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Does Time Heal?
A Longitudinal Study of Usability

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Background

Making local software industry do usability

- Providing lightweight methods and techniques
- The USE project: bridging usability and design

Several years of comparative usability studies

- Where to conduct evaluations: lab/field discussion
- How to analyze data: instant data analysis (IDA)
- How to study use: snapshots versus longitudinal studies

“Usability does not matter - the user just has to learn the system”

Do usability problems disappear? Does time heal poor design?

Project context

By 2006 all Danish hospitals must have implemented Electronic Patient Records (EPR) (this political demand will not be met)

EPRs contain information about patient's medical history used by nurses and doctors

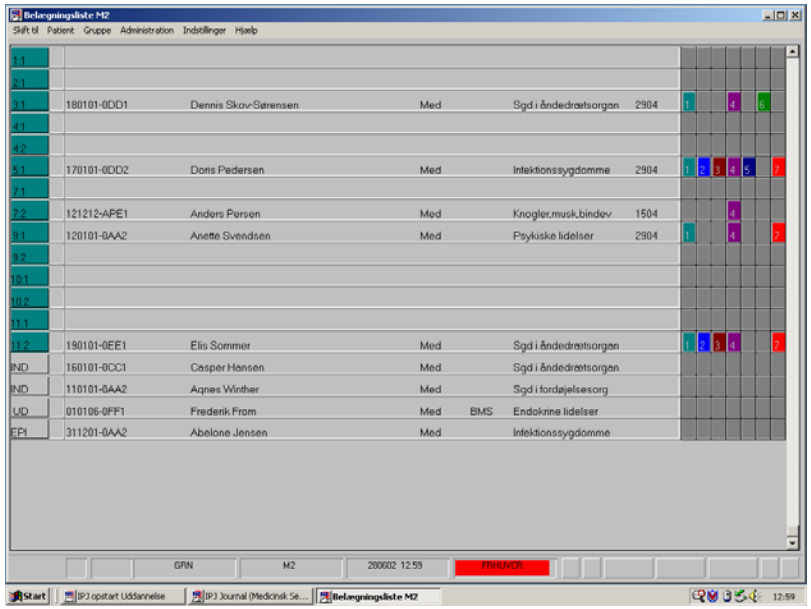
Designing useable EPR systems is a huge challenge…

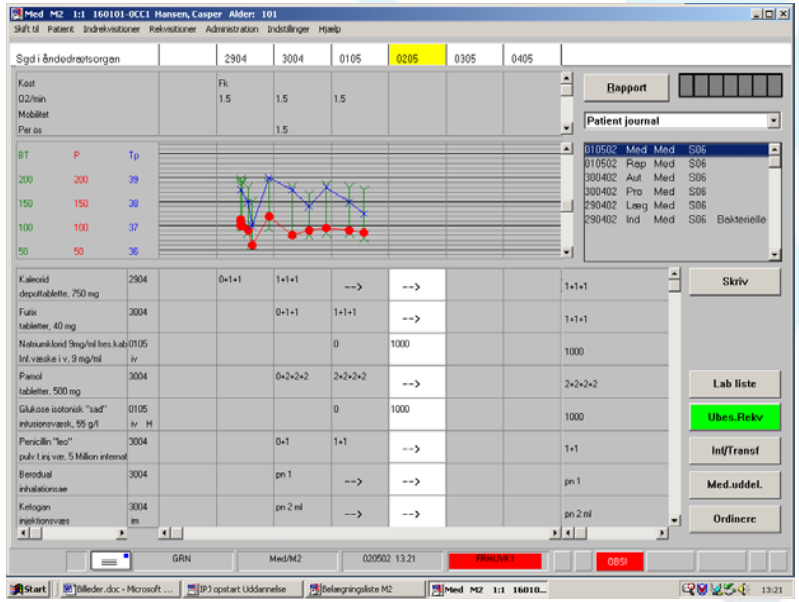
- Dynamic and stressful use context
- User's focus is not on the system
- Errors can be fatal

We participated in a large scale pilot project studying the use of EPR at a large regional hospital prior to national implementation

The EPR system evaluated

- Commercially available system: IBM IPJ 2.3
- Running on desktop and laptop PC's
- A complex system for expert users primarily engaged elsewhere (deciding if this system is useful is not trivial)

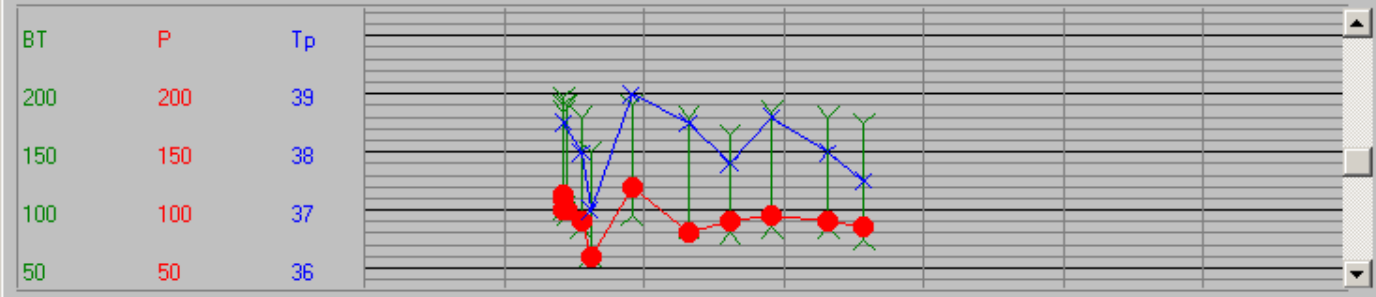




Med M2 1:1 160101-0CC1 Hansen, Casper Alder: 101

Skift til Patient Indrekvisitioner Rekvisitioner Administration Indstillinger Hjælp

Sgd i åndedrætsorgan		2904	3004	0105	0205	0305	0405
Kost		Fk					
O2/min		1.5	1.5	1.5			
Mobilitet							
Per os			1.5				



Rapport

Patient journal

010502	Med	Med	S06	
010502	Rap	Med	S06	
300402	Aut	Med	S06	
300402	Pro	Med	S06	
290402	Læg	Med	S06	
290402	Ind	Med	S06	Bakterielle

Kaleorid depottablette, 750 mg	2904			0+1+1	1+1+1	-->	-->		1+1+1
Furix tabletter, 40 mg	3004				0+1+1	1+1+1	-->		1+1+1
Natriumklorid 9mg/ml fres.kab Inf.væske i v, 9 mg/ml	0105 iv					0	1000		1000
Pamol tabletter, 500 mg	3004				0+2+2+2	2+2+2+2	-->		2+2+2+2
Glukose isotonisk "sad" infusionsvæsk, 55 g/l	0105 iv H					0	1000		1000
Penicillin "leo" pulv.t.inj.væ, 5 Million internat	3004				0+1	1+1	-->		1+1
Berodual inhalationsae	3004				pn 1	-->	-->		pn 1
Ketogan injektionsvæs	3004 im				pn 2 ml	-->	-->		pn 2 ml

Skriv

Lab liste

Ubes.Rekv

Inf/Transf

Med.uddel.

Ordinere

GRN | Med/M2 | 020502 13.21 | FRHUVK1 | OBS!

Start | Billeder.doc - Microsoft ... | IPJ opstart Uddannelse | Belægningsliste M2 | Med M2 1:1 16010... | 13:21

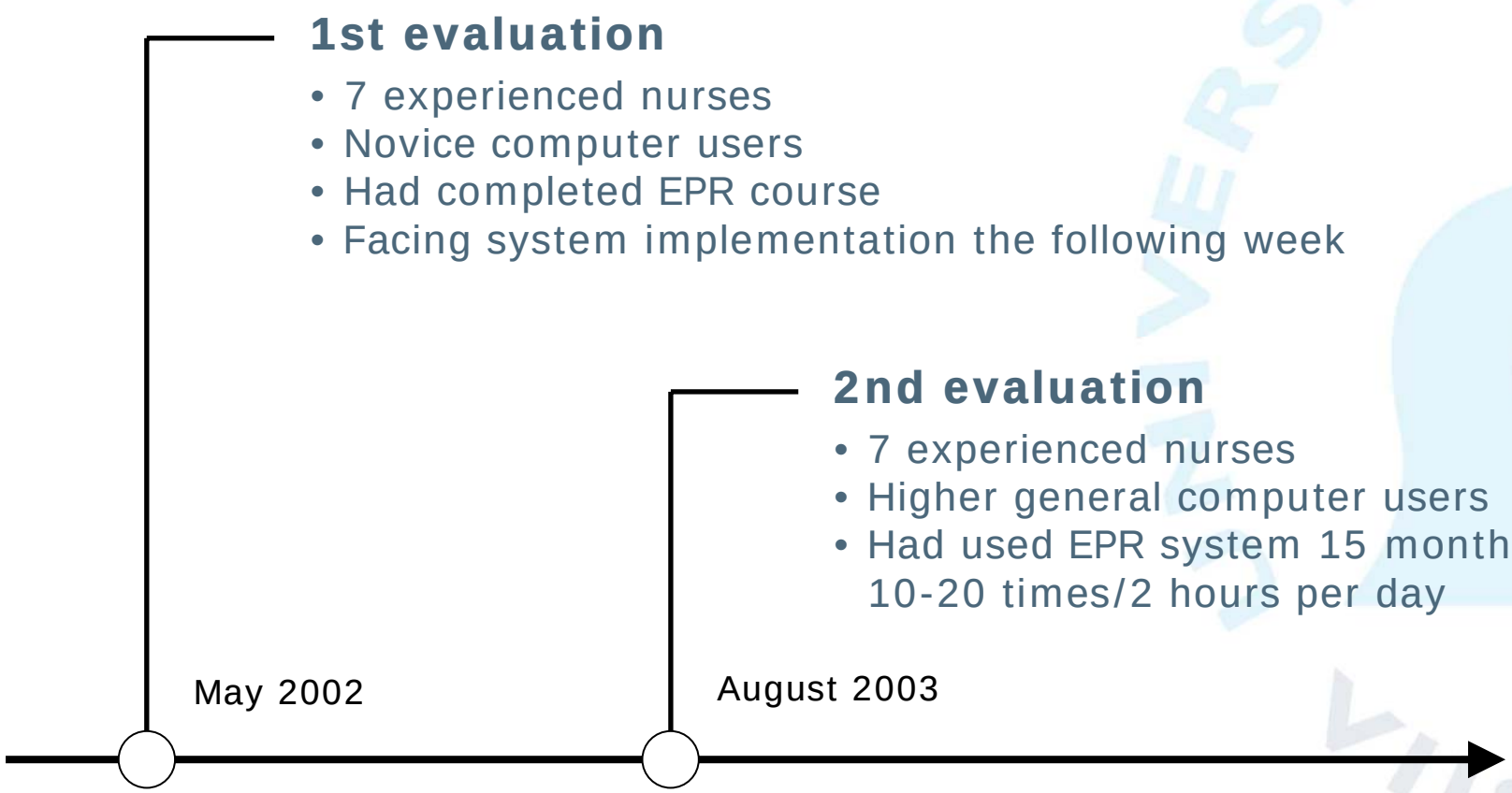
Research questions

To what extent is the effectiveness and efficiency of using the system different over time?

Which usability problems are experienced by the users over time?

Is there a difference in the severity over time?

The longitudinal study



The two evaluations

Experimental settings and approach

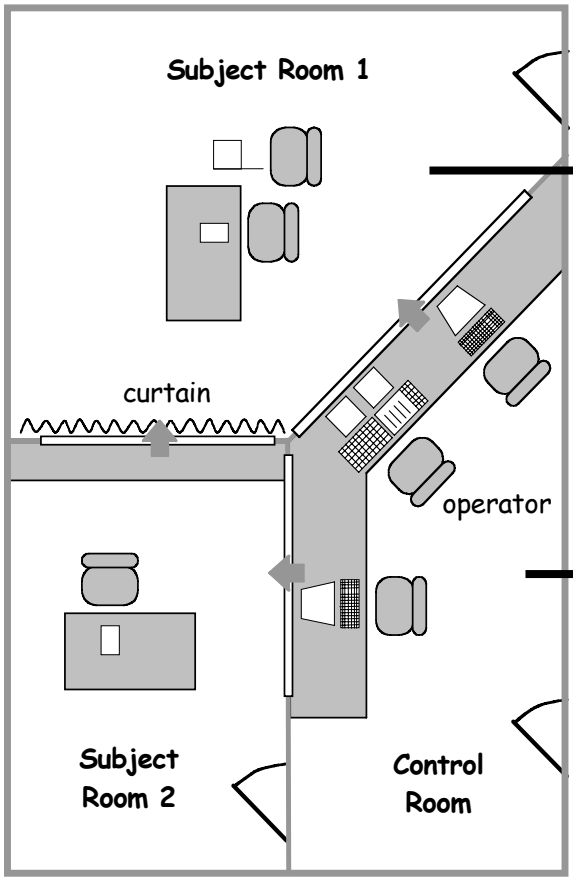
- State-of-the-art usability lab
- 3 tasks developed with hospital staff
- Thinking aloud
- Post-evaluation interviews and TLX tests

Test subjects

- 7 professional nurses
- 31-54 years of age
- 2-31 years of work experience
- 14-30 hours of EPR training

Evaluations identical in 2002 and 2003

Experimental setup



Themes of usability problems

Complexity of information

The information in the EPR system was found to be too complex and fragmented. Nurses found it difficult to get an overview of each patient and to find the necessary information

Relation to work activities

Nurses found that the structure of information in the system poorly reflected their real work tasks, making it difficult to find and store the right information

Mobility of work

Nurses stressed concerns about being mobile while having to use the system. Carrying a laptop computer was found unfeasible

Problem severity

	Delay	Irritation/ irrationality	Expectation vs. actual
Critical	Total (user stops)	Strong	Critical diff.
Serious	Several minutes	Medium	Significant diff.
Cosmetic	< 1 minute	Low	Small diff.

Based on Molich and Nielsen

Total numbers of usability problems (1)

	1st evaluation (2002) (N=7)
Critical	**25**
Serious	**45**
Cosmetic	**13**
Total	**83**

The nurses experienced 25 critical usability problems

- Information about the patients is fragmented
- It is difficult to get an overview of the different pending tasks
- It is difficult to understand relation between different parts of the systems

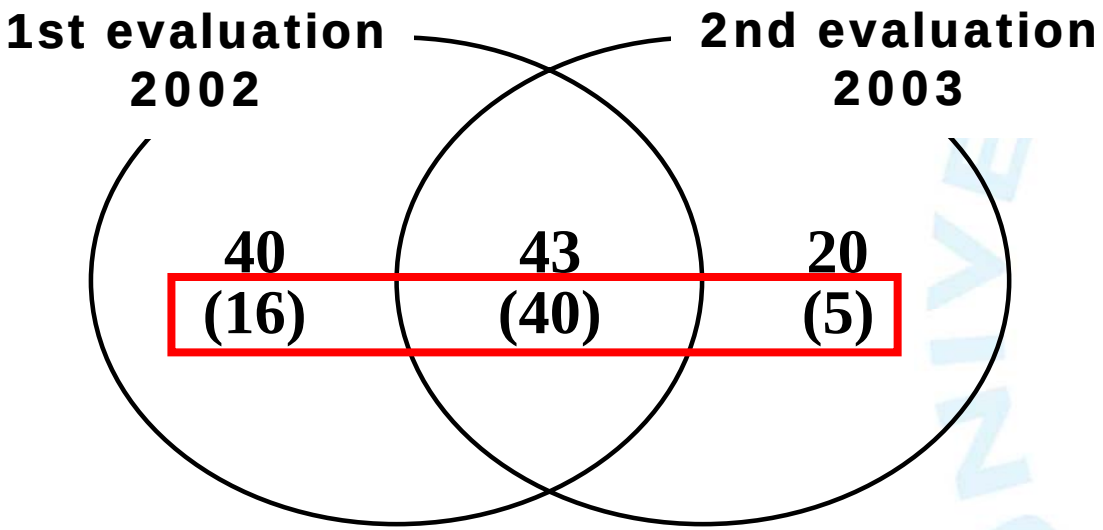
Total numbers of usability problems (2)

	1st evaluation (2002) (N=7)	2nd evaluation (2003) (N=7)	Total (N=14)
Critical	25	**19**	27
Serious	45	**34**	56
Cosmetic	13	**10**	20
Total	83	**63**	103

The nurses experienced less usability problems after one year of use

- 19 critical usability problems
- Some problems had disappeared and new ones had emerged
- Some had changed severity (critical → serious) (serious → cosmetic)

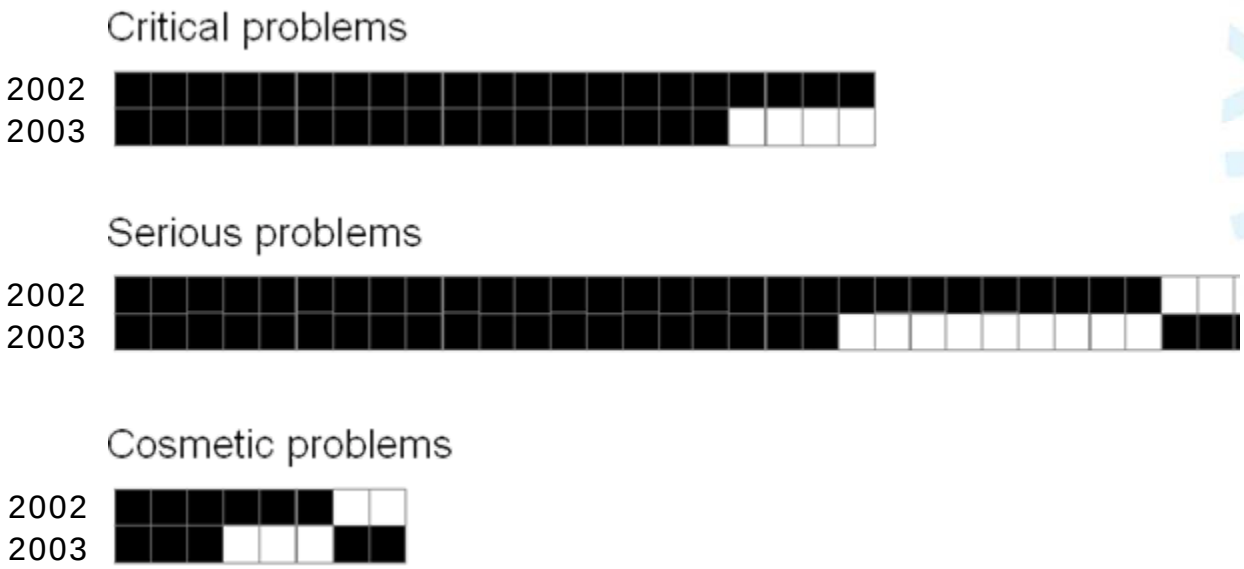
Distribution of problems across time



Numbers in parentheses show totals of non-unique problems

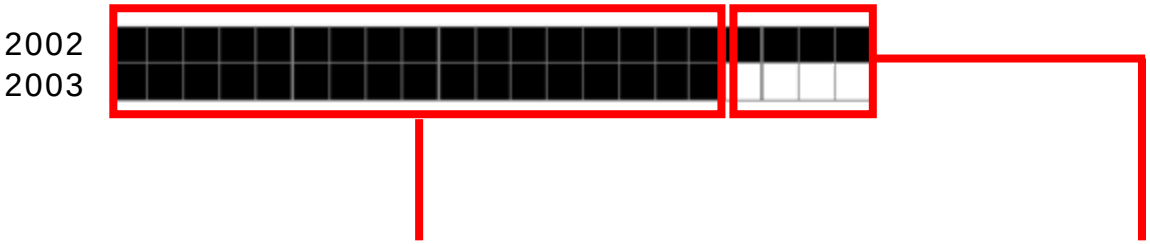
Distribution of problems across severity

Each column represents a usability problem. A black square indicates that the respective user group identified a usability problem. A white square indicates that a problem was not identified by that user group



Distribution of problems across severity (1)

Critical Problems



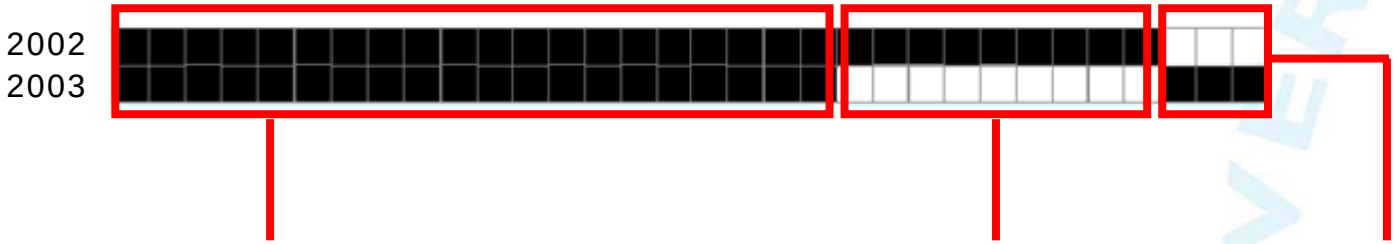
17 of the critical problems experienced in the 1st evaluation was still experienced after one year of use

4 of the critical problems found in 2002 were not experienced after one year of use

2 of these 4 problems were still experienced after one year but had changed severity to “serious”

Distribution of problems across severity (2)

Serious Problems



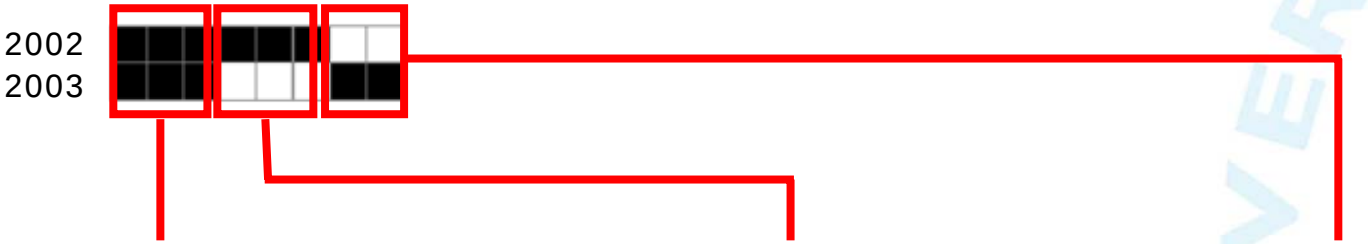
20 of the serious problems experienced in the 1st evaluation was still experienced after one year of use

9 of the serious problems experienced in the 1st evaluation had disappeared after one year of use

2 of the 3 “new” serious problems were problems experienced as critical one year before (changed severity)

Distribution of problems across severity (3)

Cosmetic Problems



3 of the cosmetic problems experienced in the 1st evaluation was still experienced after one year of use

3 of the cosmetic problems experienced in the 1st evaluation had disappeared after one year of use

After one year of use, the nurses experienced 2 new cosmetic problems

Where did the problems disappear to?

2 critical problems disappeared after one year of use because..

- The users developed workarounds outside the system to avoid them (workarounds now need to be communicated to new staff)

9 serious problems disappeared after one year of use because...

- They were closely related to the 2 disappearing critical problems
- The users got more familiar with the system

Most of the cosmetic problems disappeared because...

- The users got more familiar with the system
- The users had acquired higher general computer skills

Which problems did not disappear?

After one year of use, the basic design of the EPR system was still experienced as problematic in the nurses' everyday work at the hospital

Information structure

- Information still experienced as complex and too fragmented
- Still difficult to get an overview of individual patients
- Still difficult to get an overview of pending tasks (despite of workarounds)

Mobility and relation to work activities

- Still poor relation between information structure and work activities
- Mobility *did* become a big issue; carrying a laptop computer was found unfeasible

Basic interaction design (not learned)

- Lack of consistency (e.g. single and double click) still a problem
- Lack of affordances (e.g. Seeing which elements are active) still a problem

What did we learn?

Time does not heal usability problems

Critical usability problems do not “just disappear” with user experience

- Workarounds should not be seen as an acceptable solution!
- Problem severity may change
- Some cosmetic problems may disappear
- Poor design remains poor! (and we should be able to do better)

Longitudinal evaluations rather than “the usual” snapshots of use?

- Stretching the design process into real use situations
- Allowing for user appropriation of design
- Providing a noise filter on cosmetic usability problems

Questions...