

# INTERAKTIONSDESIGN PROCESSEN (KAP 9)

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**re-cap**

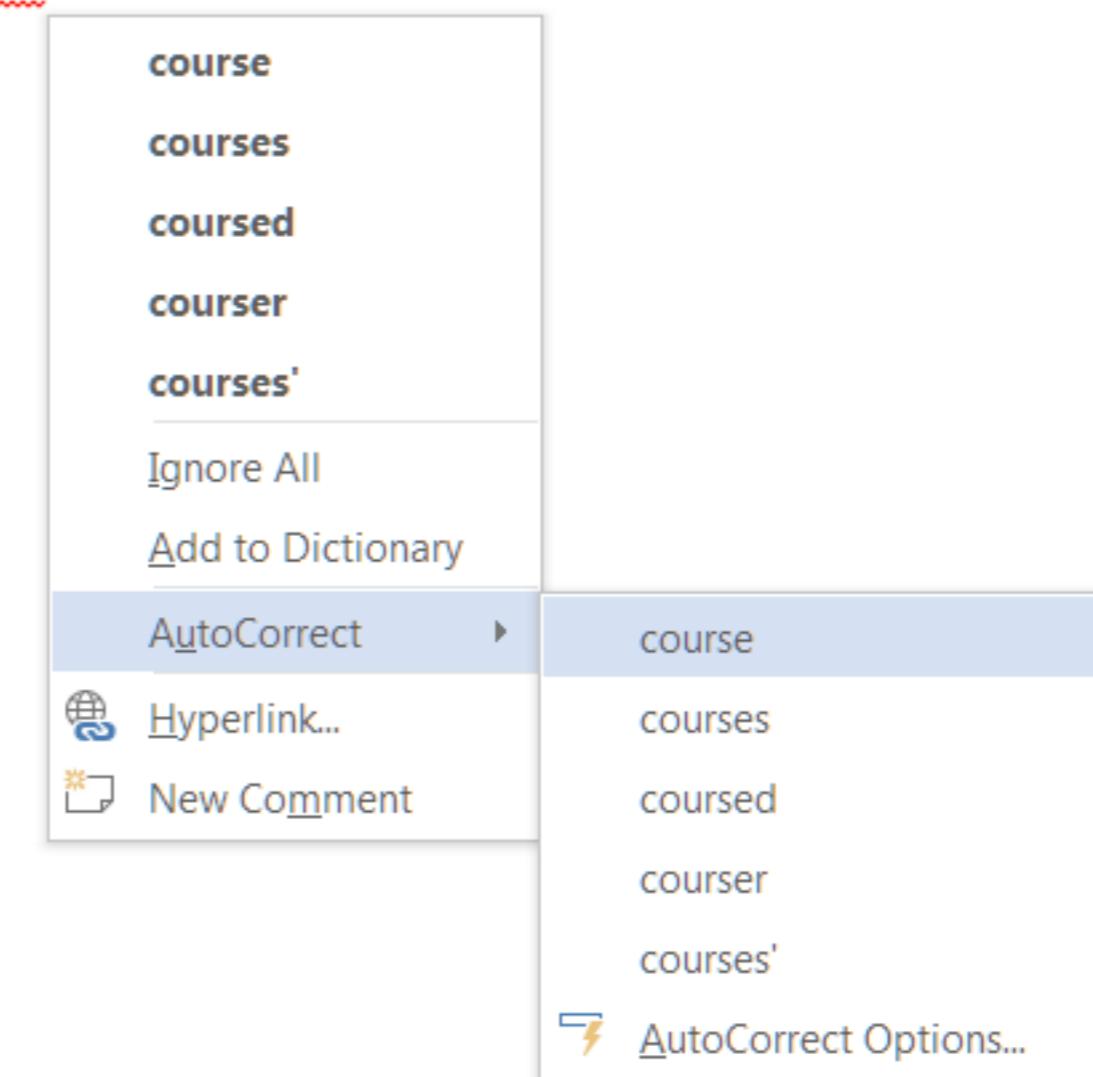
# Keystroke level modellen

$$T_{execute} = T_K + T_P + T_H + T_D + T_R$$

- Find tastesekvens (metode)
- Indsæt M-operator
- Læg tallene sammen
- Sammenlign fx. brugen af menu med tastaturshortcuts

Operator	Description	Time (sec)
K	Pressing a single key or button	
	Average skilled typist (55 wpm)	0.22
	Average non-skilled typist (40 wpm)	0.28
	Pressing shift or control key	0.08
	Typist unfamiliar with the keyboard	1.20
P	Pointing with a mouse or other device on a display to select an object. This value is derived from Fitts' Law which is discussed below.	0.40
P1	Clicking the mouse or similar device	0.20
H	Bring 'home' hands on the keyboard or other device	0.40
M	Mentally prepare/respond	1.35
R(t)	The response time is counted only if it causes the user to wait.	t

When in the coursee of human events...



# Fitts' lov

- $T = k \log(D/S + 0.5)$ 
  - $k \sim 200$  msec
- T tid det tager at flytte hånd til target
- D afstand mellem hånd og target
- S størrelsen af target

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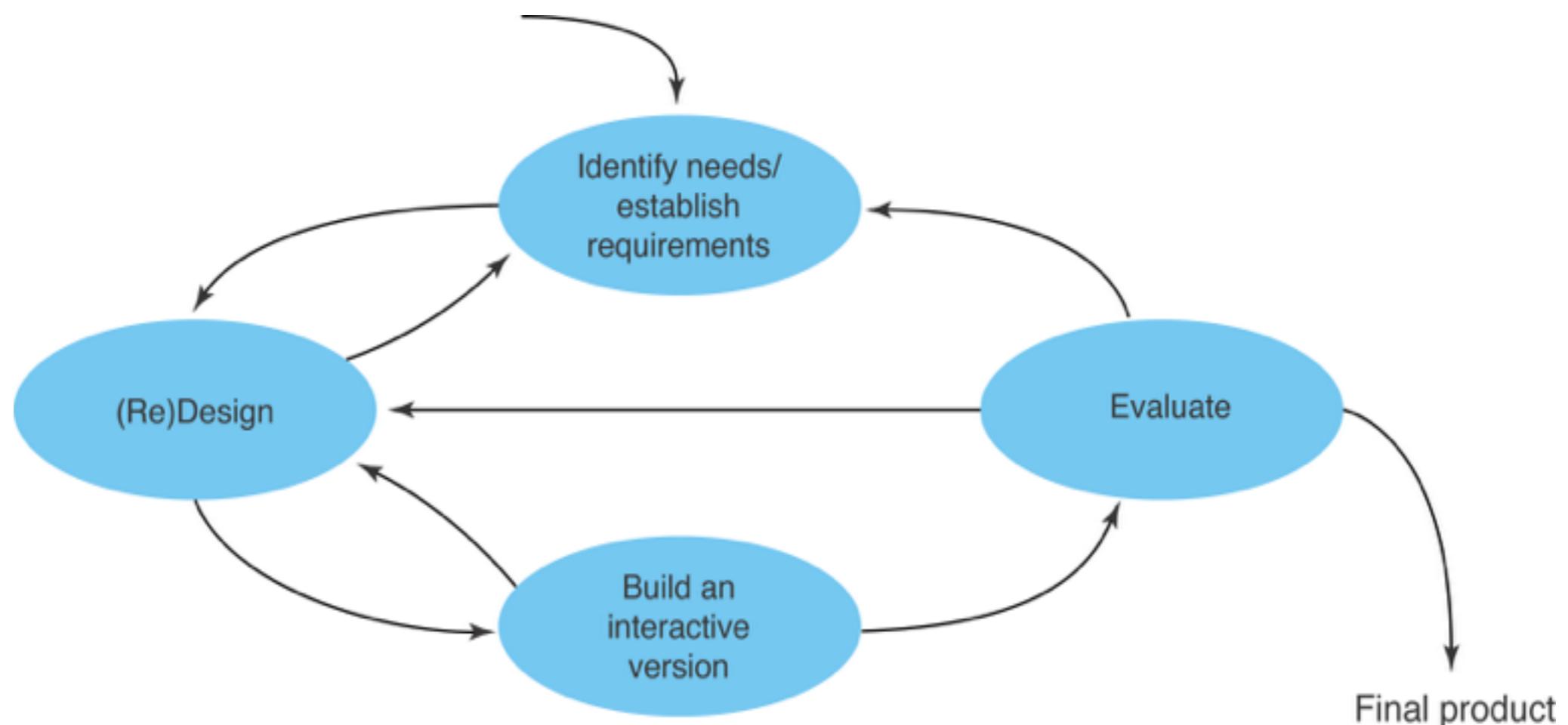
# Interaction design

- Proces
  - målrettet, skabe interaktionsdesign løsning informeret af intenderet brug, domæne, brugere og brugsforståelse, materialer, omkostninger og muligheder (politik)
  - kreativ aktivitet
  - beslutningsprocess der involverer trade-offs
- Produkt
  - plan for udvikling og evaluering
  - alternativer og produktiterationer
  - færdigt produkt

# Perspektiver på interaktionsdesign

- User-centred design
- Interaction design as a creative process  
(rapid expert design)
- Lifecycle models

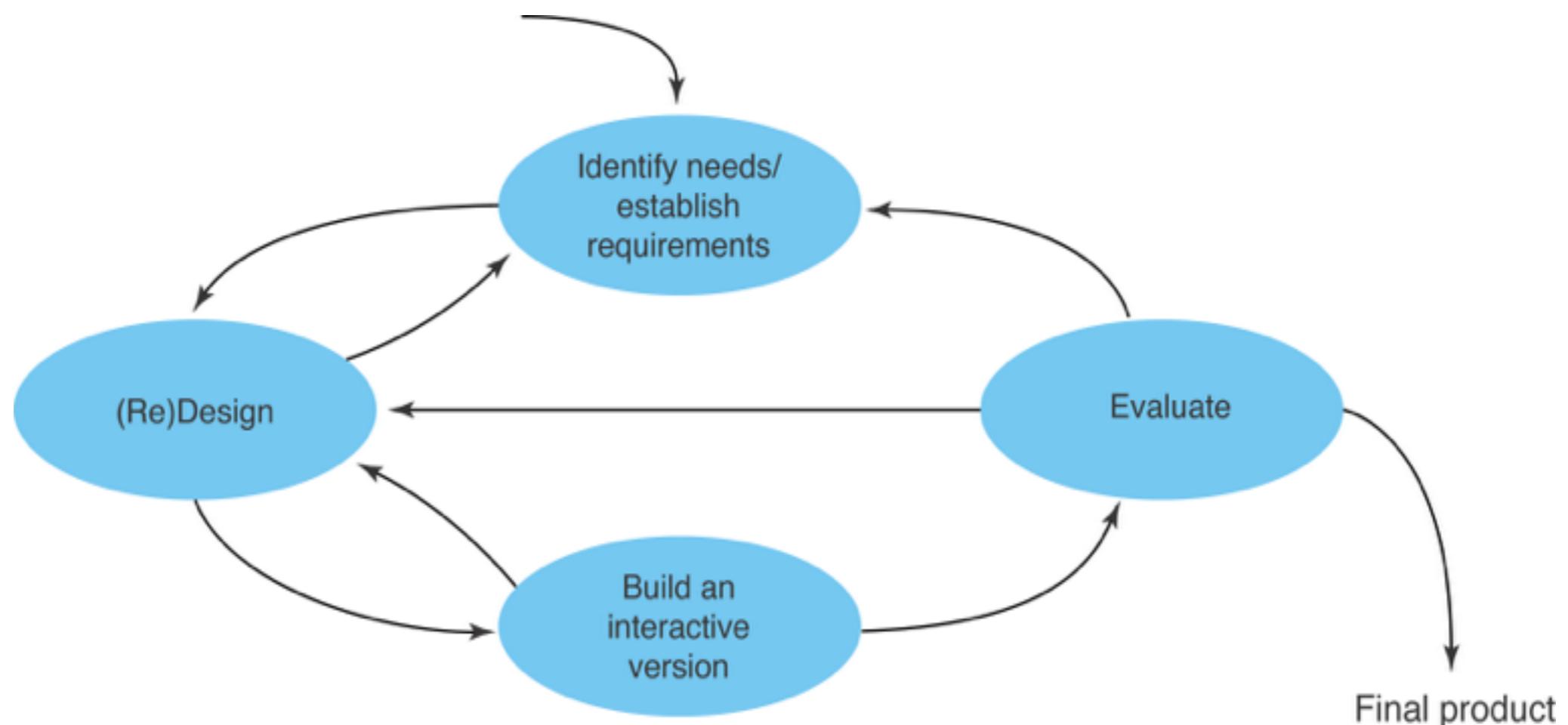
# Bogens model



# User Centred Design

- Tidligt fokus på brugere og opgaver
- Empirisk evaluering
- Iterative design

# Bogens model



# Vigtigheden af at inddrage brugere

- Viden om brugeres aktiviteter og praksis
- Forventningsafstemning
- Ejerskab

# Hvordan inddrage brugere

- spektrum
- fuld-tids ansatte < > newsletter
- før, under, efter release

# Hvem er brugerne / stakeholders

- Kræver en overvejelse
  - de der direkte interagerer med produktet
  - de der direkte interagerer med produktet's chefer
  - de der er afhængige af output fra produktet
  - de der træffer beslutning om at købe et produkt
  - de der bruger konkurrentens produkter
- Eason 1987
  - primære brugere (hands-on)
  - sekundære brugere (sjældent brug beller via andre)
  - tertiære (de der påvirkes af det nye system eller har indflydelse på købsbeslutningen)

For jeres projekt - hvem er primære,  
sekundære og tertiære brugere?

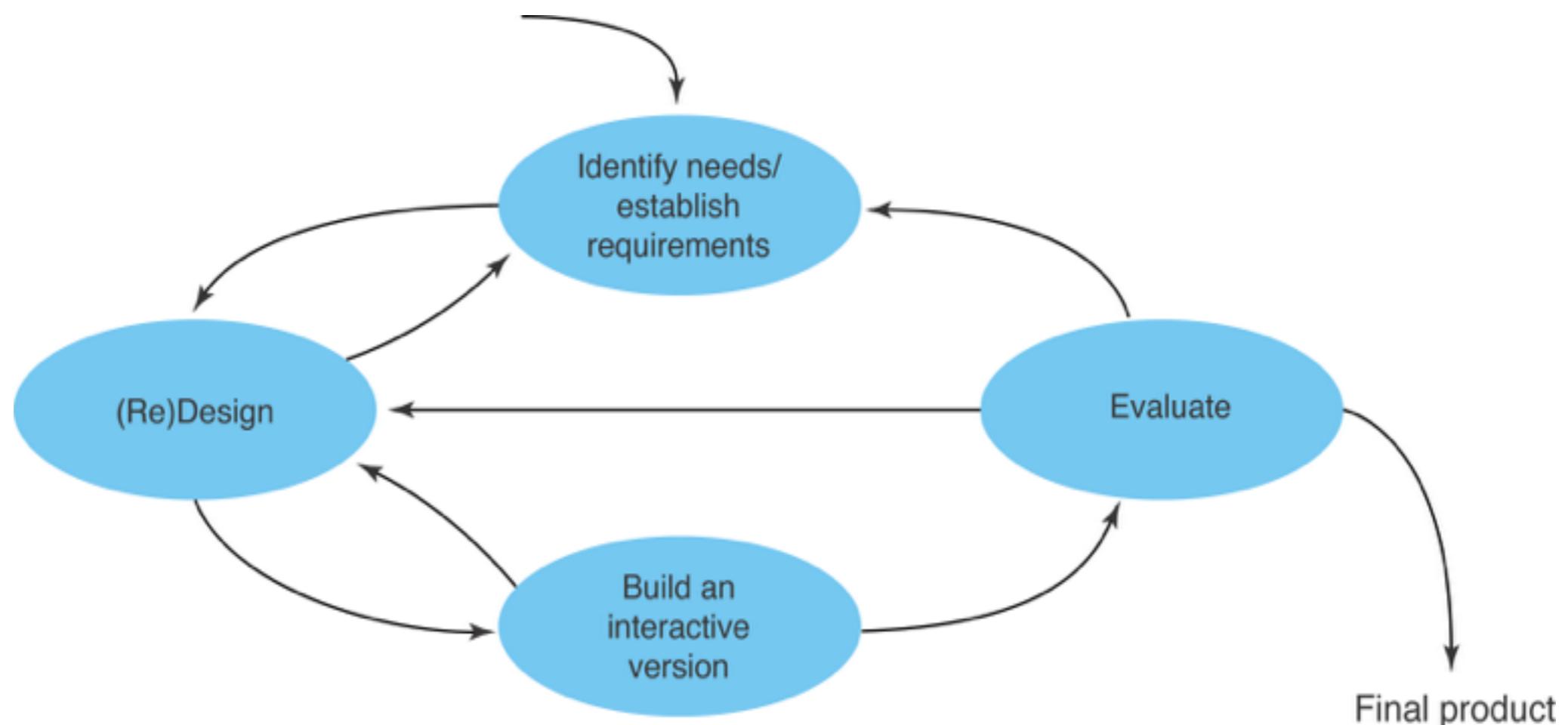
# Er I mikrofonholdere?



# Relation til brugerne

- tester på brugere?
- tester med brugere?
- udvikler med brugere?

# Hvad menes der med behov / needs?



# Hvad kunne få dig til at købe en ny mobiltelefon?



Sidst du købte en ny mobiltelefon:  
hvad var motivationen?

# Sidst du købte en ny mobiltelefon: hvad var motivationen?

- Et funktionalitetsbehov?
- Usability?
- User experience?
- Identitet, selvscenesættelse?

# un-dreamt of needs



- opgaver, krav, mål, ønsker, værdier, usability  
mål, user experience mål....

# Phone Fact Sheet

- In 2005 more than 100 million cell phones were discarded in the United States, equalling over 50,000 tons of still-useable equipment [1]
- There are more than 4 billion mobile phone users worldwide [2]
- Around the world, mobile phone sales have increased from more than 100 million units per year in 1997 to an estimated 779 million units per year in 2005 [3]
- Less than 1 percent of the millions of cell phones retired and discarded annually are recycled [4]
- A global consumer survey released by Nokia reveals that only 3% of the total mobile phone users recycle their phones (6,500 people in 13 countries were interviewed, owning an average of 5 phones each) [5]
- Over 3 billion people globally own mobiles: if each of them returned one phone for recycling, over 240,000 tons of raw materials could be saved. The carbon emissions saved from this would be the equivalent to taking 4 million cars off the road [6]
- Nokia conducted a study which found that between 65-80% of a phone can be recycled and roughly 18,500 homes could be powered for a year with the energy wasted by old phones being thrown away instead of being recycled [7]
- Every year, over 100 million cell phones are made obsolete. The average life span of a cell phone is just 18 months. The average American cell phone user owns three or more cellular phones. Up to 75% of obsolete phones are stockpiled in drawers, including the battery and the charger [8]
- According to the U.S. Environmental Protection Agency, 130 million mobile phones go out of use annually in the U.S. This creates an estimated 65,000 tons of electronic waste [9]
- To make one phone, over 2kgs of raw materials are required, including petroleum-based plastics, liquid crystal display materials, brominated flame retardants (BFRs), and toxic heavy metals including cadmium, lead, nickel, mercury, manganese, lithium, zinc, arsenic, antimony, beryllium and copper. If not properly recycled, toxins from

# Cultural aspects of interaction design

- Er der nogle kulturelle forskelle der kunne tænkes at være et problem eller en mulighed, hvis jeres produkt skulle bruges i en anden kulturel kontekst?



[Profil](#)[Ydelser](#)[Kunder](#)[Inspiration](#)[Kontakt](#)

Search



## Om Lindberg International

Vores målgruppe er mellemstore og store business-to-business virksomheder med en høj eksportandel. Dem hjælper vi med en unik kombination af globale markedsanalyser og jordnær salgs- og marketingrådgivning. Vi håndterer selv alle vores projekter og har derfor fastansatte og freelancere fra mere end 20 lande.

Vi har eksisteret siden 1995 og har i den periode løst mere end 1.100 opgaver over hele verden.

[Læs mere DK](#)

## "Danmarks Klogeste Julekalender"

Tilmeld dig og få masser af ny inspiration!

Arbejder du med strategi, salg eller marketing i en internationalt orienteret business-to-business virksomhed? Så tilmeld dig "Danmarks Klogeste Julekalender" fyldt med nye vinkler, nye råd, nye tanker og nye værktøjer.

Hver dag fra den 1. til den 24. december sender vi dig en mail, og sørger for, at du bliver godt "oplyst" midt i juletravlheden. Du kan også åbne de 24 låger direkte på vores hjemmeside.

[Tilmeld dig](#)[Åben låger](#)

Lindberg International A/S

## Konference om Lean, viden og arbejdsglæde

Vores konference "Udnyt opsvinget" er netop overstået. Det blev en sjov dag, hvor deltagerne fik inspiration til, hvordan de og deres virksomheder kan udnytte mulighederne i forlængelse af krisen.

Konferencen var den 16. i rækken, og bød på et stærkt hold af indlægsholdere fra bl.a. LINAK og GEA Niro.

Se det fulde program fra konferencen den 1. oktober her

**Netværk**  
danish version only

### Login


### Læs brochure

[Lindberg Netværk](#)  
[Lindberg International \(DK\)](#)  
[Lindberg International \(UK\)](#)

### Konferencer

### Downloads

## Netværk for praktikere

### Vigtigere end nogensinde

Hører du til dem, der er bekymrede over "krisen"? Kunne du tænke dig at snakke med andre fra virksomheder, der ligner din og høre, hvad de har oplevet, og hvordan de håndterer den nye situation? Så er Lindberg Netværk noget for dig.

I Lindberg Netværk er der rig mulighed for, at medarbejdere med ansvar for salg og/eller marketing i store eksporttunge b-t-b virksomheder kan udveksle erfaringer med hinanden. Så kom og få idéer, der kan gøre dit arbejde både mere succesrigt og sjovere.

[Læs mere](#)

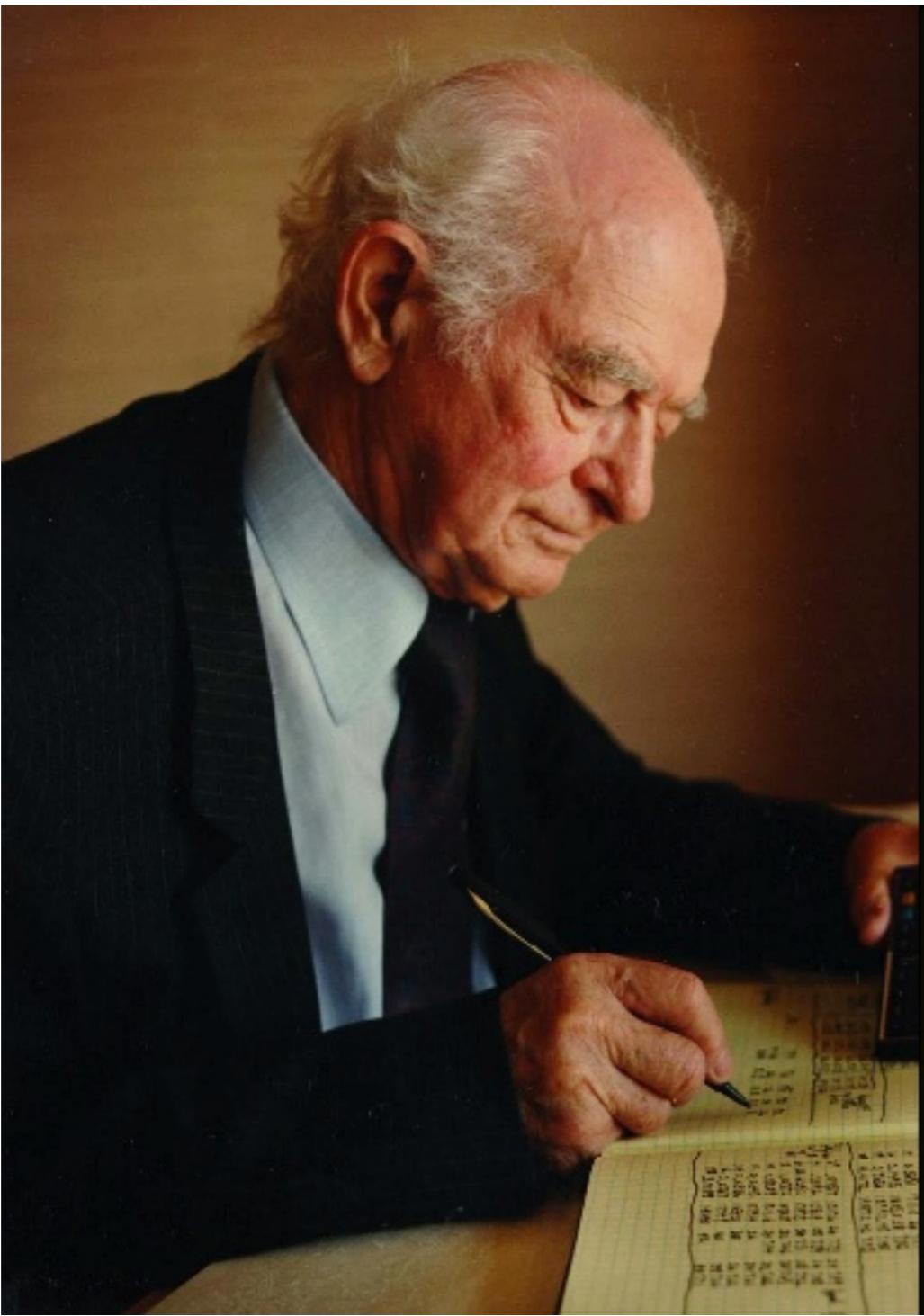
**LINDBERG**  
INTERNATIONAL

Phone: +45 70 20 00 85  
DK-8230 Aabyhoej

# Interaction design as a creative process

- alternatives
- tools for innovation
- ideo.com

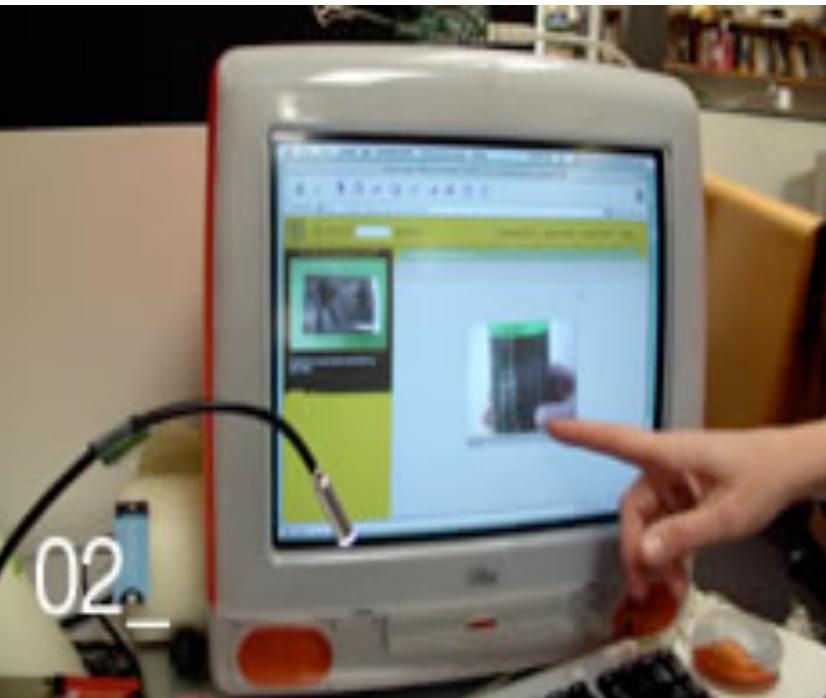
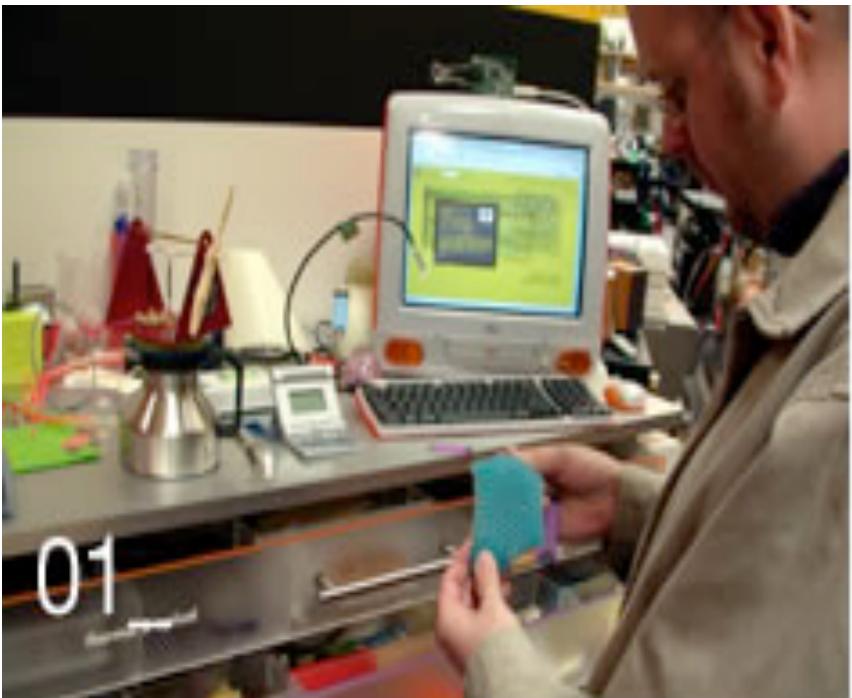




“The best way to get a good idea is to get **lots of ideas** and throw the bad ones away.”

*- Linus Pauling*

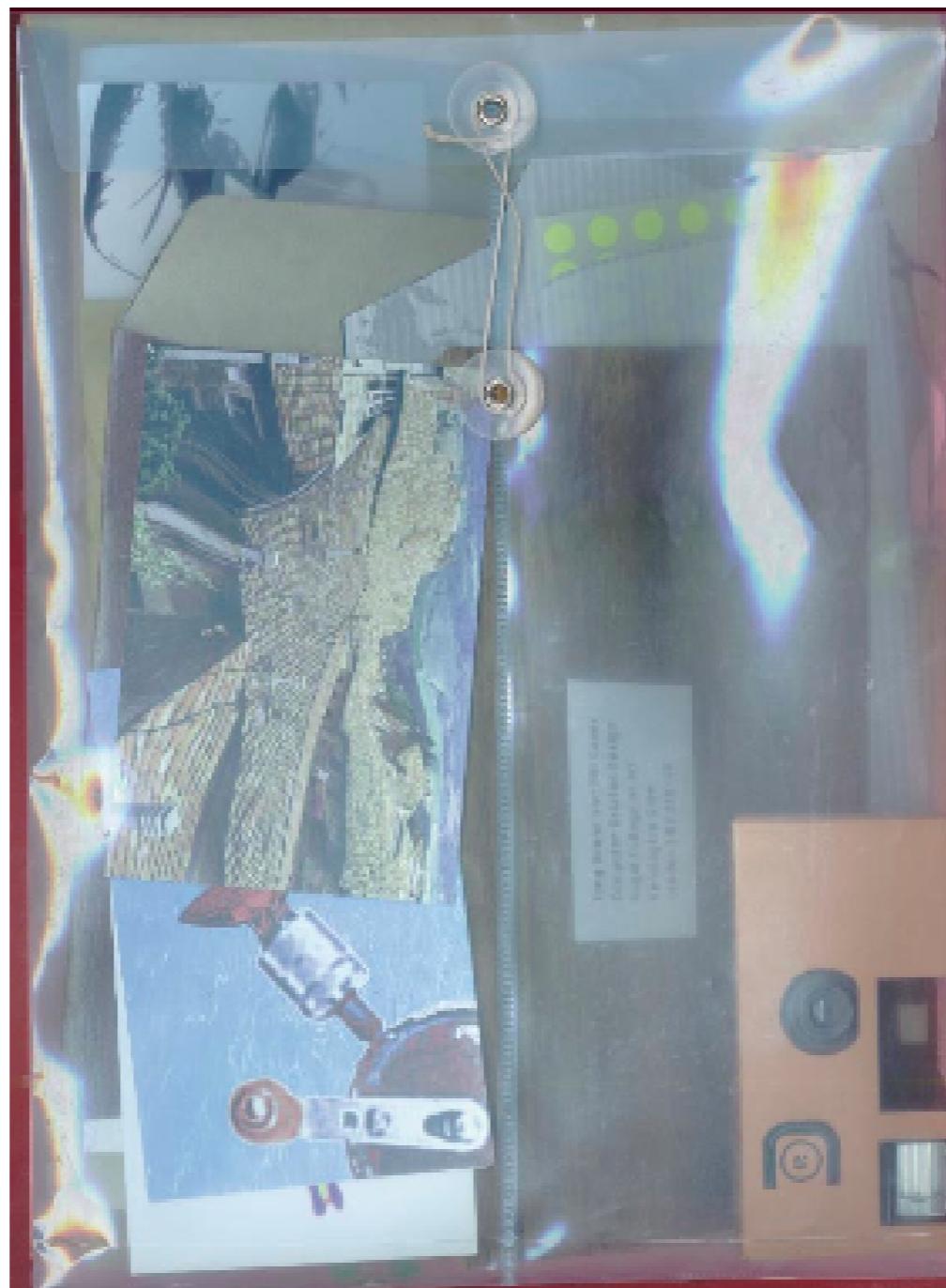
# the best way to get a good idea is to get lots of ideas



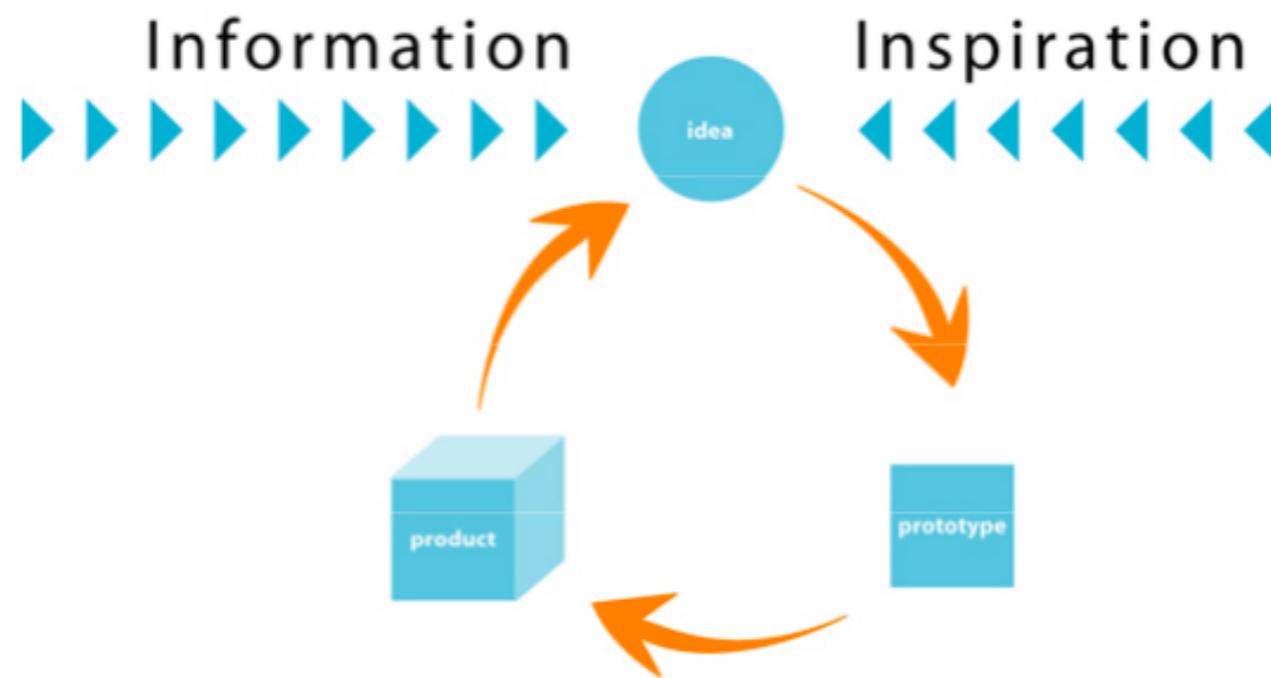
# Genious design



# understanding and designing for user experience



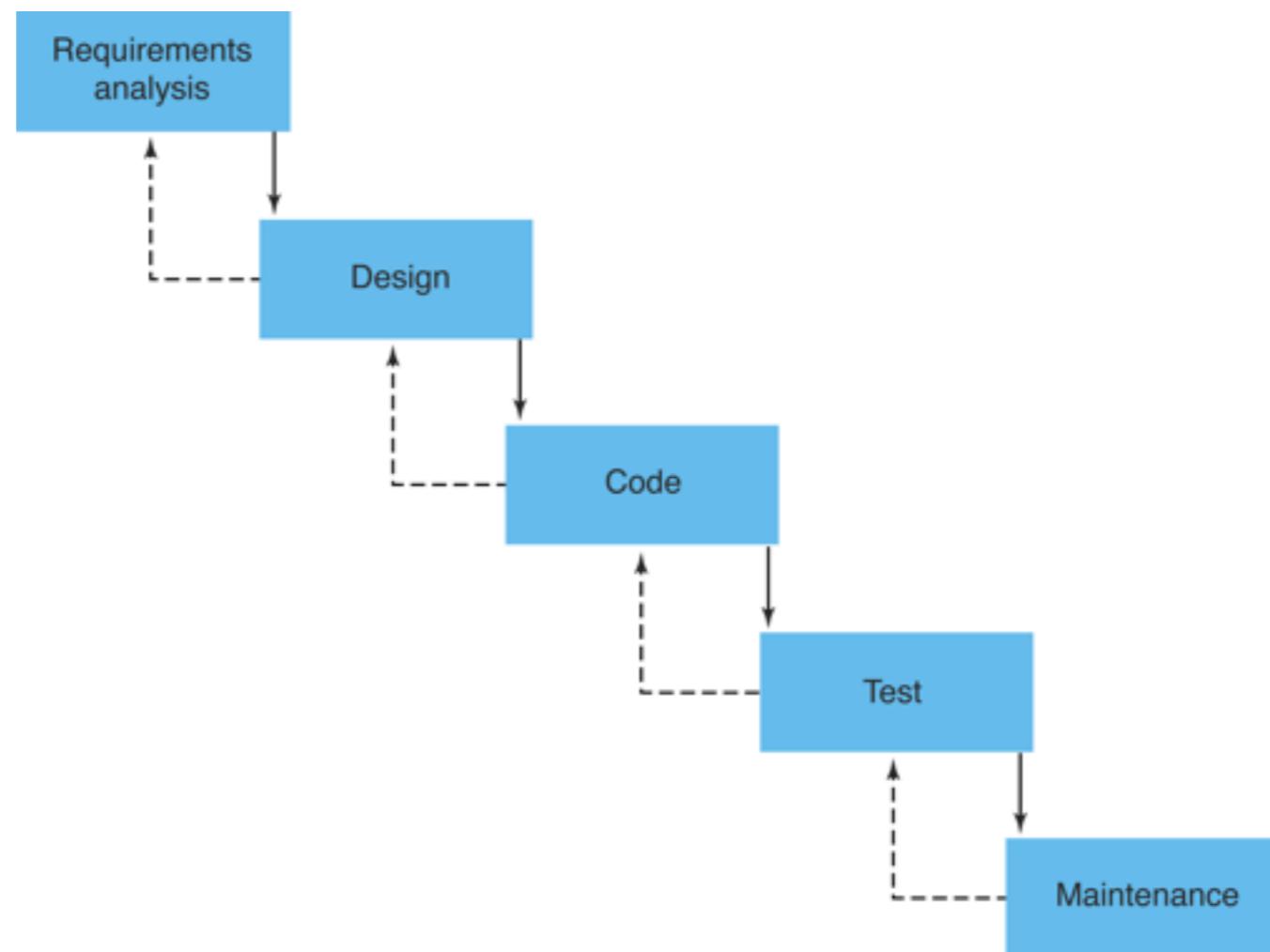
# Cultural Probes



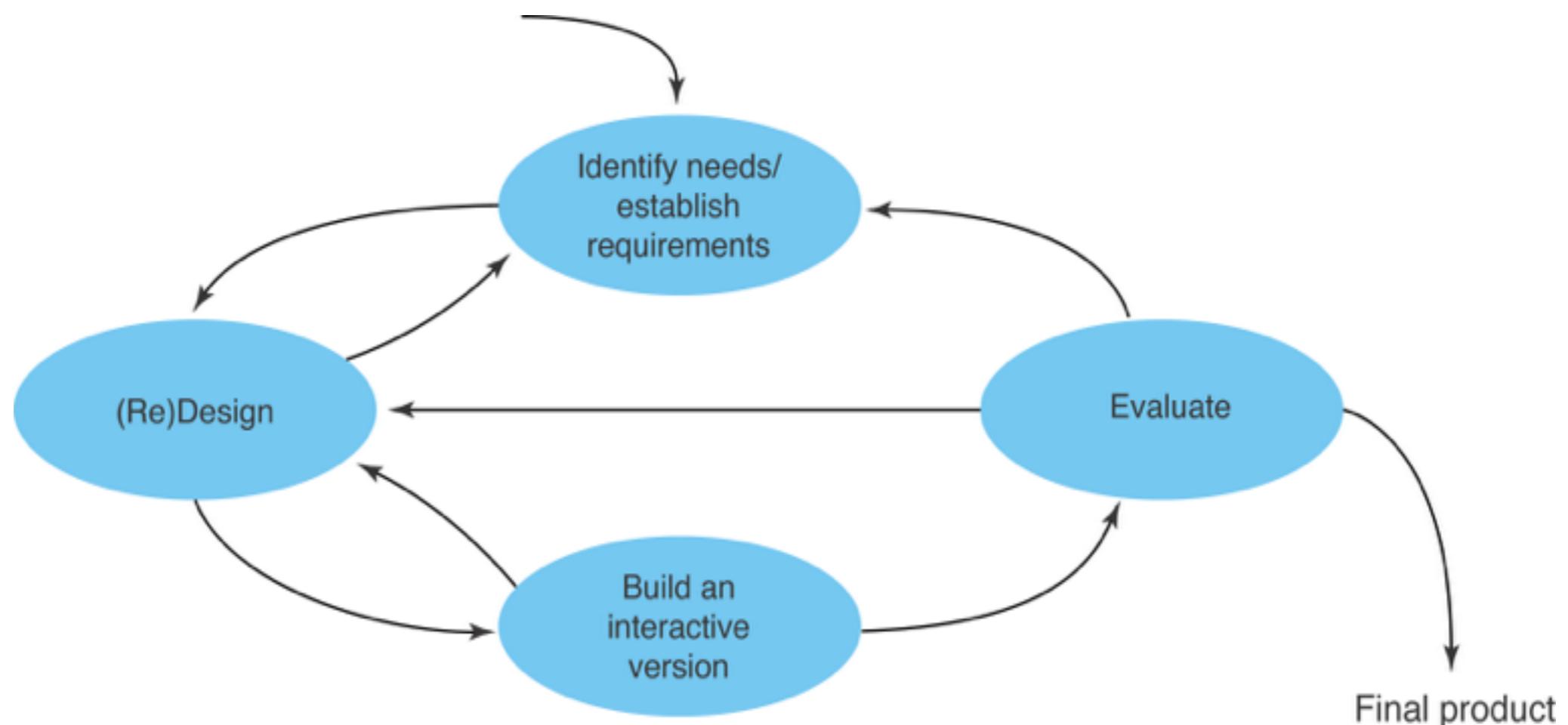
# lifecycle models

- Viser hvordan aktiviteter er relateret
- lifecycle models er
  - ledelsesværktøjer
  - simplificerede modeller af virkeligheden
- Der eksisterer en række modeller
  - software engineering: vandfald, spiral, agile metoder - scrum mv
  - hci: star, usability engineering, user centred design

# SW: Traditionel vandfalds model | 1970s



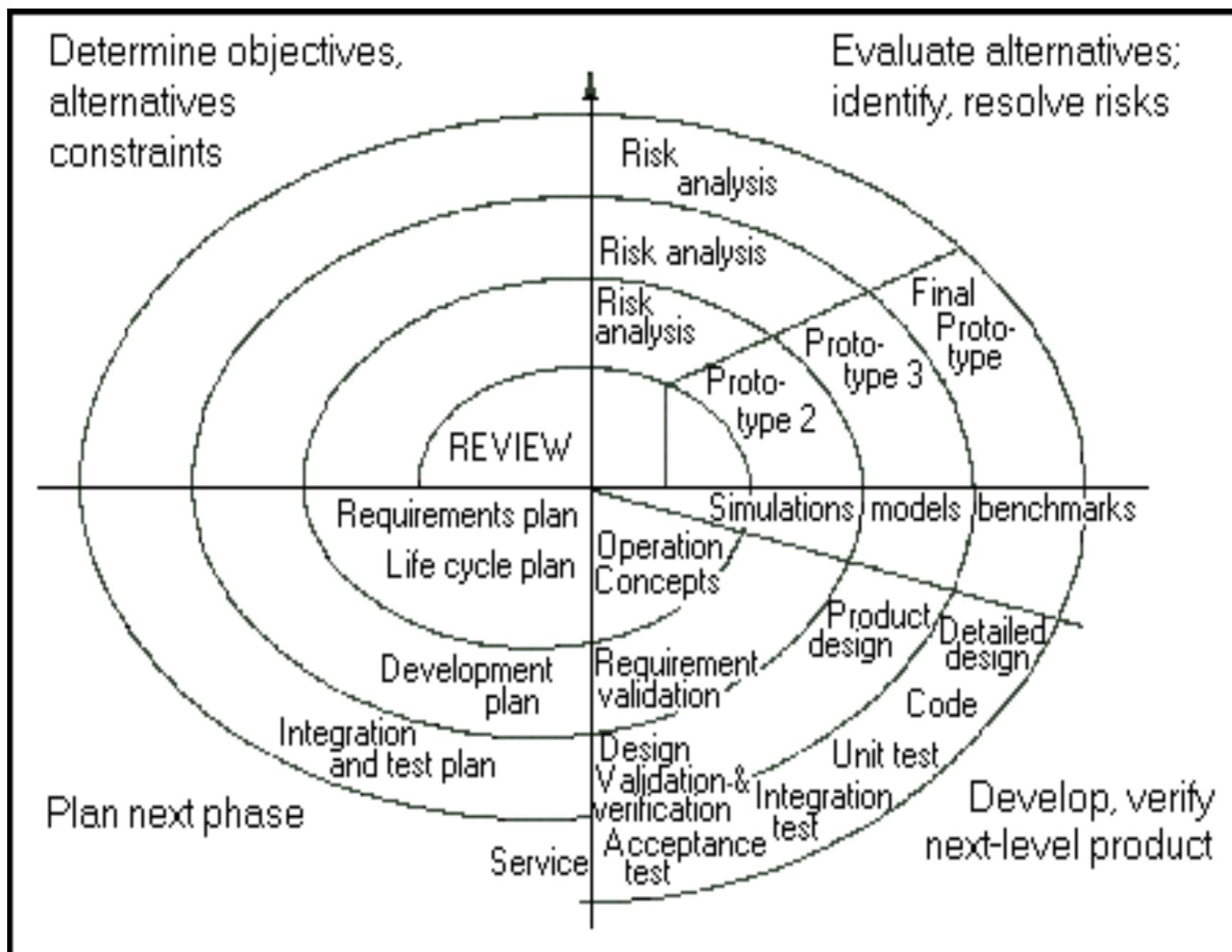
# Bogens model



# Vandfaltsmodellen

- Tidlig sw model 70s
- ingen iteration
- ingen brugerinvolvering
- afspejler stadig praksis en del steder...

# Spiral modellen (Boehm 1988)



# Agile metoder

- eXtreme programming, scrum, adaptive software mv.
- agile manifesto
  - individuals and interactions over process and tools
  - working software over comprehensive documentation
  - customer collaboration over contract negotiation
  - responding to change over following a plan

# Agile metoder

- iteration and feedback
- collaboration with customer (not necessarily end-user)
- one-three weeks iterations
- product part delivered at the end of each iteration

# Integration mellem interaktionsdesign og agile metoder

- Integration ml sw udvikling og interaktionsdesign
- Brugsforståelse en udfordring:
  - designer del af kunde/produkt ejer team
  - tidlig fælles forståelse: personas, task modeller, mental models
  - user validation group

# Generel tendens i interaktionsdesign processen

- Iteration
- user-centredness
- interaction design as a creative process

# Opsummering

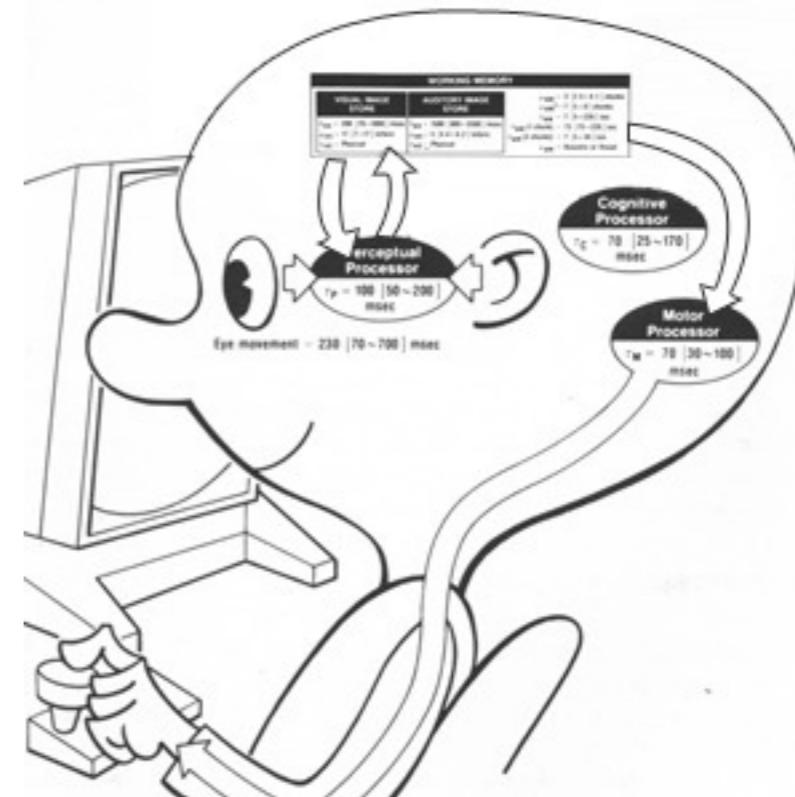
- User-centred design er kommet for at blive
  - udfordringer og muligheder
- Interaction design as a creative process
  - nye værktøjer og nye teknologier
- Lifecycle models
  - integration mellem interaktionsdesign og sw udvikling

# 1st, 2nd and 3rd waves of HCI

- Human Computer Interaction

# 1st wave

- Human factors
- professional users
- psychology
- ergonomics
- laboratory experiments



# 2nd wave

Man is one of the best general-purpose computers available and if one designs for man as a moron, one ends up with a system that requires a genius to maintain it. Thus we are not suggesting that we take man out of the system, but we are suggesting that he be properly employed in terms of both his abilities and limitations .

- Human actors
- Work practices
- Sociology
- Context
- WIMP, PC and webs of technology
- Designing with users, UCD

# 3rd wave

- Human actors (and creators)
- Life rather than work
- Design, Aesthetics, Emotion and Experiences
- AR, TUIs, gesture, touch

# Jonathan Grudin - The interface reaches out (1990)

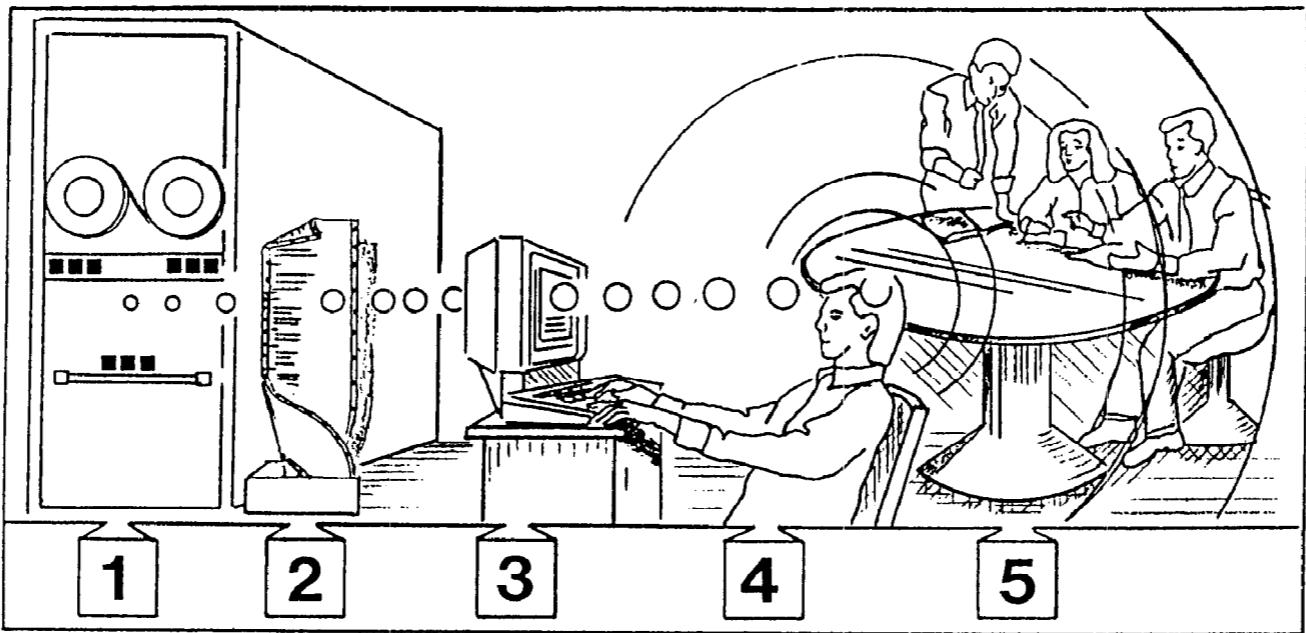


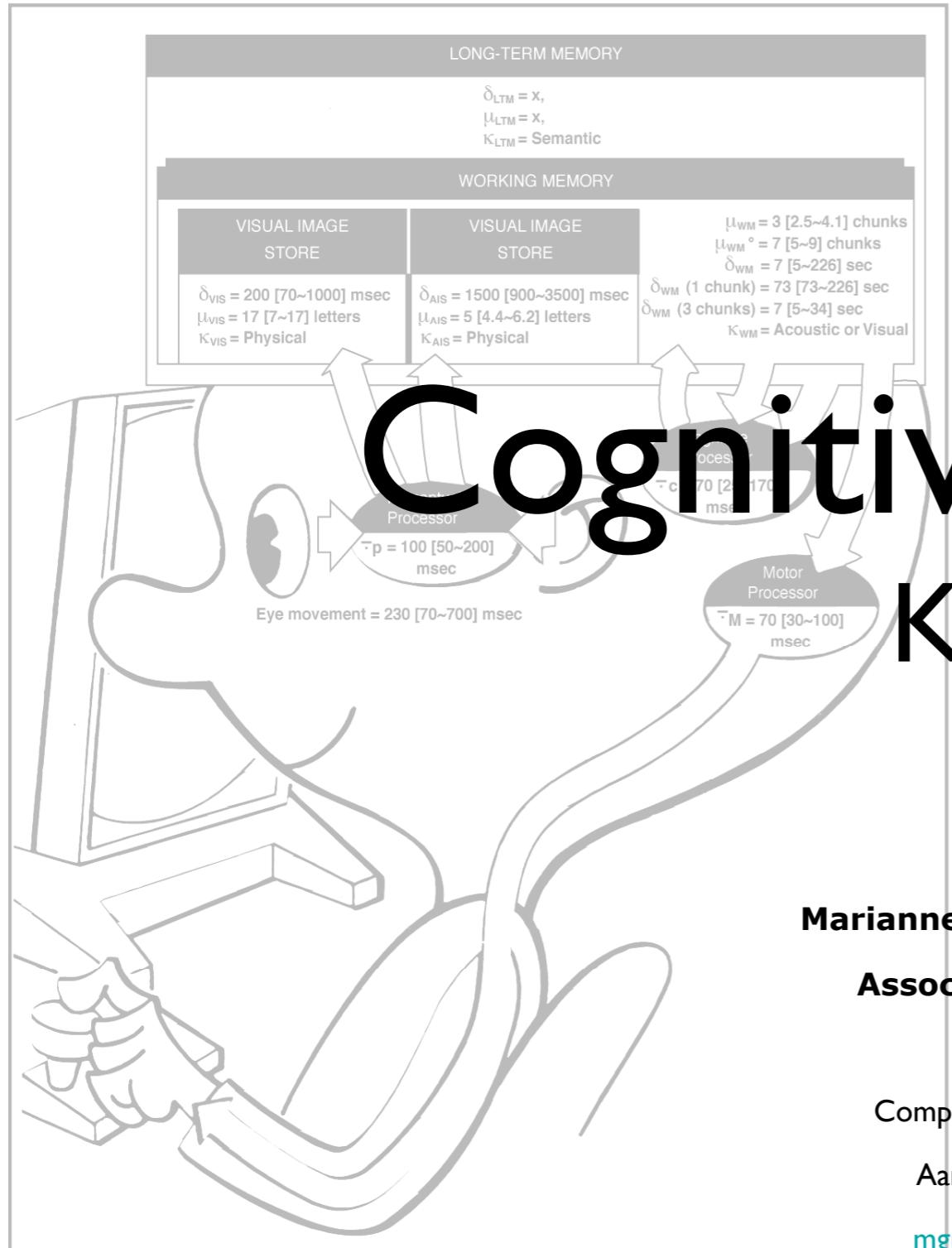
Figure 1. The five foci of interface development.

	Level 1. Interface as hardware	Level 2. Interface as software	Level 3. Interface as terminal	Level 4. Interface as dialogue	Level 5. Interface as work setting
Principal users	Engineers/ programmers	Programmers	"End users"	"End users"	Groups of end users
Interface specialist disciplines	Electrical engineering	Computer science	Human factors, cognitive psych., graphic design	Cognitive psych., cognitive science, (dramatic arts?)	Social psych., anthropology, organizational...
Research methods	Largely informal	Largely informal	Laboratory experiment	Wizard of Oz, thinking aloud, data capture	Ethnographic, contextual, parti- cipant observer
Duration of basic events studied	Microseconds/ hours	Milliseconds/ hours	Seconds	Minutes	Days
Cost of evaluation	Lowest	Low	Moderate	High	Highest
Precision, generality	Highest	High	Moderate	Low	Lowest
Major focus	1950s	1960s-1970s	1970s-1990s	1980s-	1990s-

Table 1. Summary of the distinctions across levels of interface focus.

# I dag og næste gange

- Kognitive aspekter
- Social interaktion
- Emotionel interaktion



# Cognitive Aspects

## Kap 3

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- What is cognition?
- What are users good and bad at?
- Describe how cognition has been applied to interaction design
- Mental Models
- Internals classic theories of cognition
- More recent external theories of cognition
- cognitive frameworks

# kognitive processer

- attention
- perception
- memory
- learning
- reading, speaking, and listening
- problem solving, planning, reasoning, and decision making

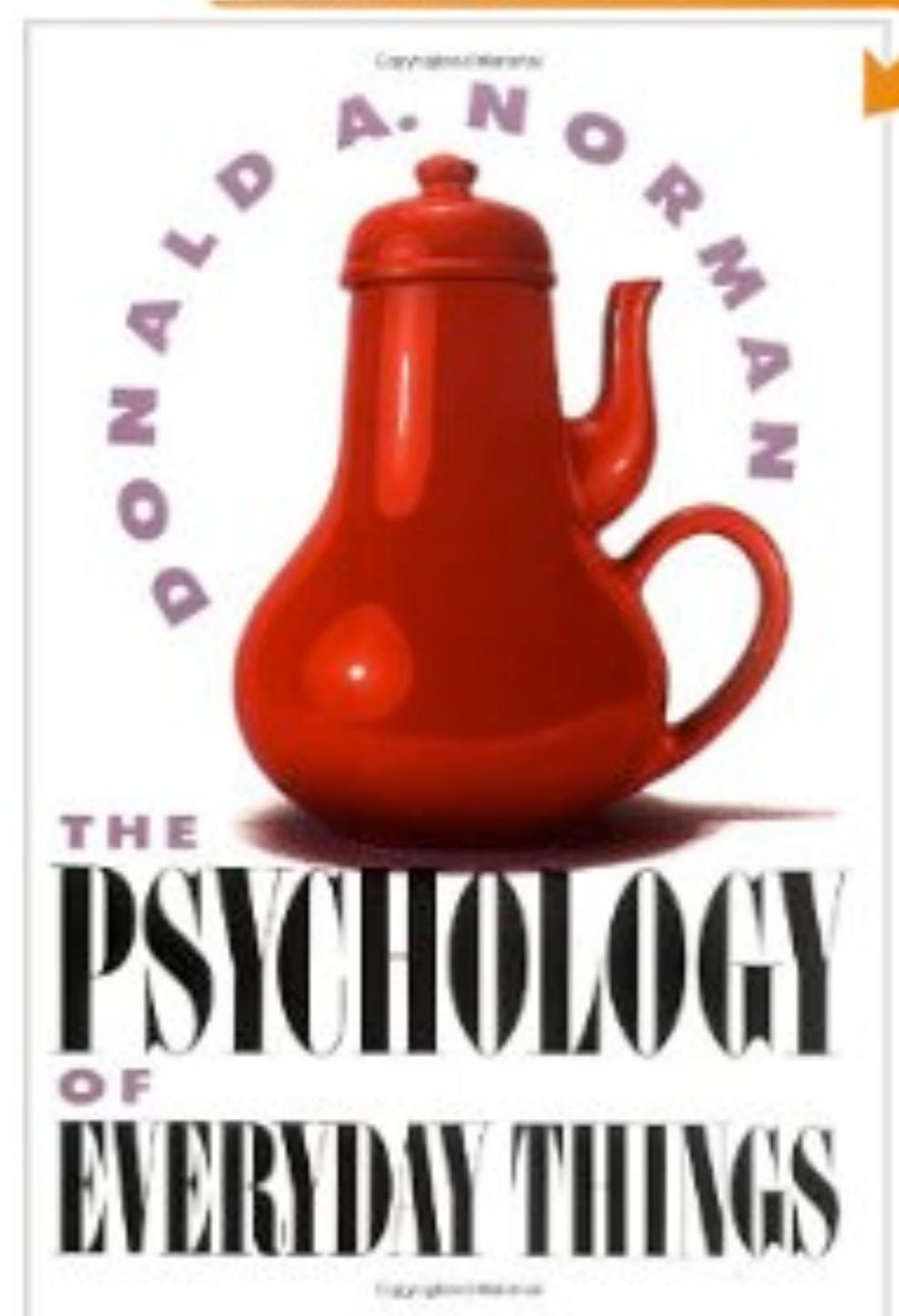
# Kahneman (2011)

- Fast thinking
- Slow thinking

# Norman

- experiential cognition
  - perceive, act, react to events around us effectively and effortlessly
- reflective cognition
  - thinking, comparing, decision making

[Click to LOOK INSIDE!](#)



# Knowing what to do



# Knowing what to do



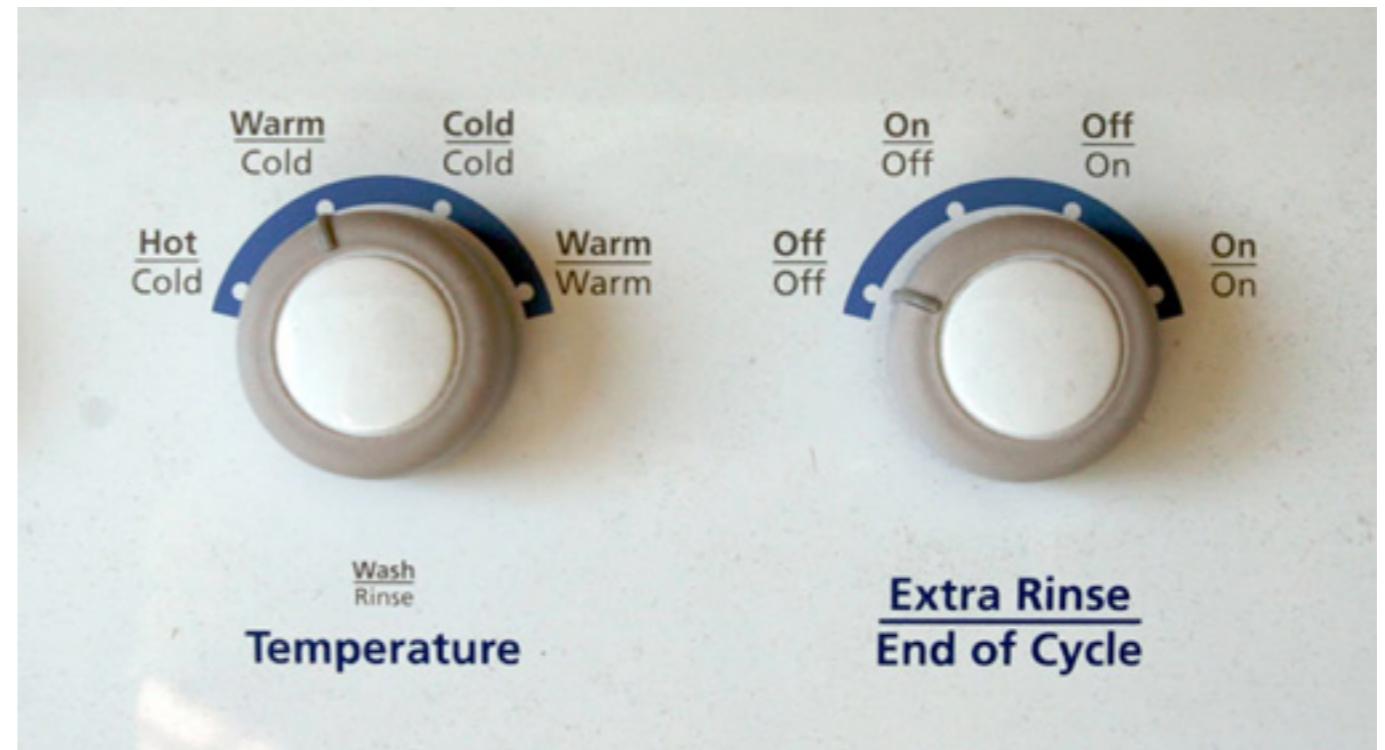
# Design principles

- Visibility
- Feedback
- Constraints
- Affordances

# Feedback er ?

- ↳ Baglæns iteration i interaktionsdesignprocessen
- ↳ Et andet ord for analyse
- ↳ Et signal fra systemet om hvad en udført handling har resulteret i
- ↳ Et signal fra systemet om hvad en potentiel handling sandsynligvis vil resultere i

# Bad designs



# kognitive processer

- attention
- perception
- memory
- learning
- reading, speaking, and listening
- problem solving, planning, reasoning, and decision making

# Attention

- Vælge ting at koncentrere sig om
  - auditiv
  - visuel



# Sammenhæng mellem mål og tilgængelig information



# Information presentation

## Pris for dobbeltværelse

### Pennsylvania

Bedford Motel/Hotel: Crinaline Courts

(814) 623-9511 S: \$18 D: \$20

Bedford Motel/Hotel: Holiday Inn

(814) 623-9006 S: \$29 D: \$36

Bedford Motel/Hotel: Midway

(814) 623-8107 S: \$21 D: \$26

Bedford Motel/Hotel: Penn Manor

(814) 623-8177 S: \$19 D: \$25

Bedford Motel/Hotel: Quality Inn

(814) 623-5189 S: \$23 D: \$28

Bedford Motel/Hotel: Terrace

(814) 623-5111 S: \$22 D: \$24

Bradley Motel/Hotel: De Soto

(814) 362-3567 S: \$20 D: \$24

Bradley Motel/Hotel: Holiday House

(814) 362-4511 S: \$22 D: \$25

Bradley Motel/Hotel: Holiday Inn

(814) 362-4501 S: \$32 D: \$40

Breezewood Motel/Hotel: Best Western Plaza

(814) 735-4352 S: \$20 D: \$27

Breezewood Motel/Hotel: Motel 70

(814) 735-4385 S: \$16 D: \$18

### South Carolina

City	Motel/Hotel	Area code	Rates		
			Phone	Single	Double
Charleston	Best Western	803	747-0961	\$26	\$30
Charleston	Days Inn	803	881-1000	\$18	\$24
Charleston	Holiday Inn N	803	744-1621	\$36	\$46
Charleston	Holiday Inn SW	803	556-7100	\$33	\$47
Charleston	Howard Johnsons	803	524-4148	\$31	\$36
Charleston	Ramada Inn	803	774-8281	\$33	\$40
Charleston	Sheraton Inn	803	744-2401	\$34	\$42
Columbia	Best Western	803	796-9400	\$29	\$34
Columbia	Carolina Inn	803	799-8200	\$42	\$48
Columbia	Days Inn	803	736-0000	\$23	\$27
Columbia	Holiday Inn NW	803	794-9440	\$32	\$39
Columbia	Howard Johnsons	803	772-7200	\$25	\$27
Columbia	Quality Inn	803	772-0270	\$34	\$41
Columbia	Ramada Inn	803	796-2700	\$36	\$44
Columbia	Vagabond Inn	803	796-6240	\$27	\$30

# multitasking og attention

- heavy multi-taskers are easily distracted and find it difficult to filter irrelevant information (Ophir et al 2009)



"This project calls for real concentration.  
Are you still able to monotask?"

# Design implications for attention

- Make information salient when it needs attending to
- Use techniques that make things stand out like color, ordering, spacing, underlining, sequencing and animation
- Avoid cluttering the interface with too much information
- Avoid using too much because the software allows it

# Perception

- information acquired from environment and transformed into experiences of objects, events, sounds and tastes
- involverer forskellige sanser, syn, høre, føle

# Find Italian, French

Black Hills Forest	Peters Landing	Jefferson Farms	Devlin Hall	Webmaster	Curriculum	Student Life	Dance
Cheyenne River	Public Health	Psychophysics	Positions	Russian	Emergency (EMS)	Accountancy	Gerontology
Social Science	San Bernardino	Political Science	Hubard Hall	Athletics	Statistics	McKnight Center	Marketing
South San Jose	Moreno Valley	Game Schedule	Fernadino Beach	Go Shockers	Award Documents	Council of Women	College Bylaws
Badlands Park	Altamonte Springs	South Addison	Council Bluffs	Degree Options	Language Center	Commute	Why Wichita?
Juvenile Justice	Peach Tree City	Cherry Hills Village	Classical Lit	Newsletter	Future Shockers	Small Business	Tickets
Results and Stats	Highland Park	Creative Writing	Sociology	Geology	Intercollegiate	Thinker & Movers	Career Services
Thousand Oaks	Manchesney Park	Lake Havasu City	Greek	Manufacturing	Bowling	Alumni	Doers & Shockers
Promotions	Vallecito Mts.	Engineering Bldg	Wallace Hall	Management	Wichita Gateway	Foundations	Core Values
North Palermo	Rock Falls	Sports Studies	Concert Tickets	UCATS	Transfer Day	Corbin Center	Grace Wilkie Hall
Credit Union	Freeport	Lakewood Village	Public Radio FM	Alumni News	Job Openings	Jardine Hall	Strategic Plan
Wilner Hall	Slaughter Beach	Rock Island	Children's Museum	Saso	Live Radio	Hugo Wall School	Medical Tech
Performing Arts	Rocky Mountains	Deerfield Beach	Writing Center	Educational Map	Beta Alpha Psi	Staff	Softball, Men's
Italian	Latin	Arlington Hill	Theater Auditions	Physical Plant	Liberal Arts	Aerospace	McKinley Hall
Coaches	Pleasant Hills	Preview Game	Delaware City	Graphic Design	Counseling	Choral Dept.	Email
McKees Rocks	Observatory	Richland Hills	Scholarships	Non Credit Class	Biological Science	Alberg Hall	Dental Hygiene
Glenwood Springs	Public Affairs	Experts Guide	Hendricksville	Media Relations	Duerksen Fine Art	French	Tenure
Urban Affairs	Heskett Center	Neff Hall	Knights Landing	Advertising	EMT Program	Spanish	Personnel Policies
McLeansboro	Brunswick	Grand Wash Cliffs	Modern Literature	English	Religion	Parents	Instrumental
Experimental Links	East Millinocket	Indian Well Valley	Studio Arts	Graduate Complex	Art Composition	Wrestling	Nursing
Graduation	Women's Studies	Online Courses	Hughes Complex	Music Education	Physics	Philosophy	Opera
Emory Lindquist	Vacant	Lindquist Hall	Cumberland Flats	Advising Center	Entrepreneurship	Wichita Lyceum	Sports History
Clinton Hall	News Theatre	Fisk Hall	Central Village	Medical School	Koch Arena	Fairmount Center	Athletic Dept.
San Luis Obispo	Candlewood Isle	Los Padres Forest	Hoffman Estates	Levitt Arena	Roster	Women's Museum	Health Plan

# Perception

- Lettere at genkende end at huske
- Konteksten har betydning

# Design implications for perception

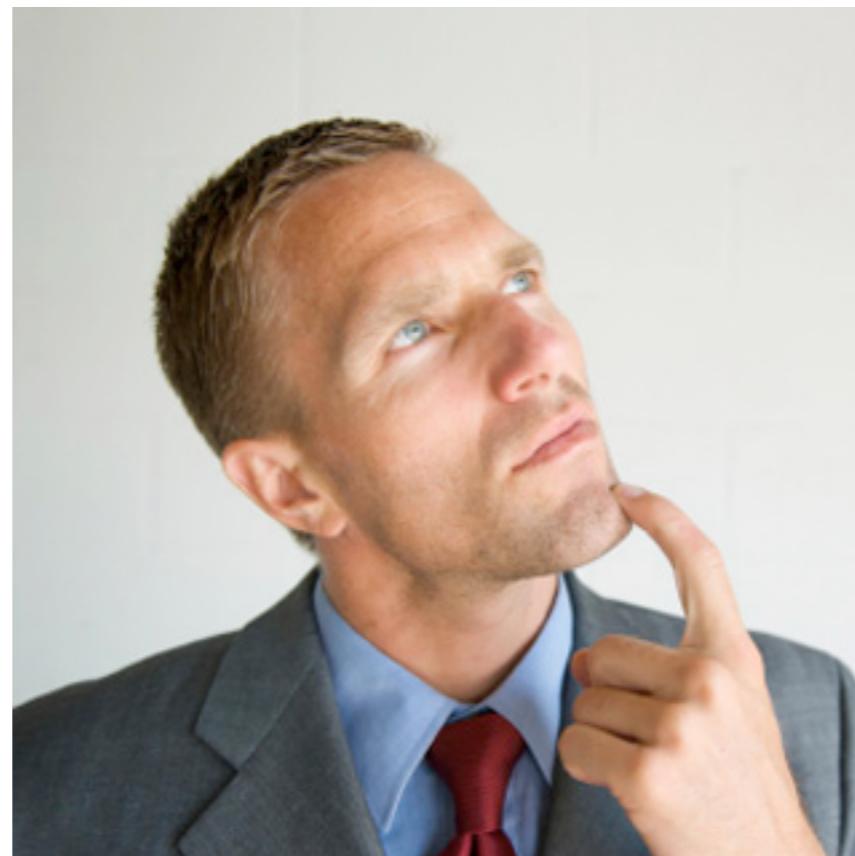
- Icons should enable users to readily distinguish their meaning
- Bordering and spacing are effective visual ways of grouping information
- Sounds should be audible and distinguishable
- Speech output should enable users to distinguish between the set of spoken words
- Text should be legible and distinguishable from the background
- Tactile feedback should allow users to recognize and distinguish different meanings

# Memory

- øget kompleksitet af hvad vi skal huske
- recall and recognition
- vigtigt at designe til såvel recall som recognition

Miller 1956

vi kan huske 7+-2 elementer vha  
korttidshukommelse



Miller 1956

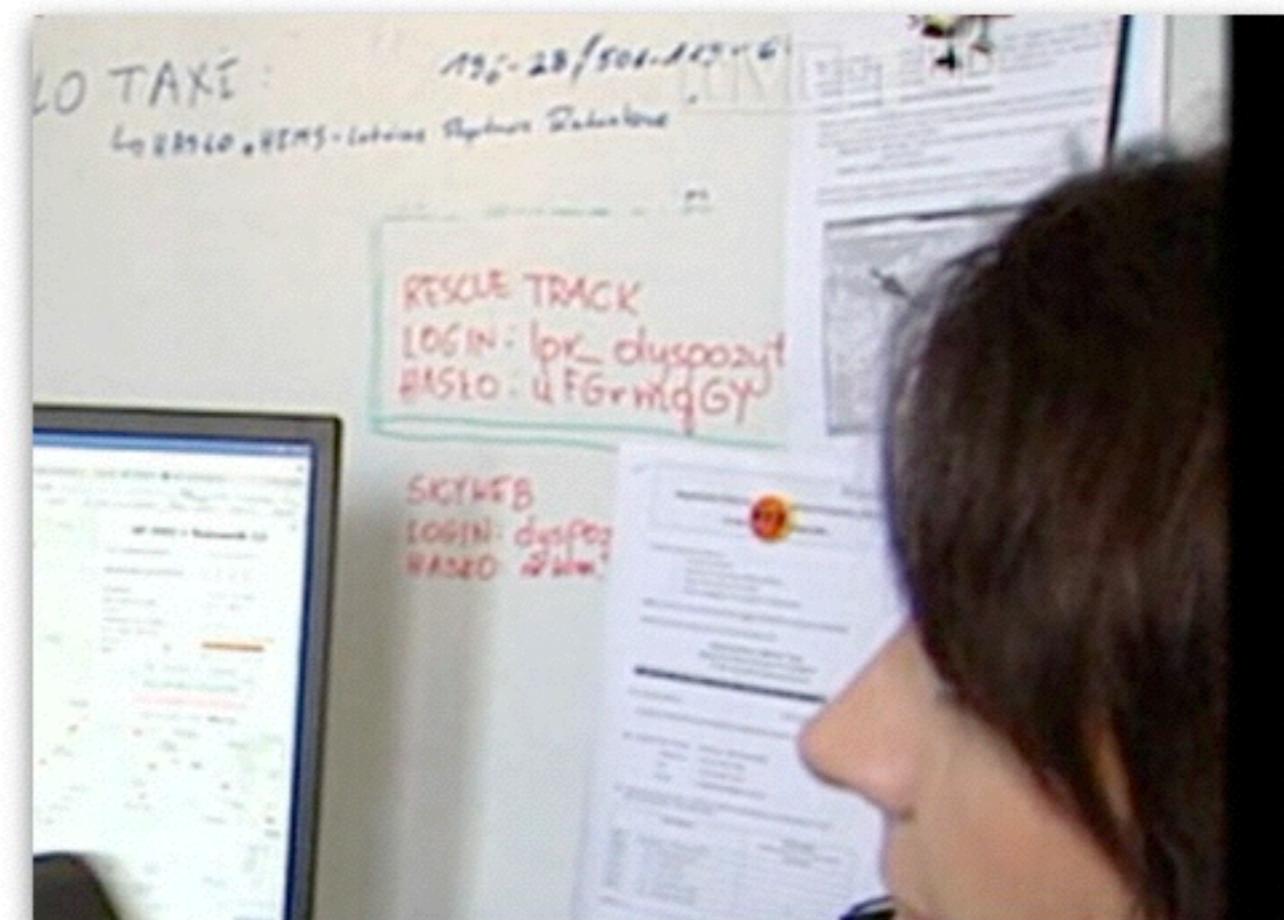
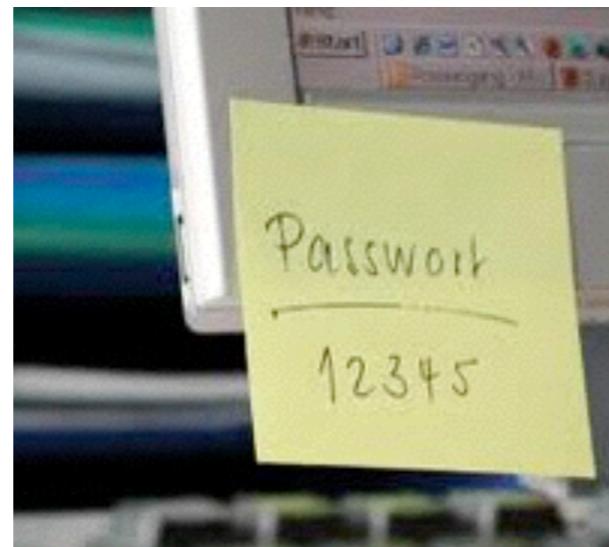
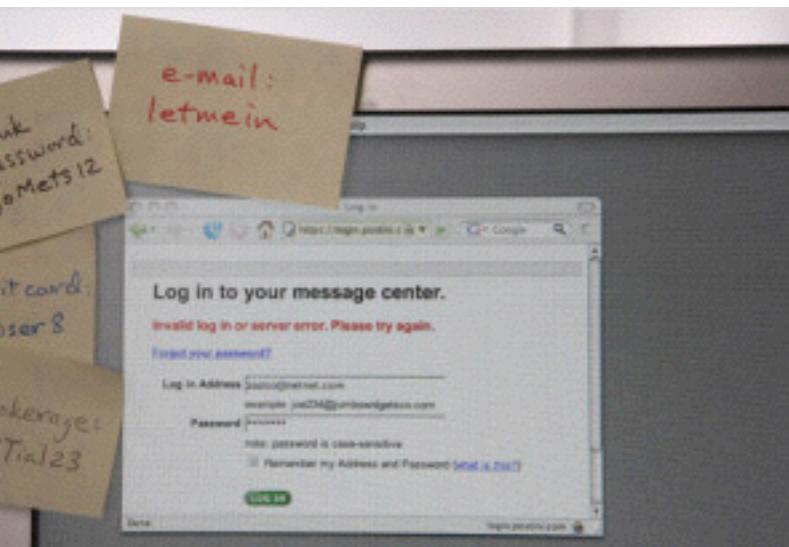
vi kan huske 7+-2 elementer vha  
korttidshukommelse

- meget misbrugt indenfor interaktionsdesign
- betyder ikke
  - hav 7 options i menu bar
  - hav max 7 ikoner etc...

# Design implications for Memory

- Don't overload users' memories with complicated procedures for carrying out tasks
- Design interfaces that promote recognition rather than recall
- Provide users with various ways of encoding information to help them remember
  - e.g. categories, color, flagging, time stamping

# Passwords



# Learning

- Hvordan man lærer at anvende et system
- Anvende et system til at lære om et emne
- Svært at lære vha manual
  - learning by doing

# Interaktionsdesign værktøjer ift. learning?

# Design implications for learning

- Design interfaces that encourage exploration
- Design interfaces that constrain and guide learners
- Dynamically linking concepts and representations can facilitate the learning of complex material

# Læse, tale og lytte

- Forskelligt mellem mennesker og situationer hvad der er passende
  - personlige, aldersmæssige preferencer
  - kræver mindre kognitiv anstrengelse at lytte end at læse eller tale
  - ordblinde

# læse, tale og lytte systemer

- tale genkendelse
- syntetisk stemme
- oplæsning af tekst
- systemer der kommunikerer via naturligt sprog

# Design implicationer ift. læse, tale og lytte

- Speech-based menus and instructions should be short
- Accentuate the intonation of artificially generated speech voices
  - they are harder to understand than human voices
- Provide opportunities for making text large on a screen

# Problem løsning, planlægning, ræsonering og beslutningstagning

- Reflektion
- Bevidste processer
- Diskussion
- Anvendelse af værktøjer
- Afprøvning af forskellige scenarier

# Design implikationer beslutnings tagning

- Provide additional information/functions for users who wish to understand more about how to carry out an activity more effectively
- Use simple computational aids to support rapid decision-making and planning for users on the move

# Kognitive frameworks

- Interne
  - mentale modeller
  - Gulfs of execution and evaluation
  - Information processing
- Eksterne
  - Distributed cognition
  - External cognition
  - Embodied interaction

# Mental model

- model af hvordan man kan anvende et system
- model af hvordan system virker

- Craik (1943) described mental models as:
  - internal constructions of some aspect of the external world enabling predictions to be made
- Involves unconscious and conscious processes
  - images and analogies are activated
- Deep versus shallow models
  - e.g. how to drive a car and how it works

# Mentale modeller

## opbygning

- Lære om system
- Anvende system
- ofte inkomplette

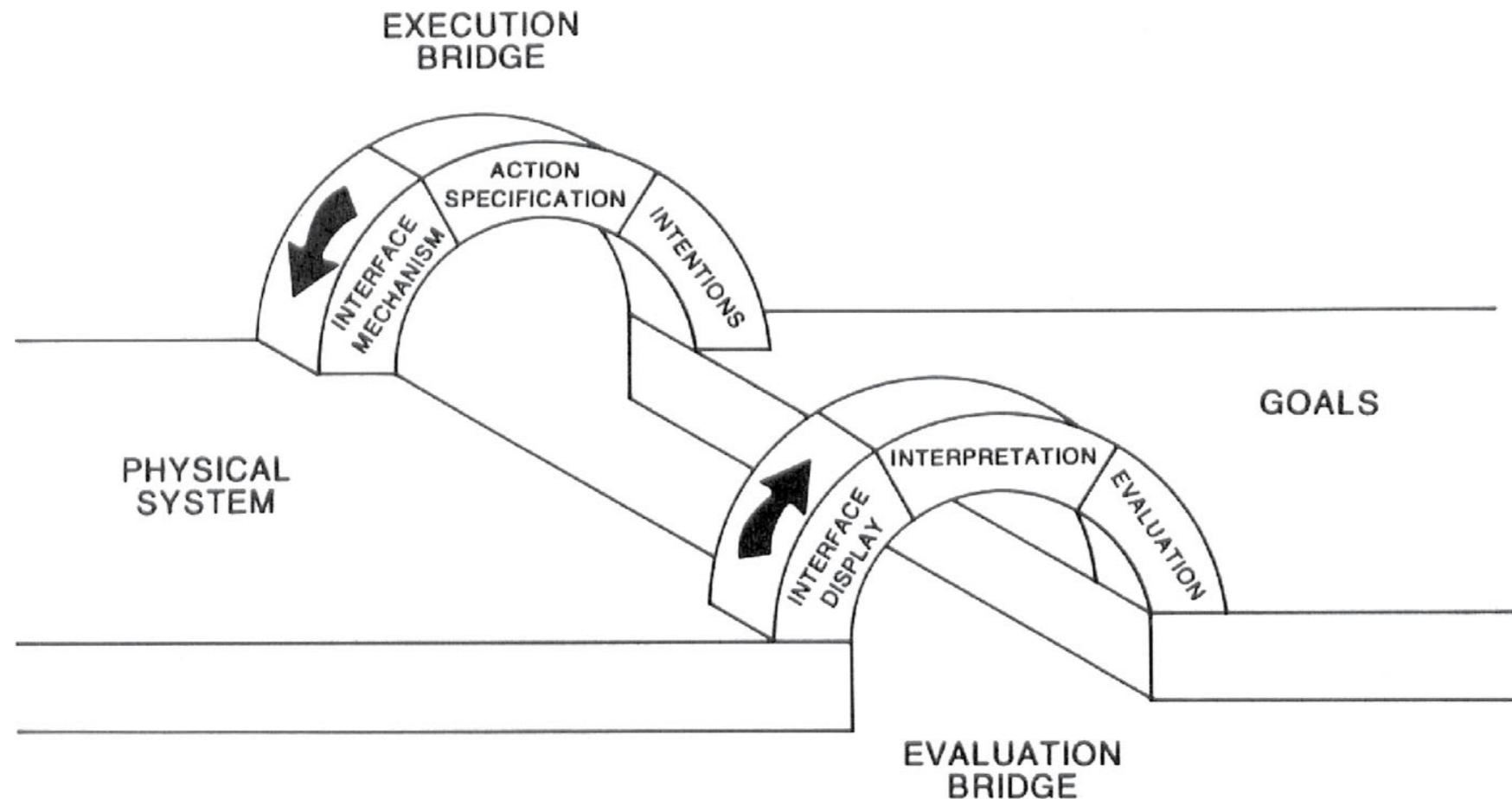
# ATM eksempel

- hvor mange penge må du hæve?
- hvad sker der hvis du prøver at hæve det beløb fra forskellige automater?
- hvad sker der hvis du taster forkert kode?
- hvorfor er der pause mellem transaktionerne?
- hvad sker der med kortet i automaten?
- kan du taste ‘fremad’?
- tæller du pengene? hvorfor?

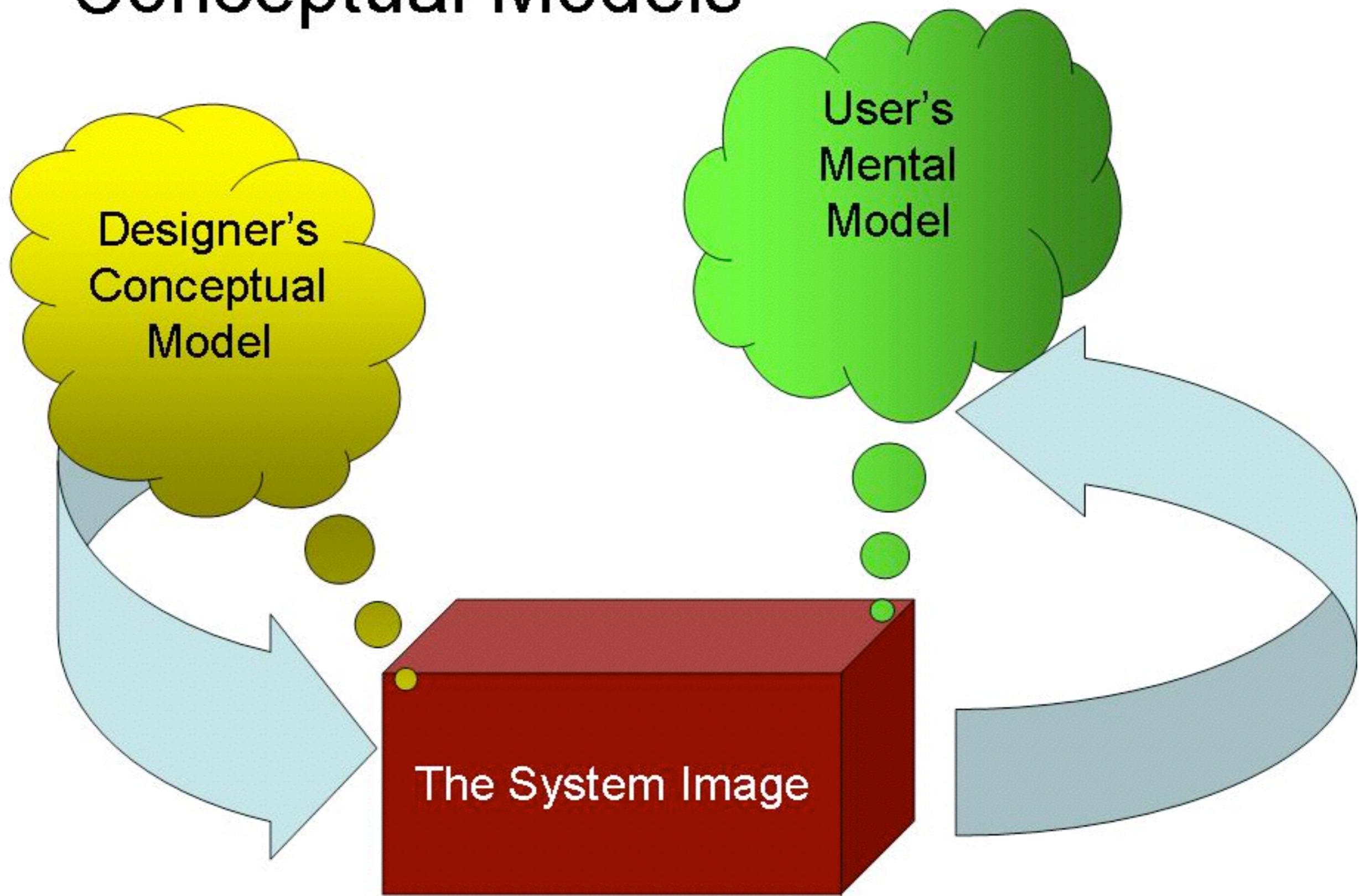
# Mental model og konceptuelt design

- ideelt overenstemmelse mellem mental model og konceptuelt design
- kræver tydeligt og kommunikeret konceptuelt design
- Transparens

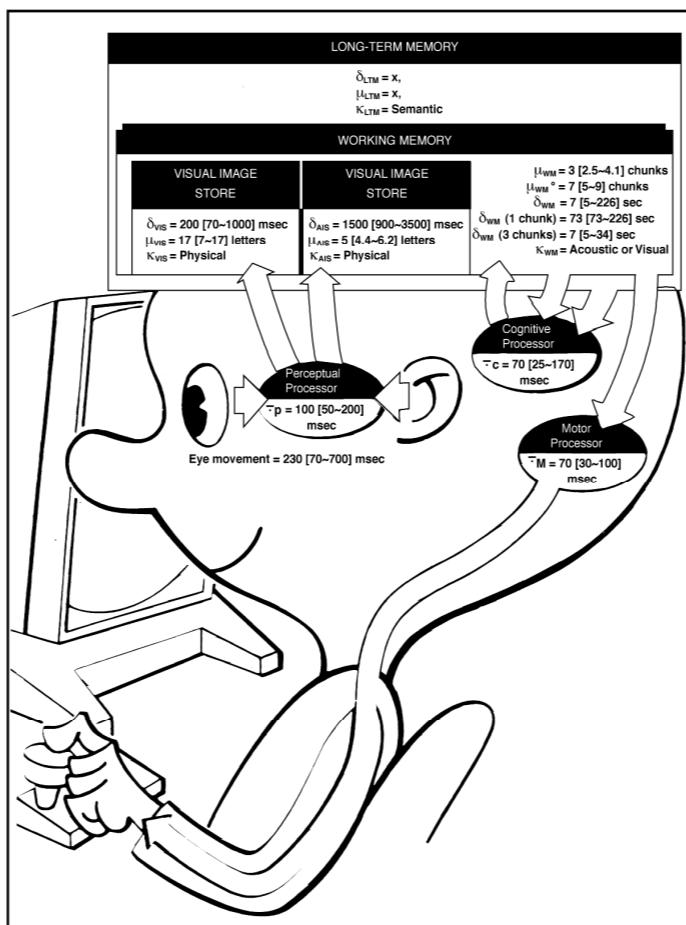
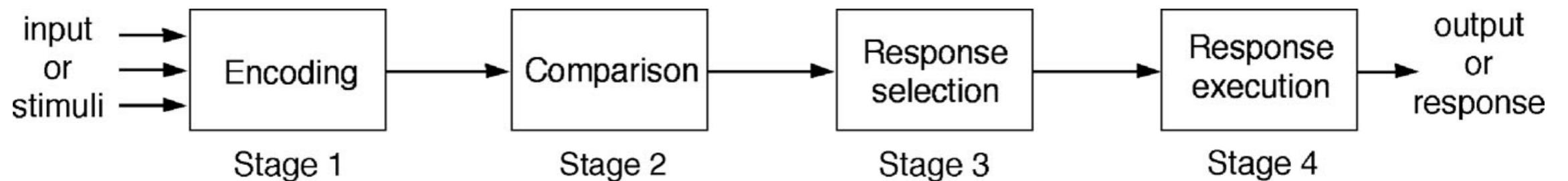
# Bridging the gulfs of execution and evaluation



# Conceptual Models



# modeller af cognition som informationsprocessering



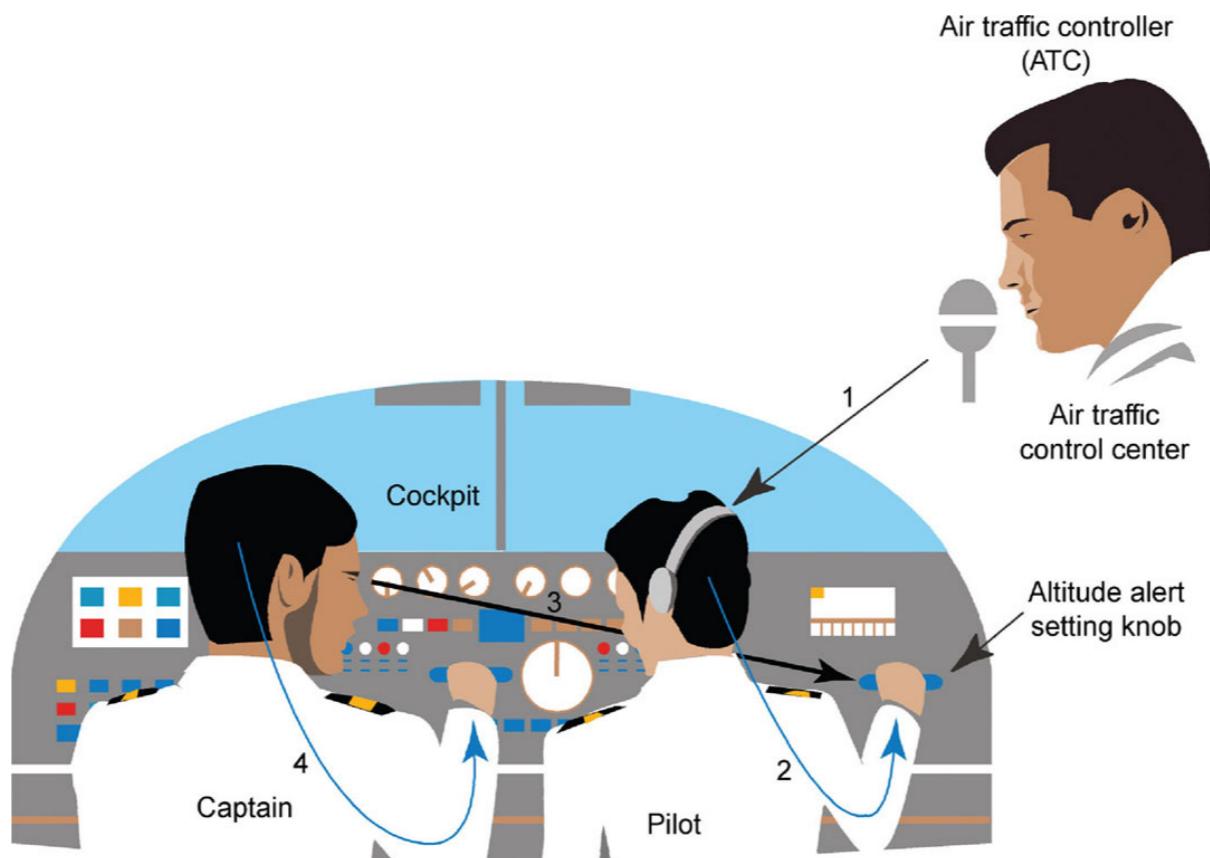
# kritik af modellerne

- fokuserer udelukkende på hvad der sker inde i hovedet på et enkelt individ ift. et enkelt system
- omfatter ikke tilstrækkelig beskrivelse af hvordan folk interagerer med systemer, hinanden og context i den virkelige verden

# Distributed cognition

- kognitive fænomener der omfatter individer, værktøjer, interne og eksterne repræsentationer
- fokus på hvordan information flyder rundt mellem disse

# Distributed cognition analyse

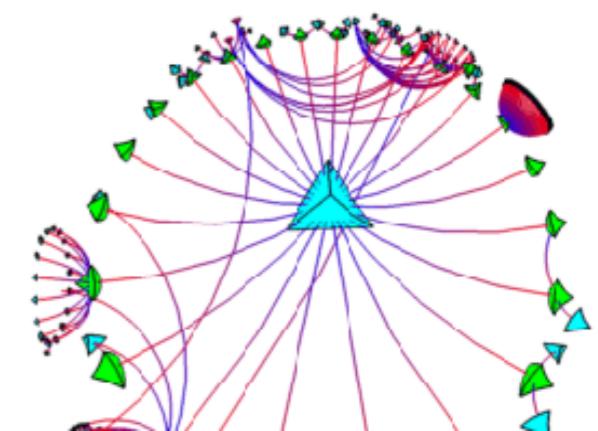


Propagation of representational states:

- 1 ATC gives clearance to pilot to fly to higher altitude (verbal)
- 2 Pilot changes altitude meter (mental and physical)
- 3 Captain observes pilot (visual)
- 4 Captain flies to higher altitude (mental and physical)

# External cognition

- Externalisere for at reducere memory load
- Externe repræsentationer
  - to-do lister, kalendre, noter, indkøbslister
  - informationsvisualisering
- Externe repræsentationer i grænsefladen der reducerer memory load



# Eksempler på Ekstern Cognition?

- Hvor mange eksterne repræsentationer har du benyttet i dag og hvilke?

# Embodied interaction

- Dourish (2001) where the action is
- Fokus på praktisk, virklig liv
- Social og fysisk kontekst
- Kompleks praksis

# Cognitive aspekter

- Et perspektiv på interaktion
  - social interaktion og emotional og æstetisk interaktion udgør alternative perspektiver
- Kognition omfatter en række processer
- Interaktionsdesign påvirker disse processer
- Modeller for kognition kan bidrage med forklaringer og forudsigelser