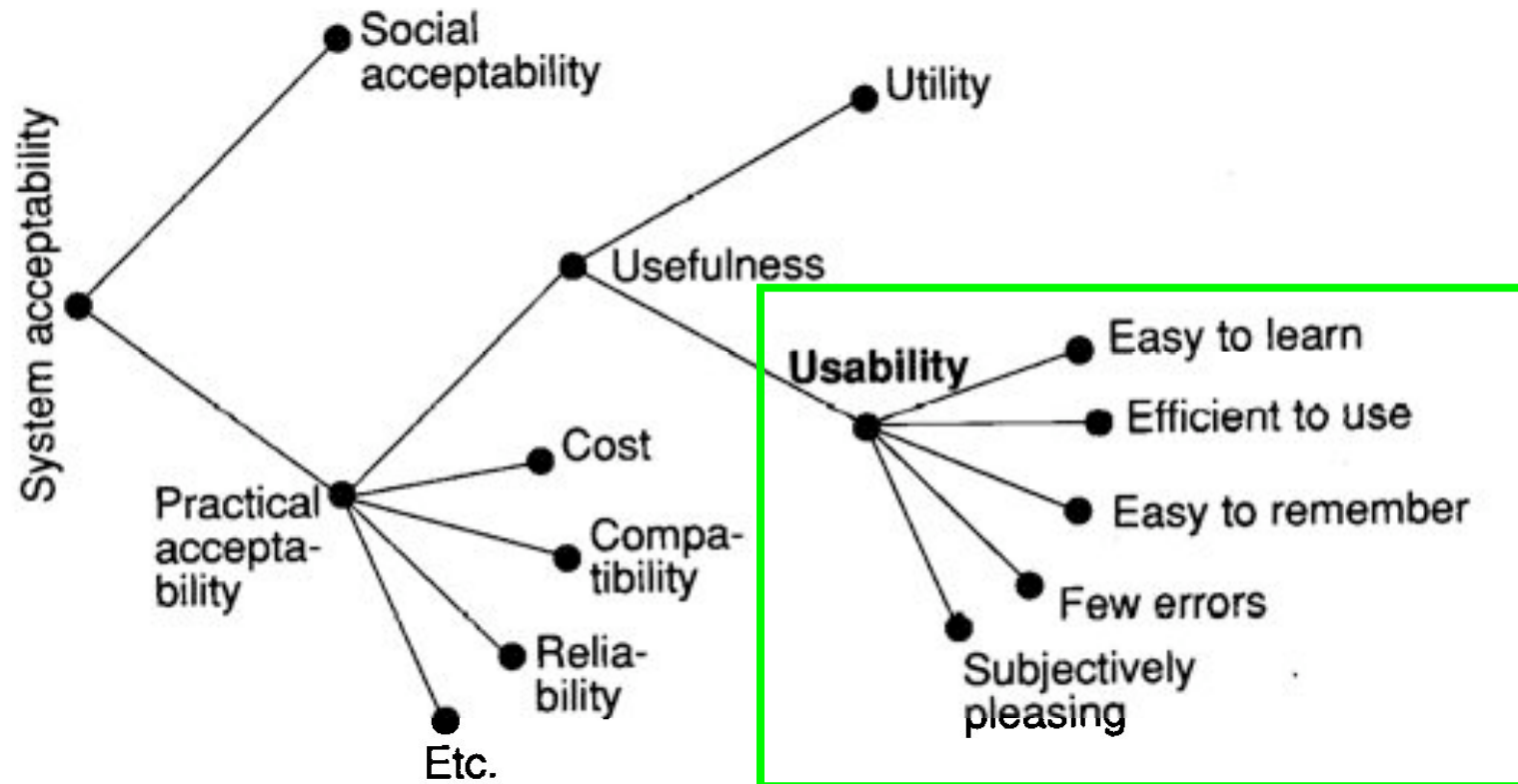
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What is usability?

Jacob Nielsen 1993:



Usability defined

- What was wrong with Nielsen's definition?
 - It is context free
- ISO 9241-11 (1998) defines usability:
 - *The effectiveness, efficiency, and satisfaction with which specified users achieve specified goals in particular environments*".

Usability defined

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- *efficiency, and*
- *satisfaction*

with which

- *specified users achieve*
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Usability defined

ISO 9241-11 (1998) defines usability:

"The

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Dependent variables

with which

- *specified users achieve*
- *specified goals in*
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What should be measured?

- **Effectiveness**

- *Task completion*
- Are the users able to perform the intended tasks on the computer?

- **Efficiency**

- *Completion time*
- How much time is needed on the computer to get the tasks done?

- **Satisfaction**

- *Subjective assessment of the “user experience”*
- How is the system assessed and described by the users?

Usability defined

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Context of use

Evaluation example: Eating utensil

- Problem: Assess the usability of these three product



Three products in three contexts of use



A usability matrix

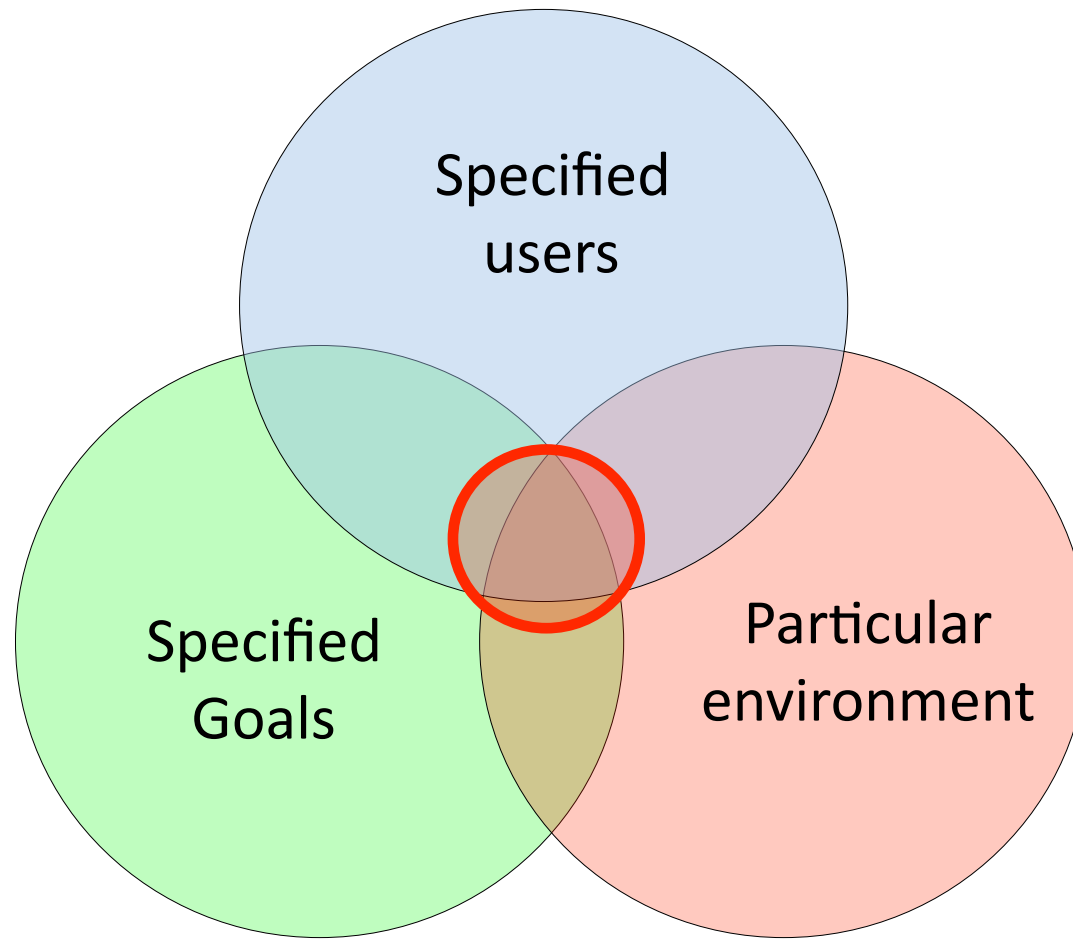


OK	+/-	X
+/-	OK	X
X	+/-	OK

Usability vs. other properties

- Usability is not an objectively measurable property of a system or object.
 - Only meaningful if we know the answers to the three questions:
 - Who are the users?
 - What do they intend to use the product for?
 - Where and in what social context do they intend to use it?
- Usability is context dependant.

"Context of use"



Consequences for Health ICT

Who, what, where:

– Who are the users?

- Access to real users. Doctors, nurses, patients, administrators, visitors

– What are the tasks?

- Detailed understanding of medical work. Cognitive, workflow, roles,,,

– Where

- Physical and social context of use. Other people. Paper. Other systems,,,

Traditional usability tests

- A “desktop” usability test is a simulation of an office.



From usability test of
“Xerox Star” 1979.

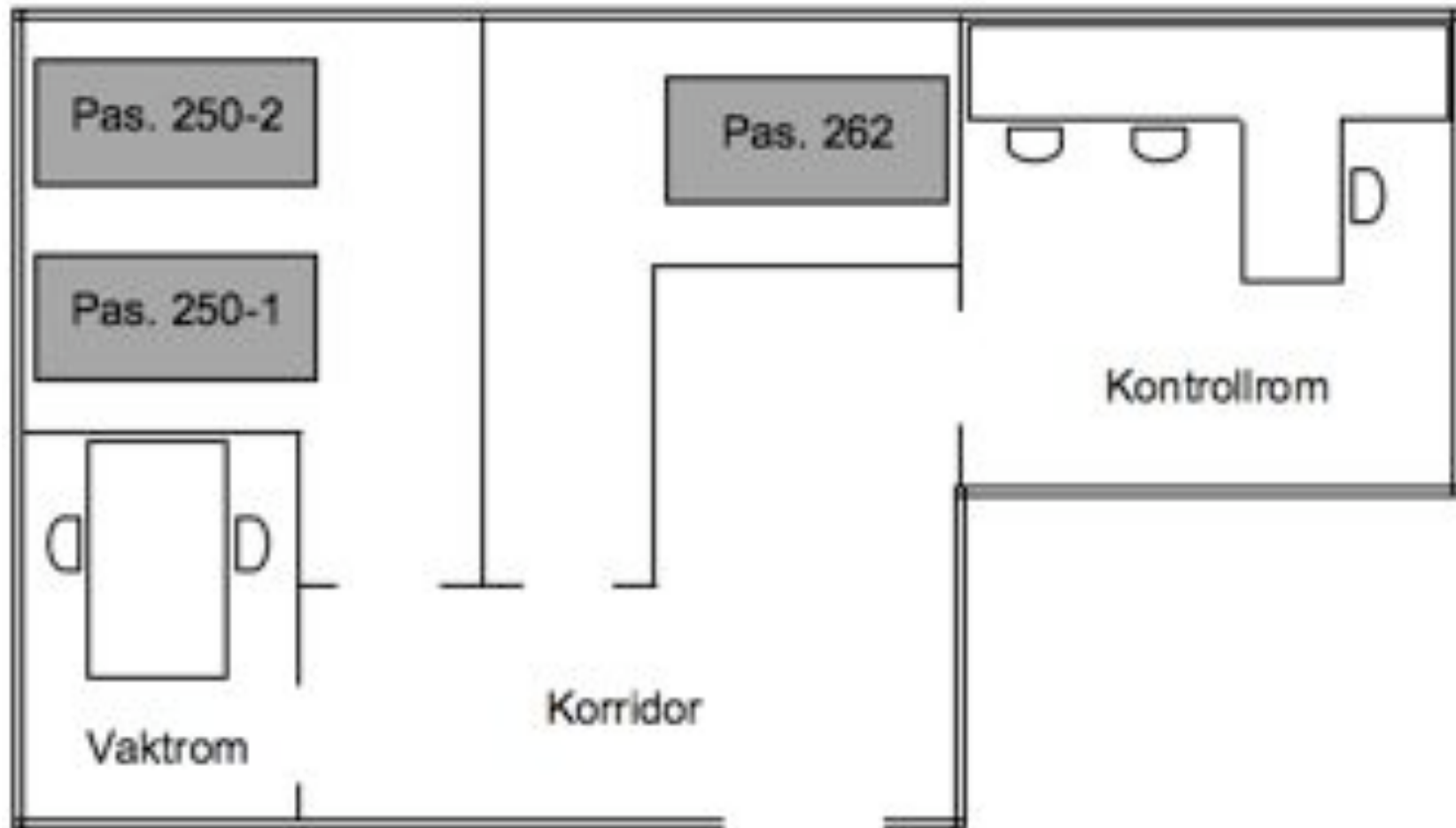


Medical work

National health informatics research center (NSEP) in Trondheim, Norway

- National research center established in Trondheim in 2004. Funded by the Norwegian Research Council.
- Focus on system integration, user involvement, field studies of EMR use, and mobile EMR.
- Includes a usability lab for testing both desktop and mobile EMR systems.

Usability lab with mobile walls



Movable walls



Control room



The lab in use



Cameras

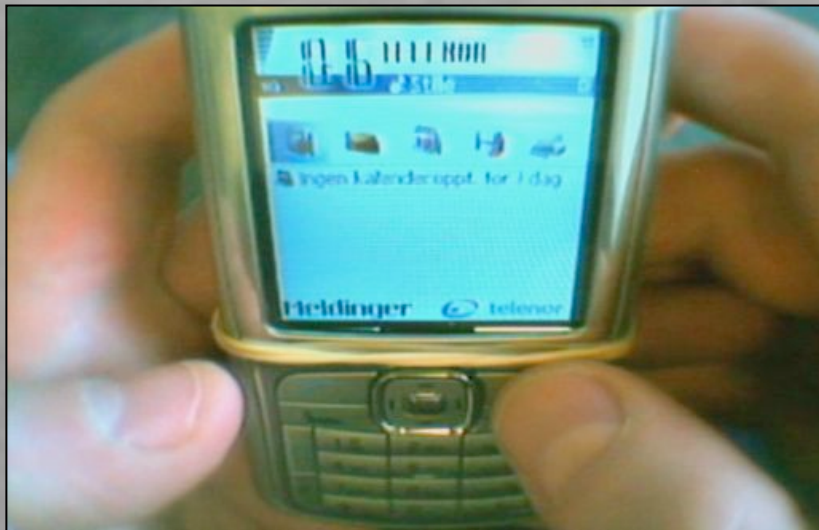


Health workers in a simulated ward



Recording and analysis (Noldus++)

Mobile usability



Equipment



Cameras



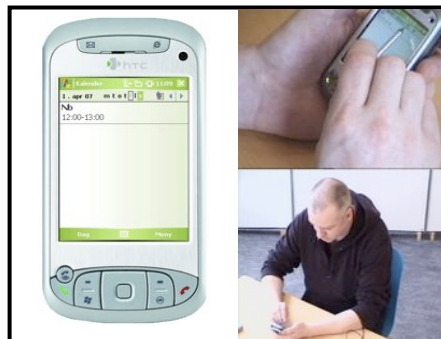
Wireless microphones



Wireless cameras



Microphones



WLAN/IP “Mirroring” of
PDA and PC content



“Mirroring” with KVMs

Cameras

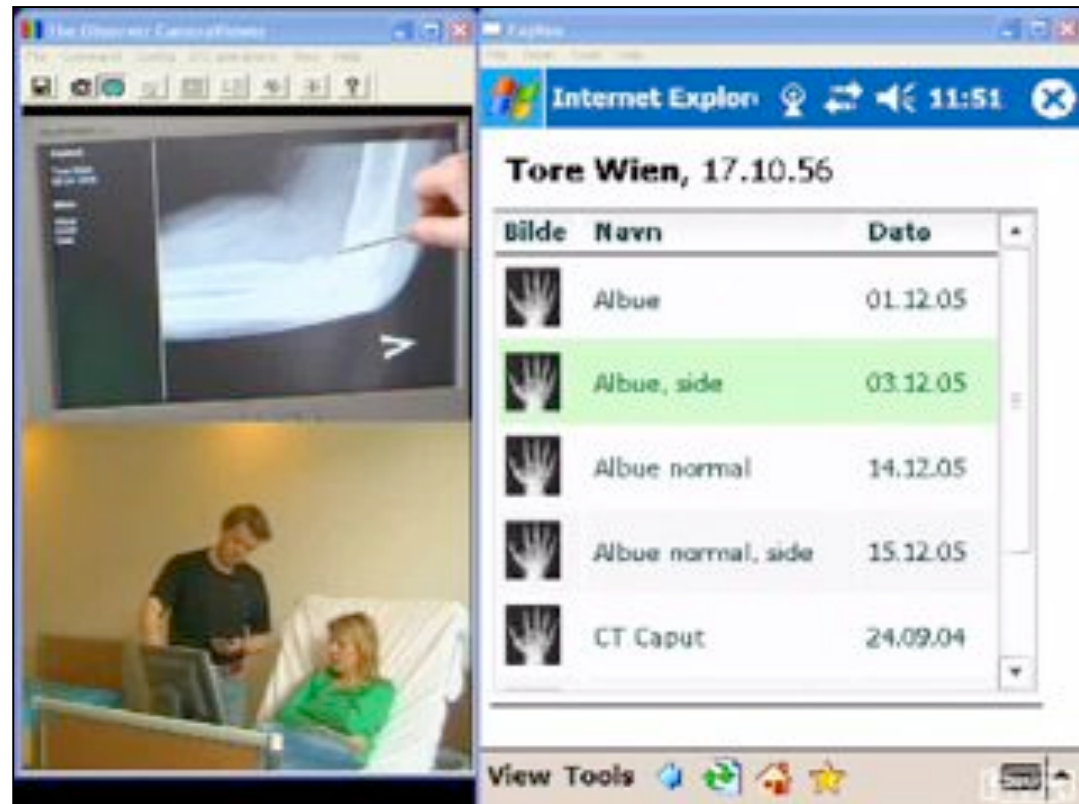


Bringing in the developers



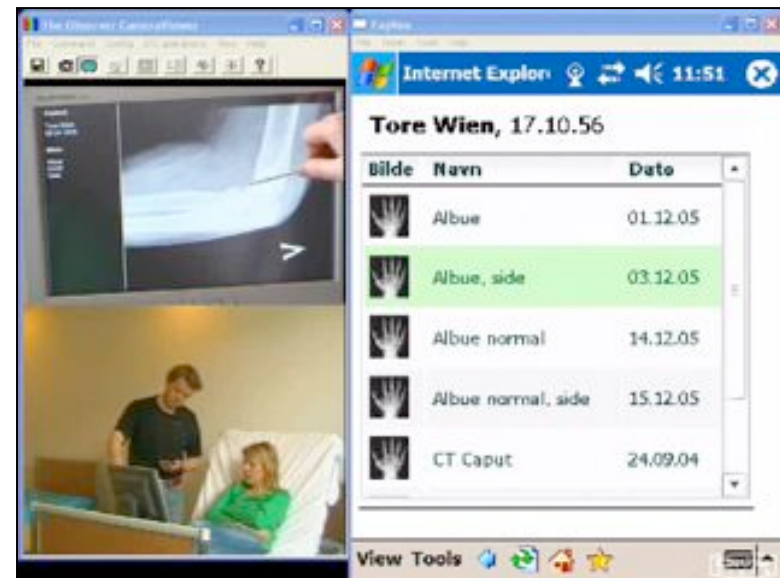
Getting the environment right

- The use of PDAs to control patient terminals
- 8 different user interfaces
- Scenario: Pre-surgery patient visit
- Environment: By patient bed



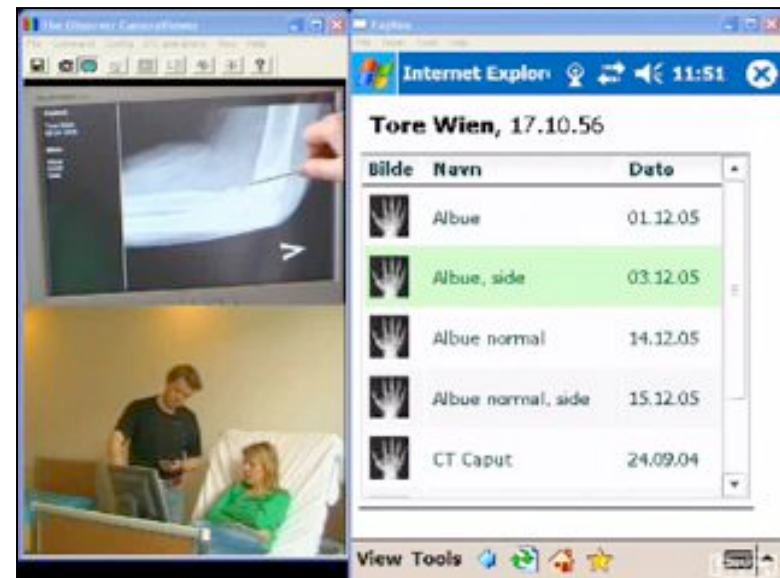
Factors affecting the usability

- GUI-design of screen
- GUI-design of PDA
- Shared screen
- Information hiding
- One hand, two hands
- Level of disruption to physician-patient eye contact.



Factors affecting the usability (ranking)

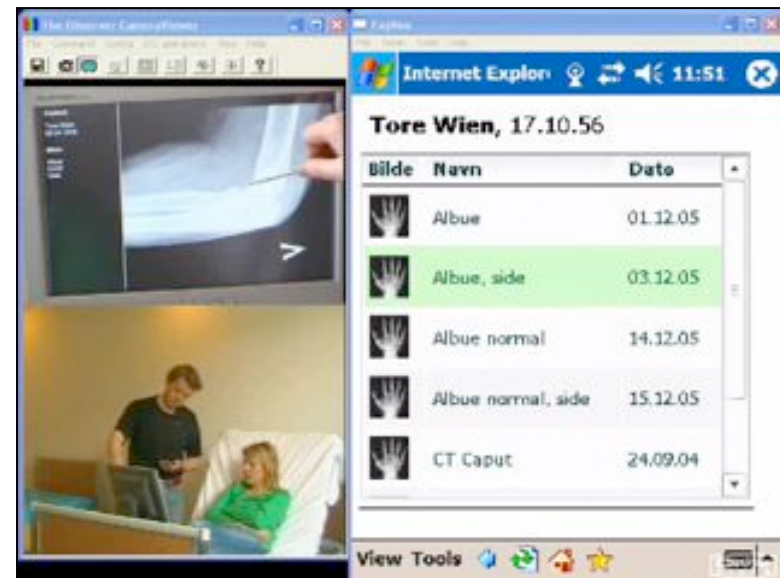
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Context of use: Environment

Implications for testing and design

- The physical and social aspects of the use environment have a strong effect on observed system usability.
- Usability testing:
 - The physical and social environment must be simulated in great detail.
- Designing for usability:
 - Detailed knowledge of physical and social environment is necessary.



Getting the scenario right (goals/tasks)



Usability testing of a CPOE module

- Cooperation between research center, hospital and vendor/developers
 - 2007:
 - Developing use scenarios
 - Baseline test
 - 2008:
 - Usability testing of first version of CPOE system

Scenario for testing CPOE system

Users:

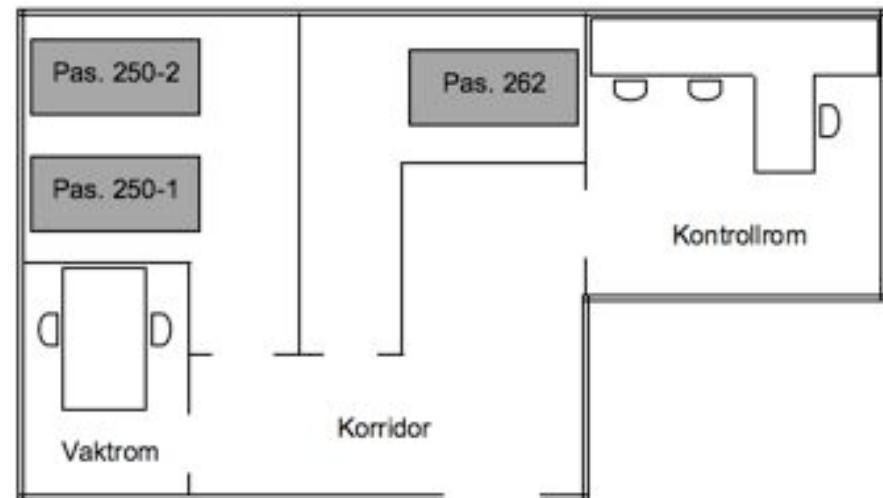
- One physician,
- One nurse
- Three patients (actors).

Scenario:

- Pre visitation meeting
- Visitation round
- Documentation
- Administration of medications

Patient stories

- EHR content
- All relevant paper-based records



Full-scale usability test / workflow simulation









Lessons learned: Scenarios and goals

- Complex workflow
- Important to include health workers in the design of the use scenarios
- Patient data needs to be medically correct
- Realism concerning scenarios and goals makes it easier for the users to accept the illusion.



Flight simulator: Test vs. Simulation



- What is the necessary level of realism?
- For what purpose?
 - Entertainment
 - Training
 - Evaluation

NASA's Boeing 747 simulator



- Is this "overkill"?
 - Simulation research indicates that too much realism actually impedes learning.
 - Simple mockups work perfectly for a number of pilot training situations.
 - Full-scale simulators are necessary for some training exercises.

Just-enough realism

- Comparative usability study of a handheld retail application.
- Three test environments compared.
- Comparison of usability errors identified.
- Suggestion for just-enough realism.

Master thesis Kenneth Devik, NTNU 2009

Scenario: Retail inventory

- PDA with barcode reader.
- Running prototype.



Three usability tests



Desktop
lab test

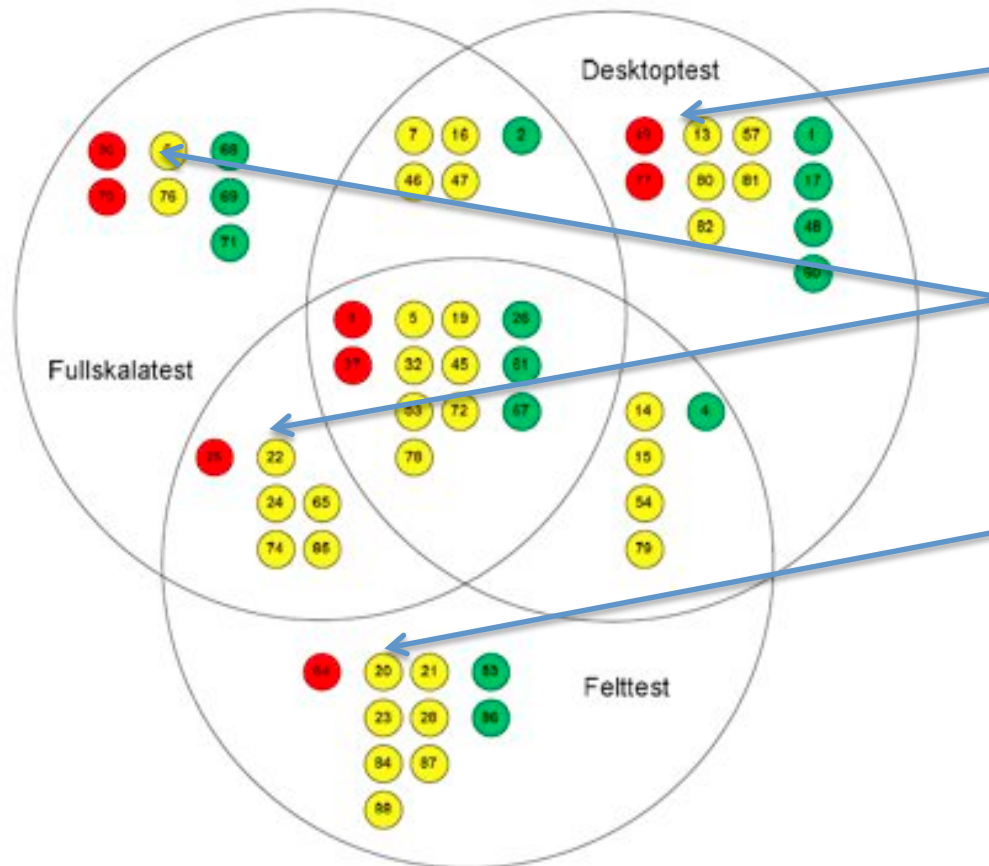


Full-scale
lab test



Field
test

Results



- False positives in desktop test.
- Full-scale lab test of value.
- Little added value of field test.

False positives



- False positives: Problems with the barcodes used in the test. Not a real problem!

Just-enough realism

- Identify the critical elements.
- In this case:
 - Standing, not sitting.
 - Real items.
 - More than one item.
 - Docking station out of sight.

