Integration (of research) in the design process

…and vice versa

On designing
On research types
On thinking
On people-centered design research

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IDStudioLab

TU Delft
Delft University of Technology

About design...

Industrial Design Engineering
is everywhere

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The faculty of **Industrial Design Engineering**

- Founded in 1969
- Largest university-based design course worldwide
- 2000 students
- 200 scientific staff
- Over 3800 alumni
- 3 departments
- 1 BSc programme
- 3 MSc programmes

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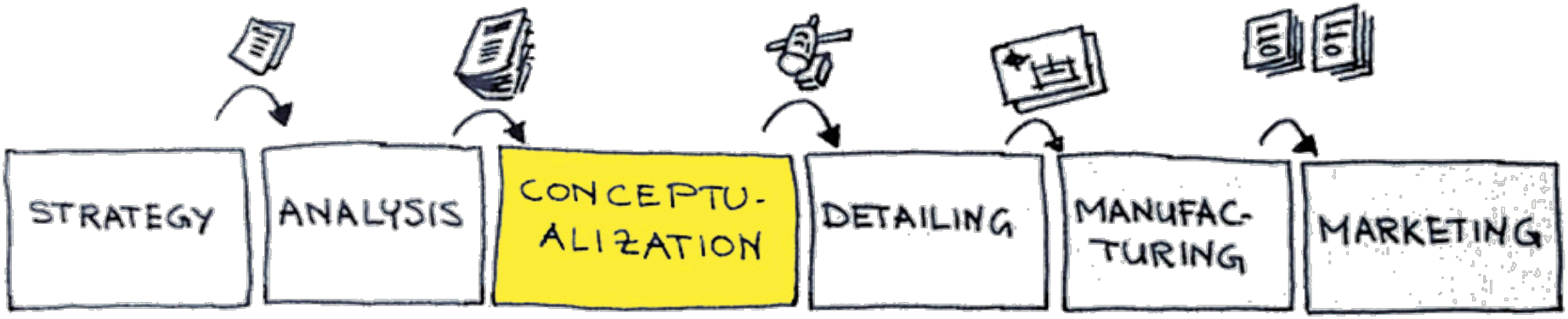
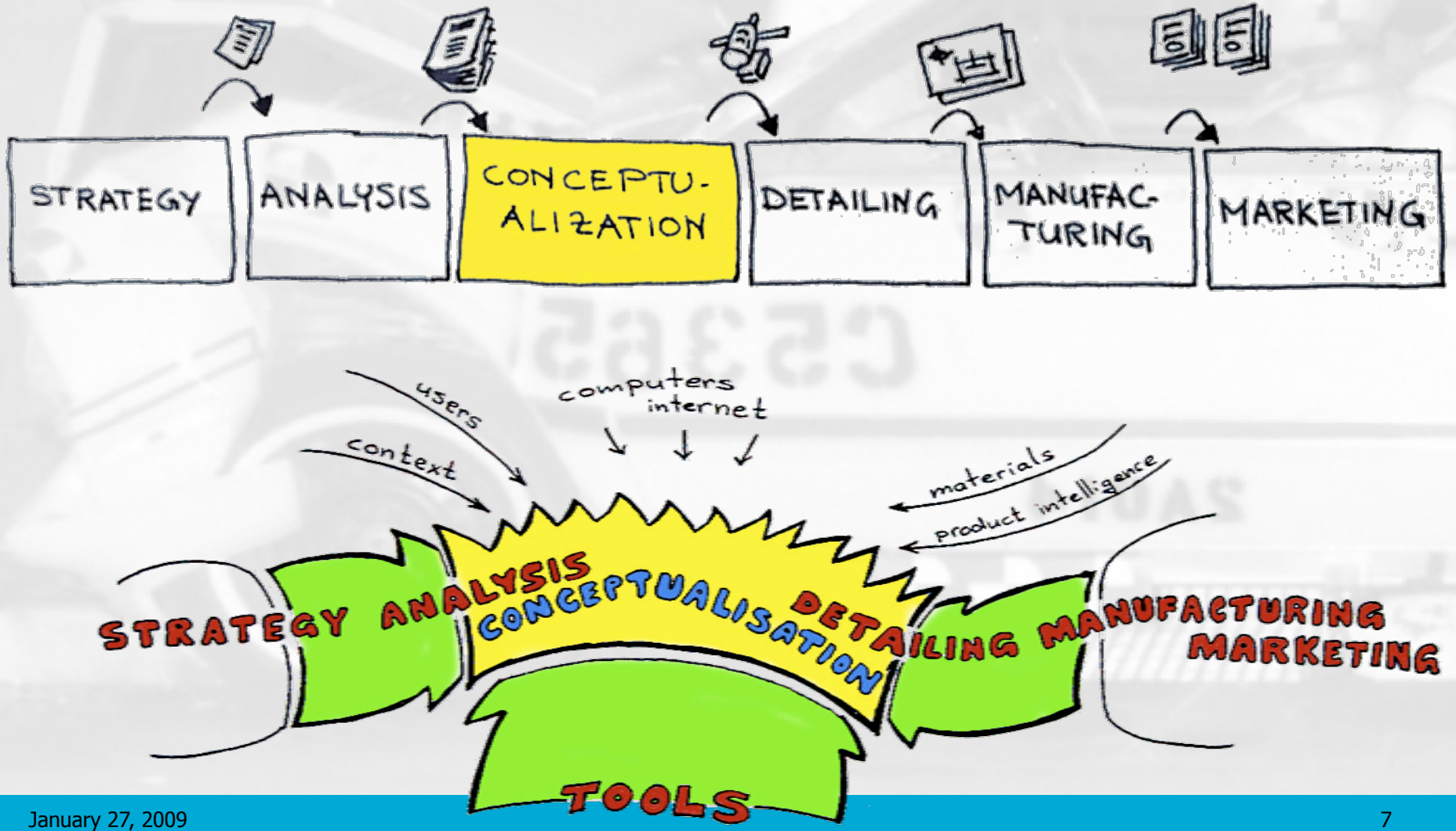
Designer, studio, and tools...

(the) design process



Welcome to the crumple zone



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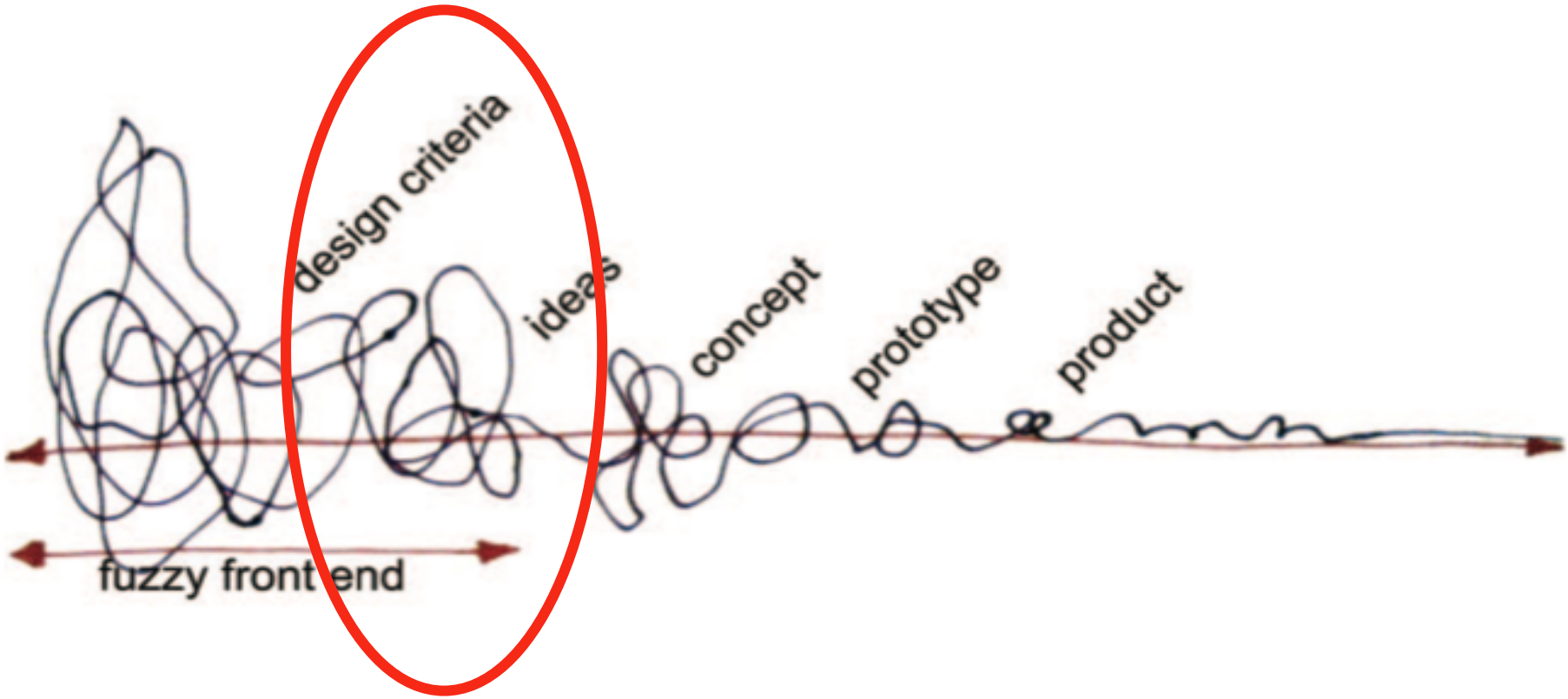
Design process – the early phase



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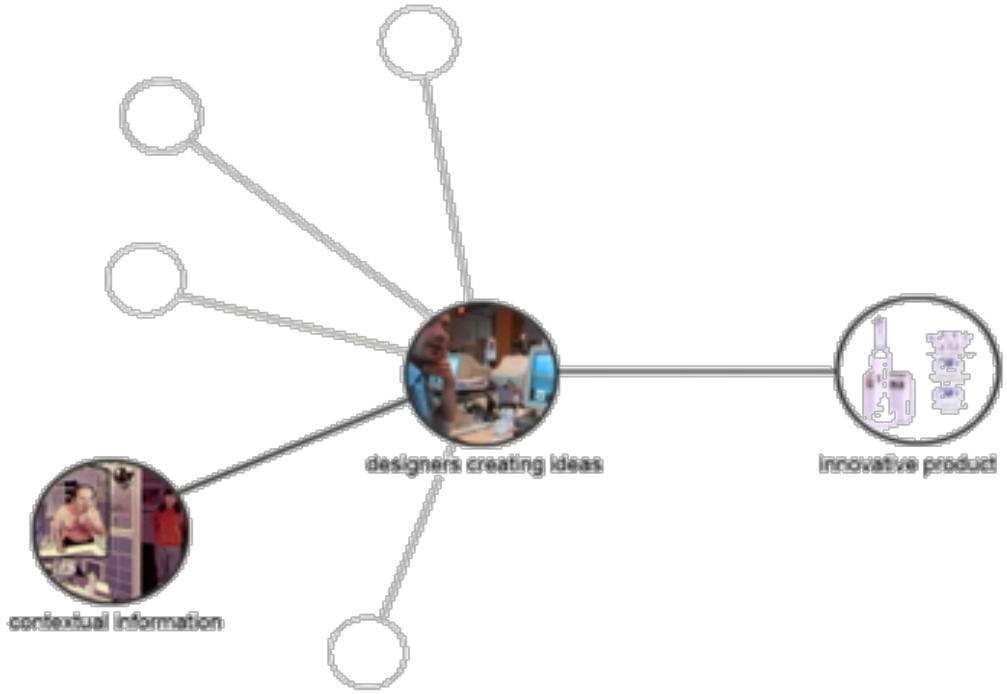
Research in the design process: design is always about integrating many conflicting sources of constraint, and opportunity



Cross about designerly ways...

In a 1982 article, Cross identified five aspects of what he labeled designerly ways of knowing:”

(1) Designers tackle **ill-defined** problems,

(2) their mode of problem-solving is **solution-focused**,

(3) their mode of thinking is **constructive**,

(4) they use codes that **translate** abstract requirements into concrete objects, and

(5) they use these codes to both read and write in inject languages."

About research

About research

- Design is just exploring its relation to research

- The role of research in design – acknowledged
- The role of design in research – budding

- The role of design next to research – growing

There's not just one type of research

Sanders:
-Inspiration / information
Harré:
- different types of experiment
Bush:
- a dimension
Stokes:
-two dimensions
Horvath's model
Iterative prototyping spiral

Sanders about research and design

Information

idea

- Conducted by researchers and applied social scientists
- Borrows from the scientific method
- Values reliability, validity and rigor
- Builds upon investigation, analysis and planning
- Relies on extrapolation from the past as a way to move into the future

Inspiration

- Explored and applied by designers
- Is discovering its own tenets of what it good research
- Values relevance, generativity and evocativeness
- Built through anticipatory thinking, ambiguity and surprise
- Draws primarily from the future, using imagination as the basis for expression

Harré's types of 'experiment'

- Exploring the characteristics of a naturally occurring process (Aristotle's study of the egg)
- Deciding between rival hypotheses (Popper)
- Finding the form of a law inductively (Galileo's motion laws)
- Using models to simulate otherwise unresearchable processes (Theodoric's model of the rainbow)
- Exploiting the accident (Pasteur's vaccines)
- Null results…
- Finding a hidden mechanism (Gibson's touch experiment)
- Existence proofs (Thomson's discovery of the electron)
- Decomposing an apparently simple phenomenon (Newton's rainbow prism)
- Demonstrating underlying unity (Faraday's electricity & magnetism)
- Working wonderful apparatus…

Bush and Stokes

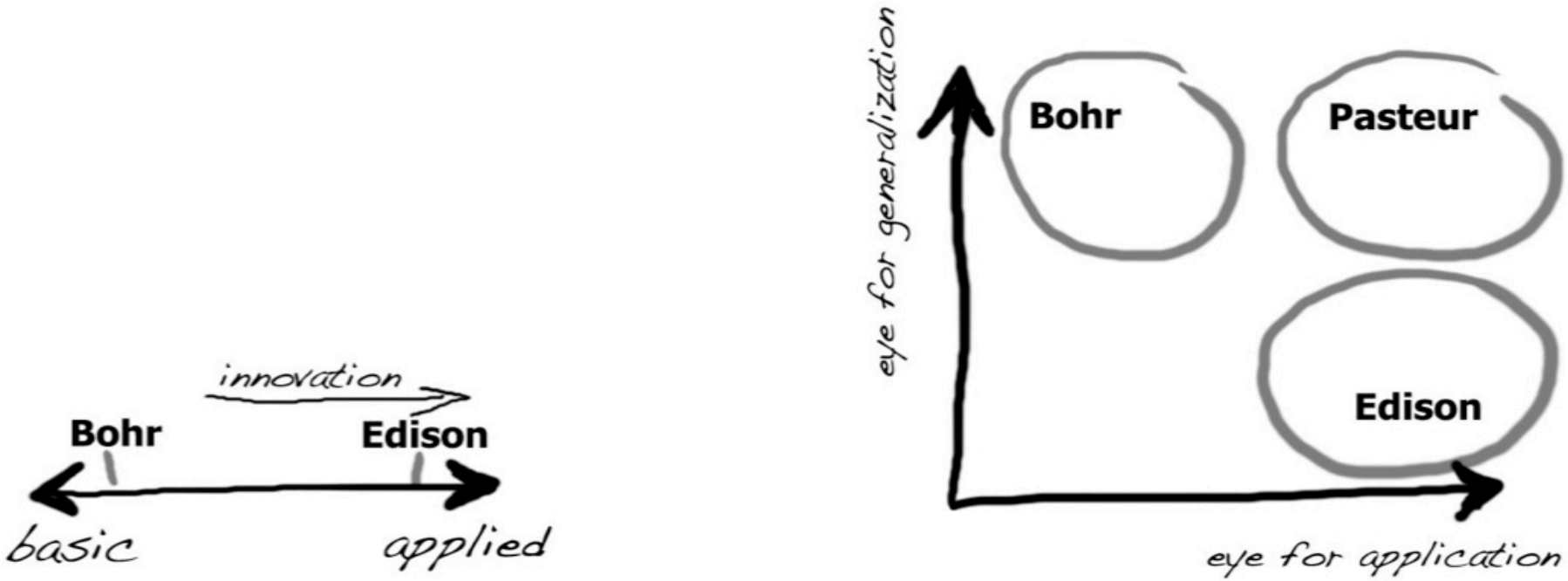


Figure 2. The linear and four-quadrant models (after Stokes, 1997)

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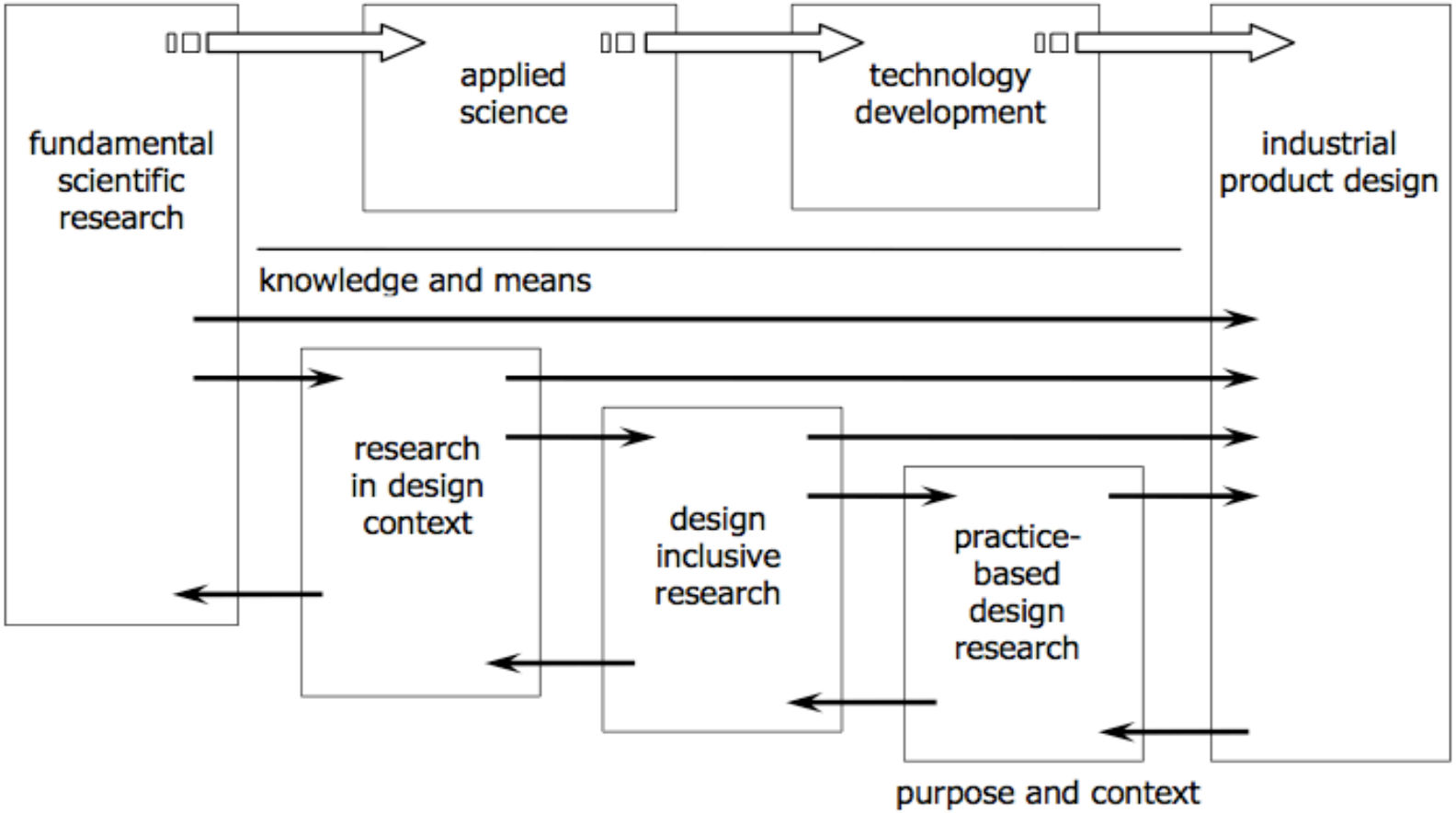
Horvath's model



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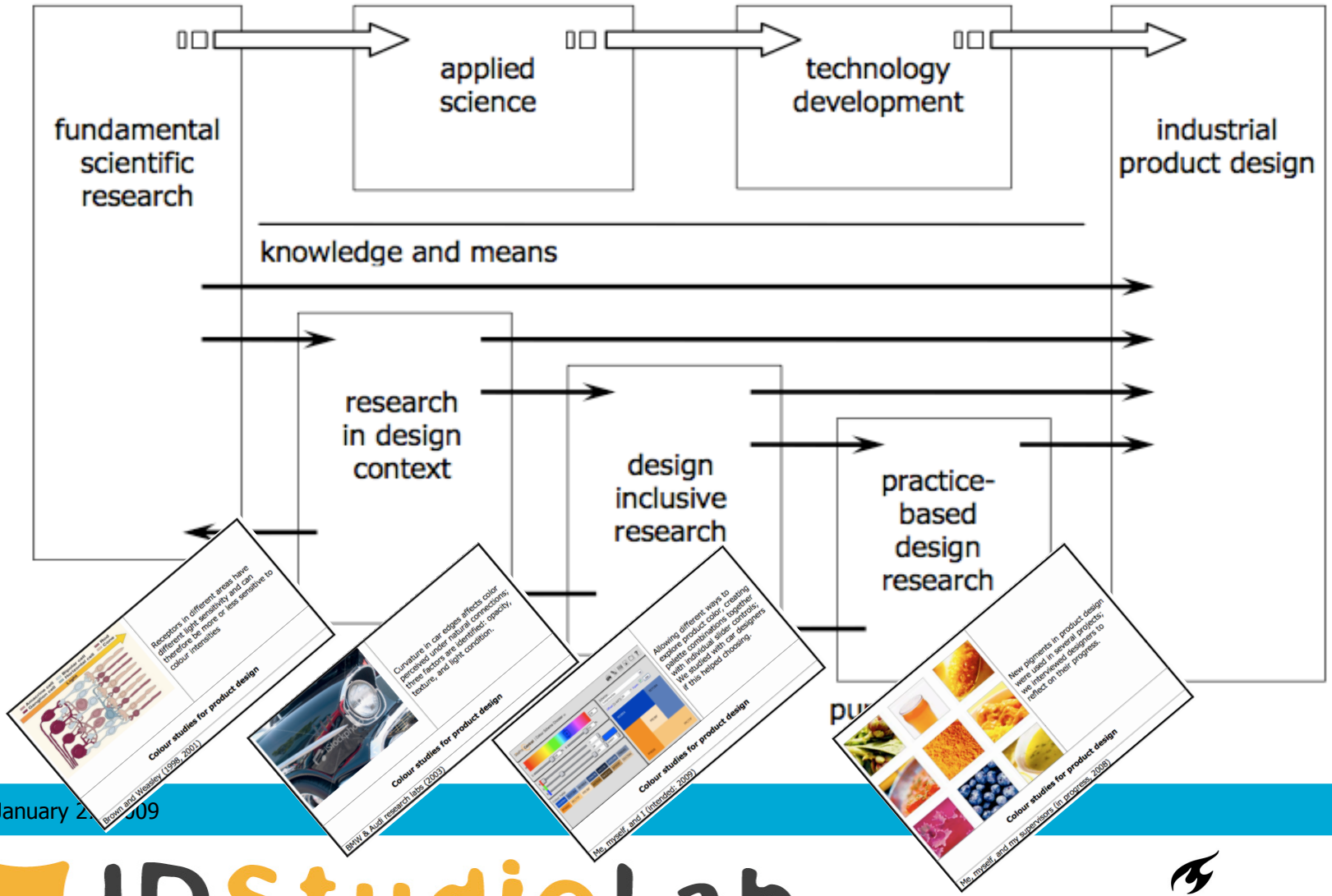
Ex1 - color



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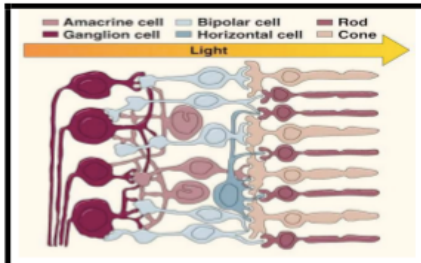
Ex1 – Color



Receptors in different areas have different light sensitivity and can therefore be more or less sensitive to colour intensities

Colour studies for product design

Brown and Weasley (1998, 2001)

Curvature in car edges affects color perceived under natural connections; three factors are identified: opacity, texture, and light condition.

Colour studies for product design

BMW & Audi research labs (2003)

Allowing different ways to explore product color, creating palette combinations together with individual slider controls; We studied with car designers if this helped choosing.

Colour studies for product design

Me, myself, and I (intended: 2009)

New pigments in product design were used in several projects; we interviewed designers to reflect on their progress.

Colour studies for product design

Me, myself, and my supervisors (in progress, 2008)

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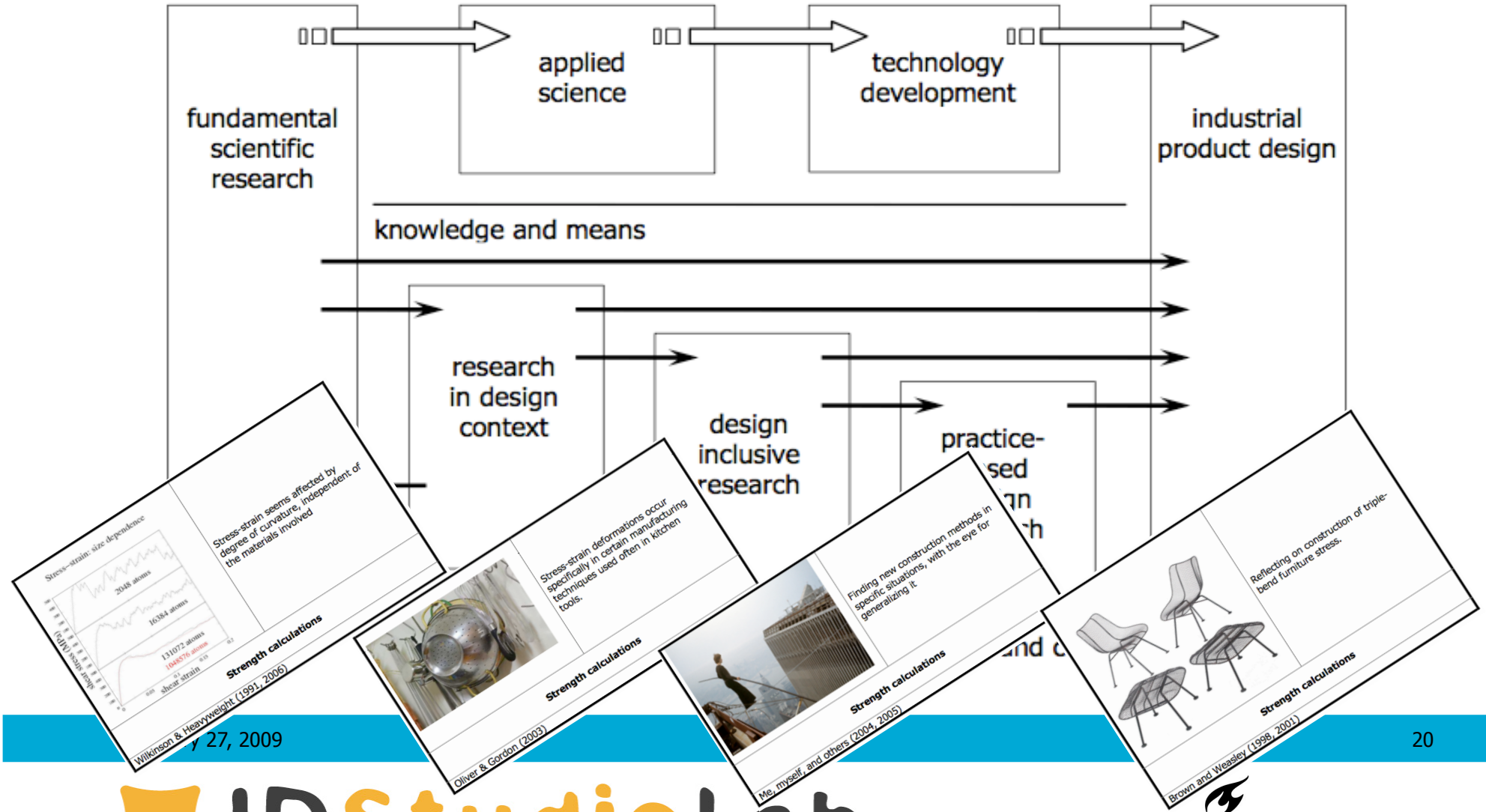
Ex2 – strength calculations



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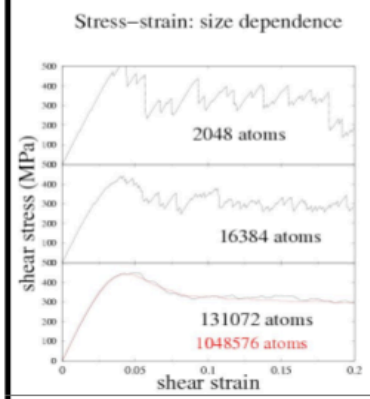
Ex2 – strength calculations



Stress-strain seems affected by degree of curvature, independent of the materials involved

Strength calculations

Wilkinson & Heavyweight (1991, 2006)

Stress-strain deformations occur specifically in certain manufacturing techniques used often in kitchen tools.

Strength calculations

Oliver & Gordon (2003)

Finding new construction methods in specific situations, with the eye for generalizing it

Strength calculations

Me, myself, and others (2004, 2005)

Reflecting on construction of triple-bend furniture stress.

Strength calculations

Brown and Weasley (1998, 2001)

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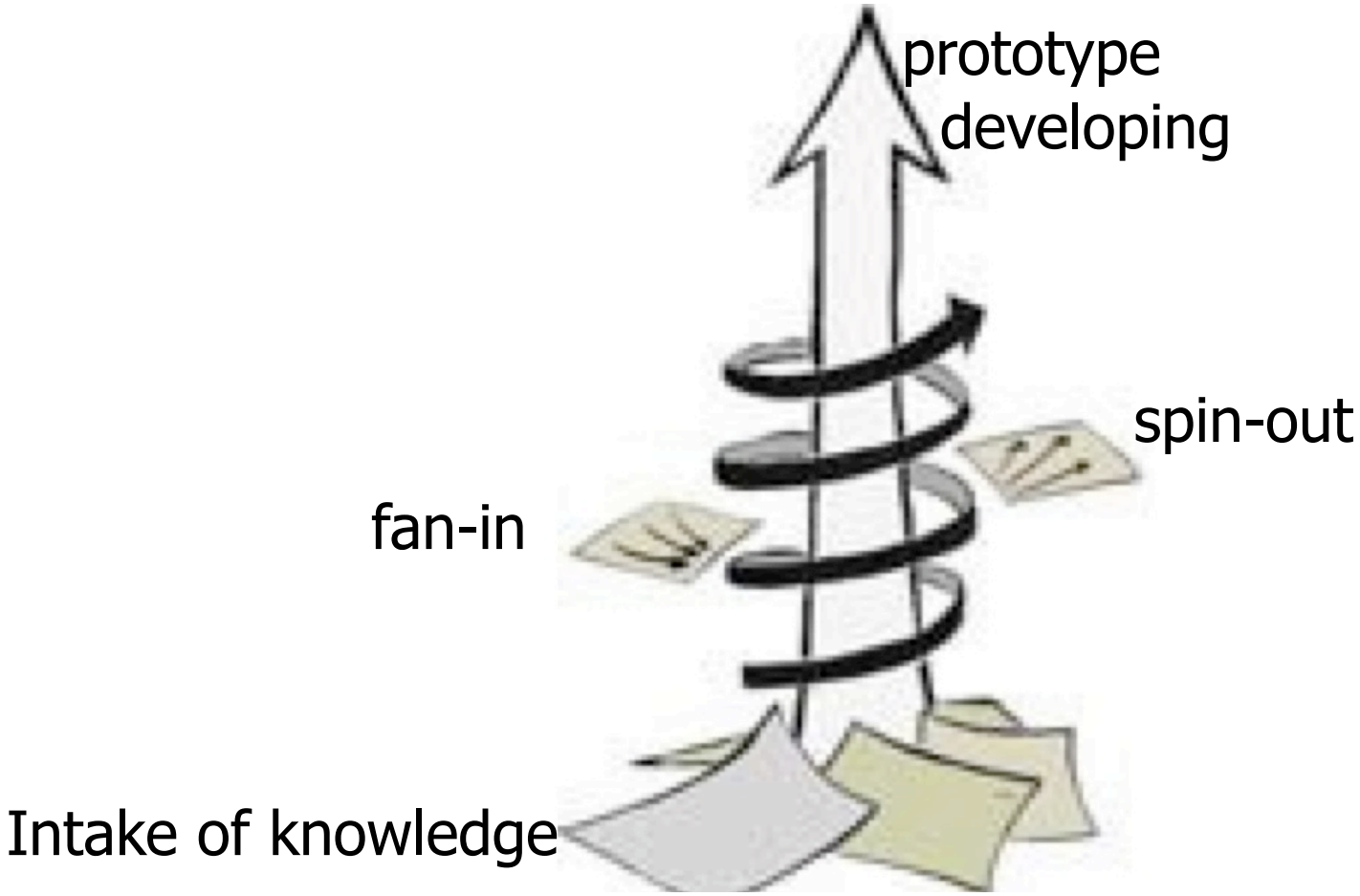
Knowledge spiral from DGK



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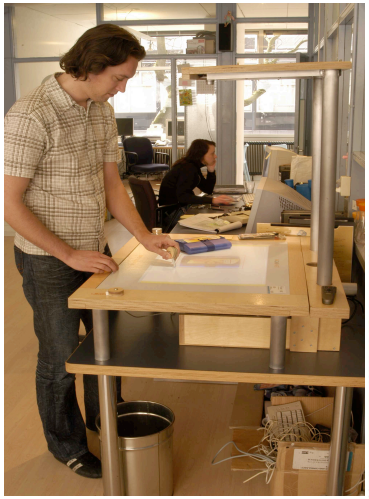
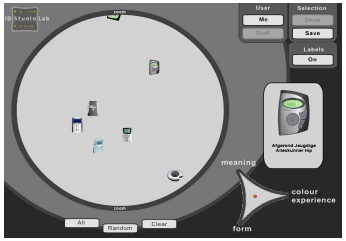
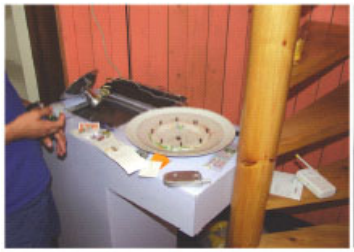
Research through design

Designing itself can generate knowledge
…but you have to spread it

Prototypes out of the lab, into the field
…get dirty, but get something done







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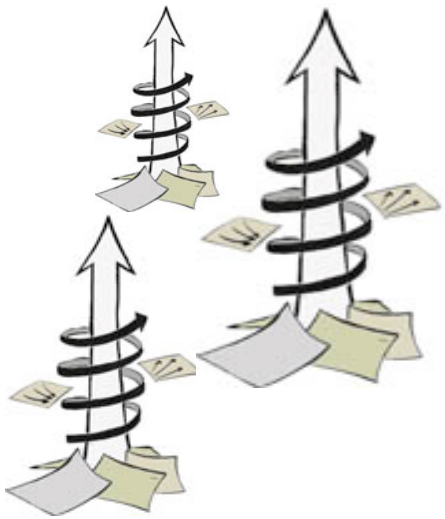
Importance of the Studio for design and design research



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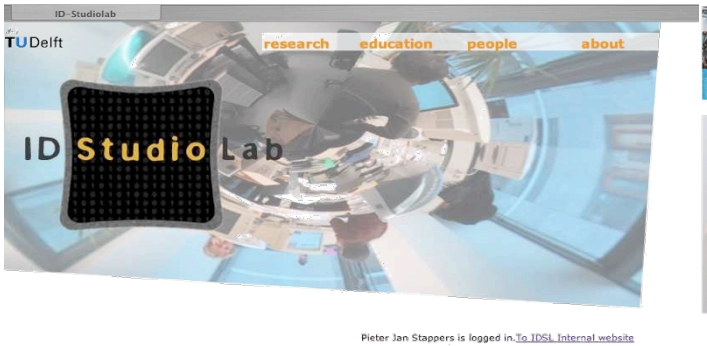

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About thinking

About thinking

- People think in different ways
- Designers often more in visual ways than others
- Making things is important for thinking
- People can think very well in terms of stories
  (hence, personas, scenarios, …)

Mintzberg

Decision making - it's not what you think

Characteristics of the Three Approaches to Making Decisions		
"Thinking first" features the qualities of	**"Seeing first" features the qualities of**	**"Doing first" features the qualities of**
science	art	craft
planning, programming	visioning, imagining	venturing, learning
the verbal	the visual	the visceral
facts	ideas	experiences

Mintzberg

When Each Decision-Making Approach Works Best

"THINKING FIRST" WORKS BEST WHEN:

- the issue is clear;
- the data is reliable;
- the context is structured;
- thoughts can be pinned down; and
- discipline can be applied

as in an established production process.

"SEEING FIRST" WORKS BEST WHEN:

- many elements have to be combined into creative solutions;
- commitment to those solutions is key; and
- communication across boundaries is essential

as in new-product development.

"DOING FIRST" WORKS BEST WHEN:

- the situation is novel and confusing;
- complicated specifications would get in the way; and
- a few simple relationship rules can help people move forward

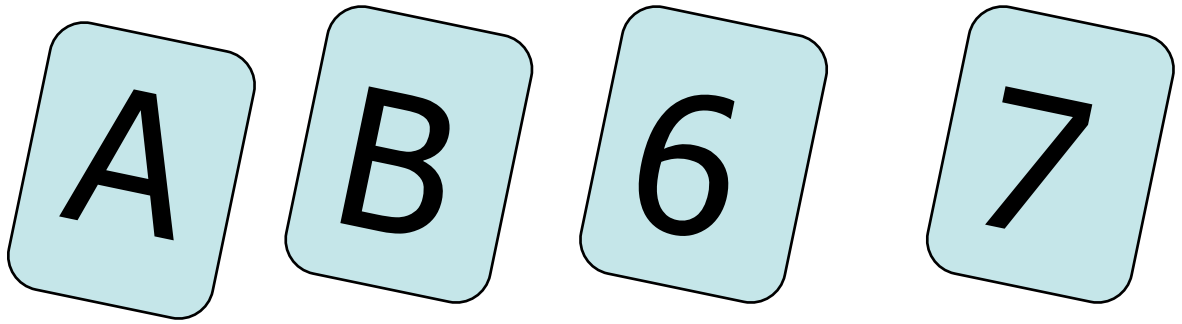
for example, when companies face a disruptive technology.

People think better in rich stories than in abstractions (Wason)…

Abstract rule:

> "if a card has a vowel on one side, then it must have an even number on the other side"

Which of these cards must you turn over to prove that the rule is true?



People think better in rich stories than in abstractions (Wason)…

Story rule:

"if a person in the bar drinks alcohol, he must be over 16 years old"

Which of these combinations must you check to prove that the rule is obeyed?

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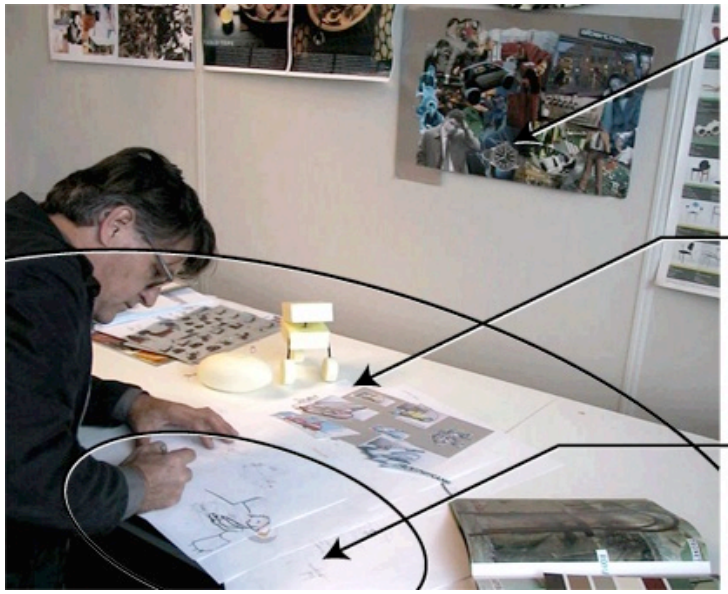
People-centered design: the body counts



Atmosphere (large range)
Hanging collages, sketches, posters and other sources of inspiration on the wall.

Layout (medium range)
Organizing and comparing ideas and previous concepts on the desk.

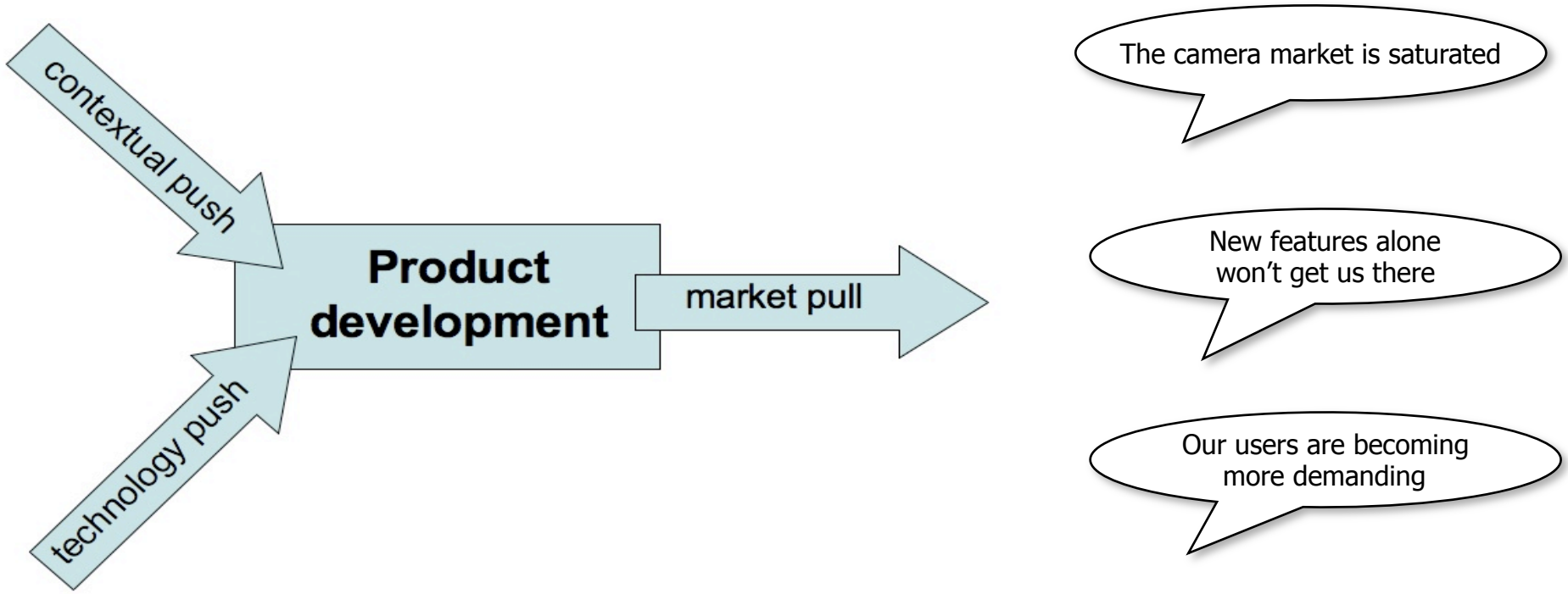
Precision (small range)
Creating and exploring concepts with sketches and models.

Designer, studio, and tools...

About user & context studies

History - industry

there is more than technology push
e.g. 'Sense & Simplicity' (Philips)



-play the movie-

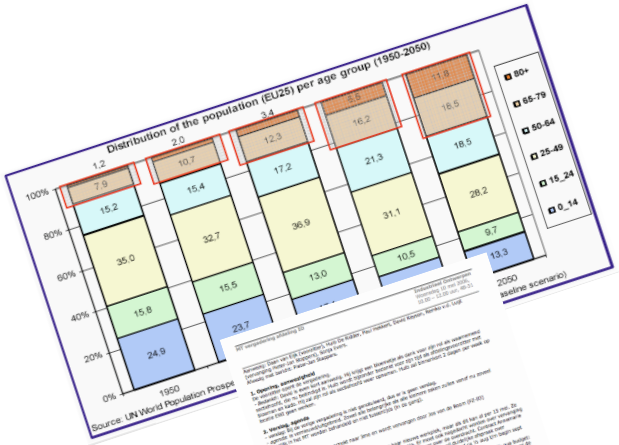
How to design new products

- technology push in crisis
- ‘new features’ alone will not get us there
- we need to fit the user’s needs

What is context?

+ Purpose
+ Meaning
+ Fit into user's (social) world
+ Relation to other products
+ Relation to services

What designers need



…or your reports or your Hollywood stock photos

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Context of product use

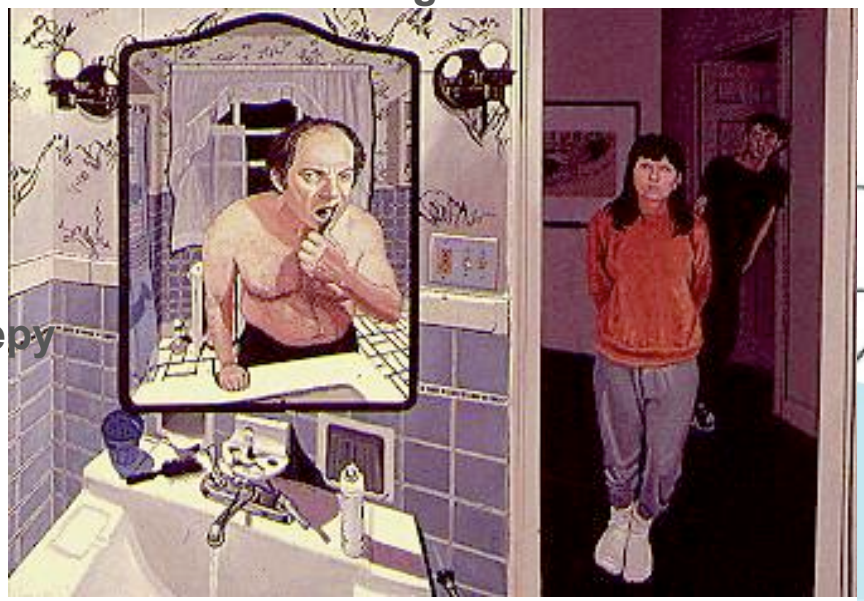
white light

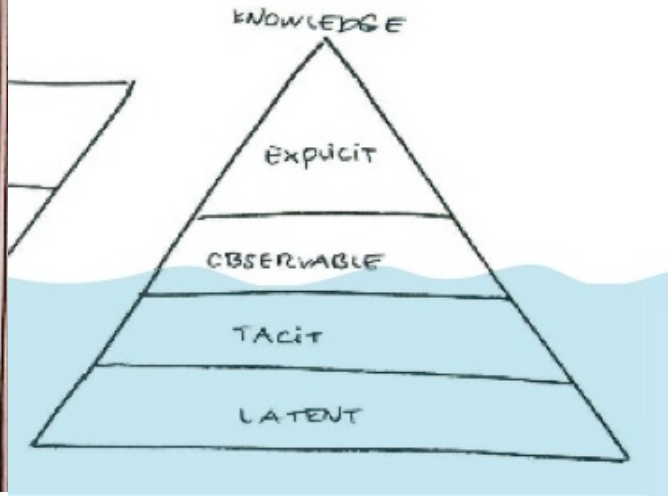
beautiful

nighttime

hate

getting older





sleepy

sound

water running

Routine---washing face afterwards

tiny objects

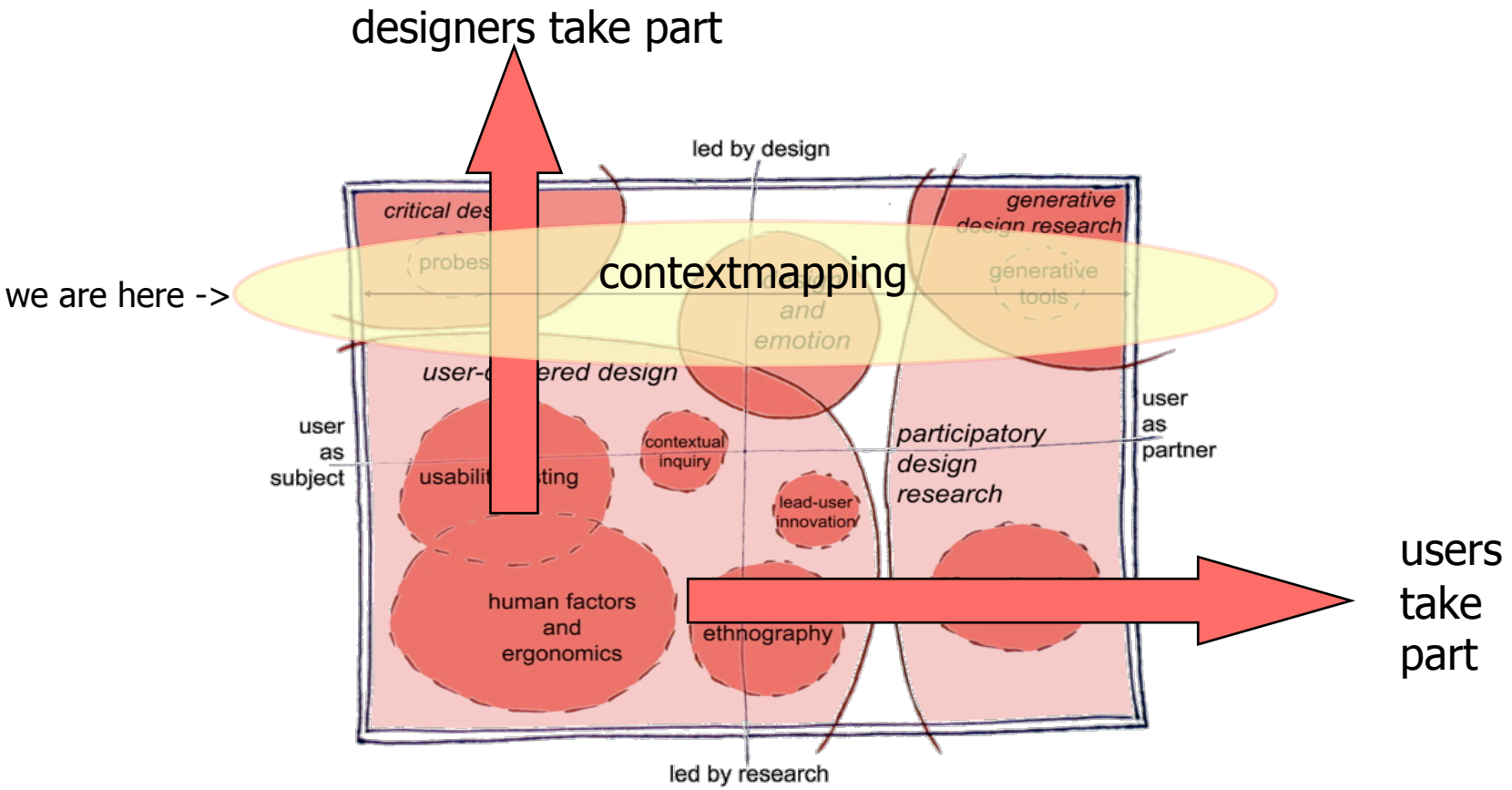
yesterday

fresh taste

All aspects that influence the experience of a product use

History - academia

new types of research are coming



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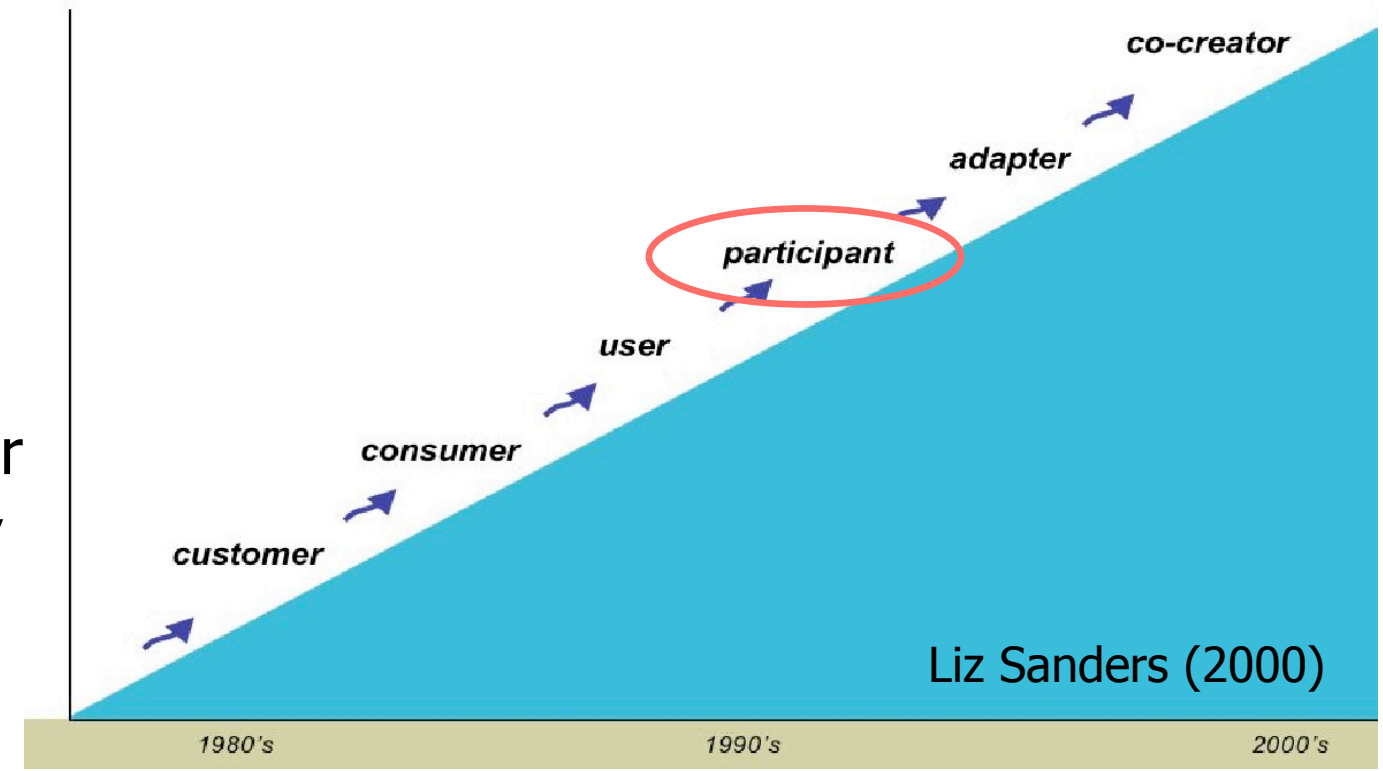
What is the role of the 'user':
between customer and co-creator

people

end-user

stakeholder
beneficiary
human



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Contextmapping: what is a map?

What is a map good for?

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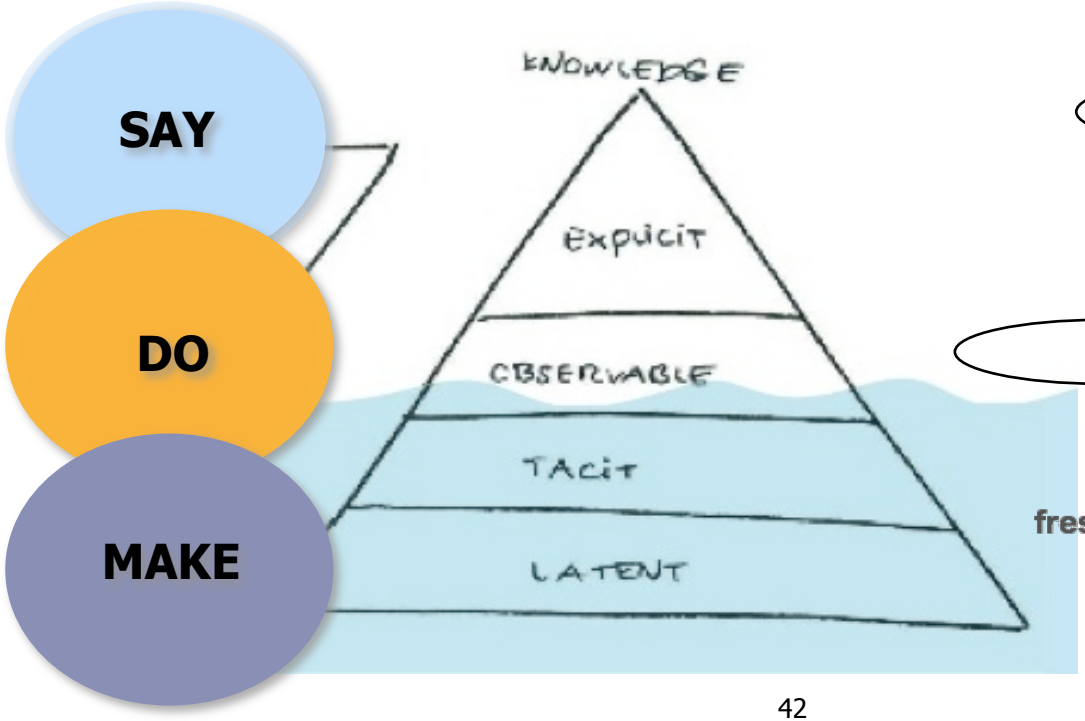
The user has deeper knowledge, hidden below the surface



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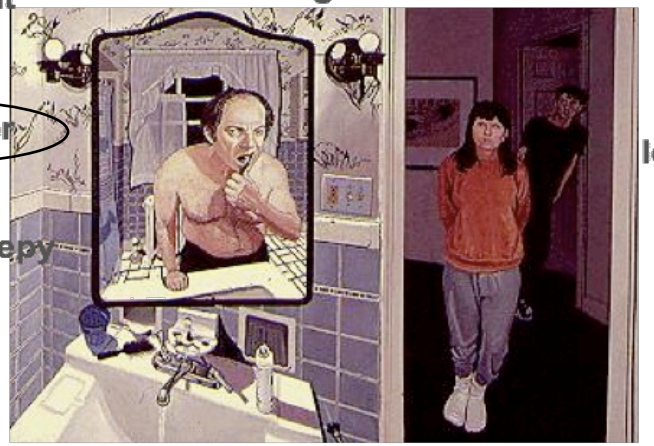

white light

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love

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hurry

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Routine---washing face after

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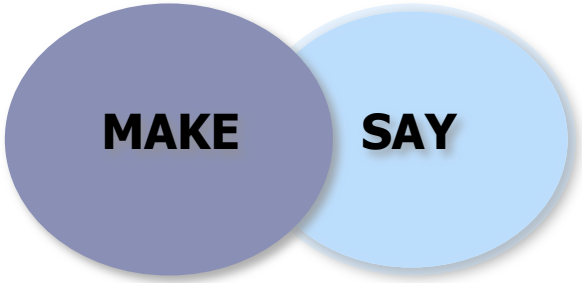
yesterday

42

Some tools for make & say

- let people create something in an open assignment
- and let them explain what they made
- allow yourself to be surprised by them



About prototyping

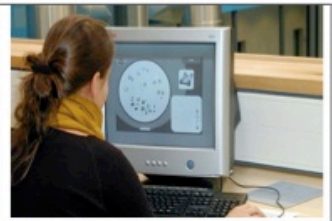
Prototypes

TRI

A platform for exploring design tools using a sketchy variety of Virtual Reality techniques. (Keller, & Stappers, Hoeben, 2000)

SketchBook

A digital sketchbook which uses the fluency of real world sketchbooks. (Hoeben, 2001)



ProductWorld

An ideation tool that helps designers finding patterns in collections of existing designs by interactive spatial classification (Pasman, 2003)

Cabinet

An image collection tool that merges virtual and physical images in one seamless collection. (Keller, 2007)

Photoboarding

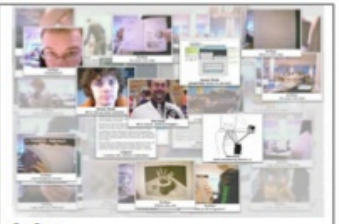
A technique to capture and retain playacting sessions in a rich and sketchy way, and develop them to storyboards. (Saakes and Keller, 2005)

Skin

A technique to play and explore colors, patterns and graphics on physical product shapes. (Saakes, 2006)

InstantTemplates

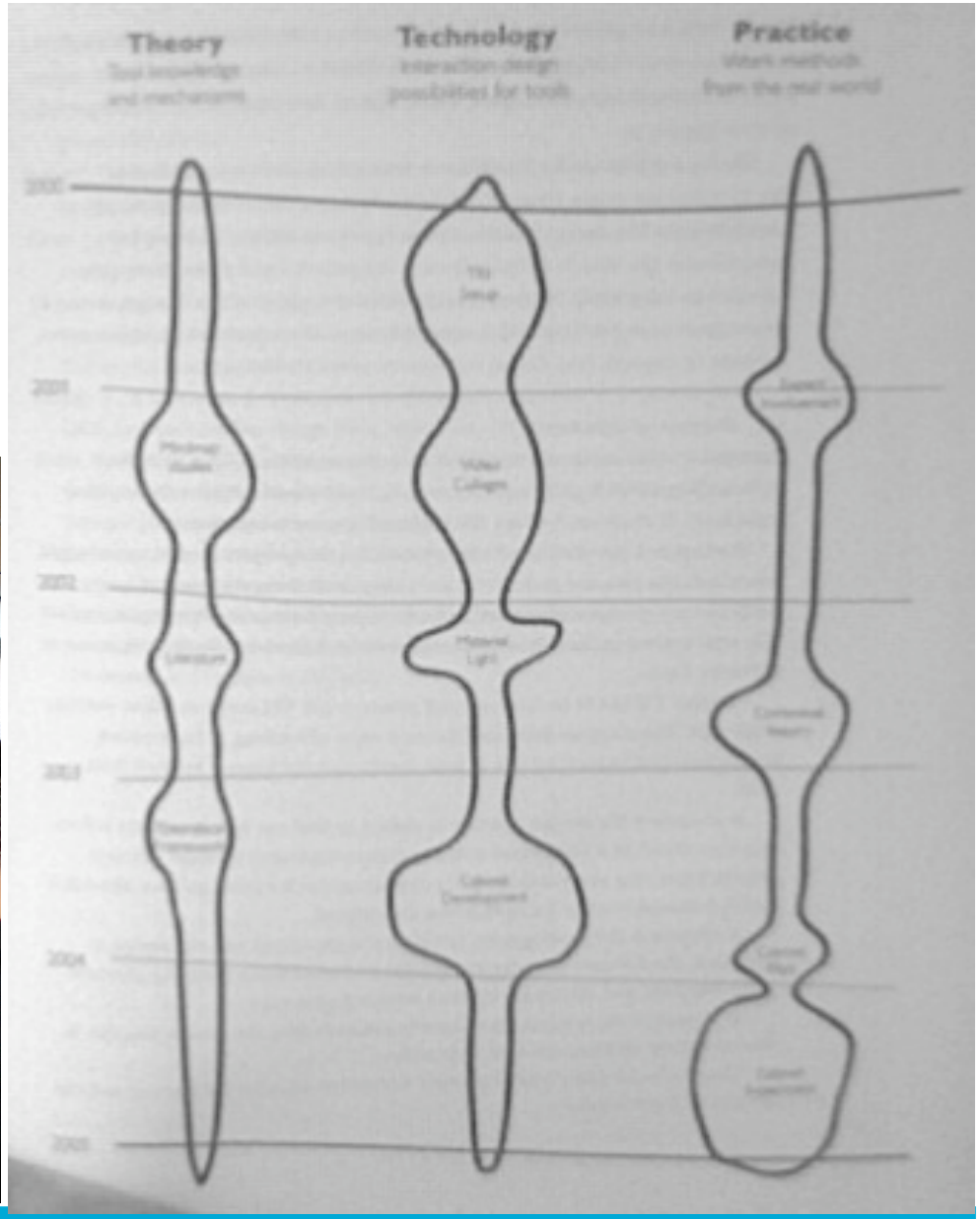
Digital templates of video to support physical drawing of natural two-handed product interactions. (Saakes and Keller, 2005)



Iris

A shared digital posting board for screenshots, to enhance situation awareness in distributed studios. (Peeters and Stappers, 2005)

Ianus Keller's Cabinet



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Daniel Saakes' Skin 2.0

Direct projection of material properties provide a tangible means of 'sketching' in 3D product appearance.

material expression

interactive material visualisation - Daniel Saakes

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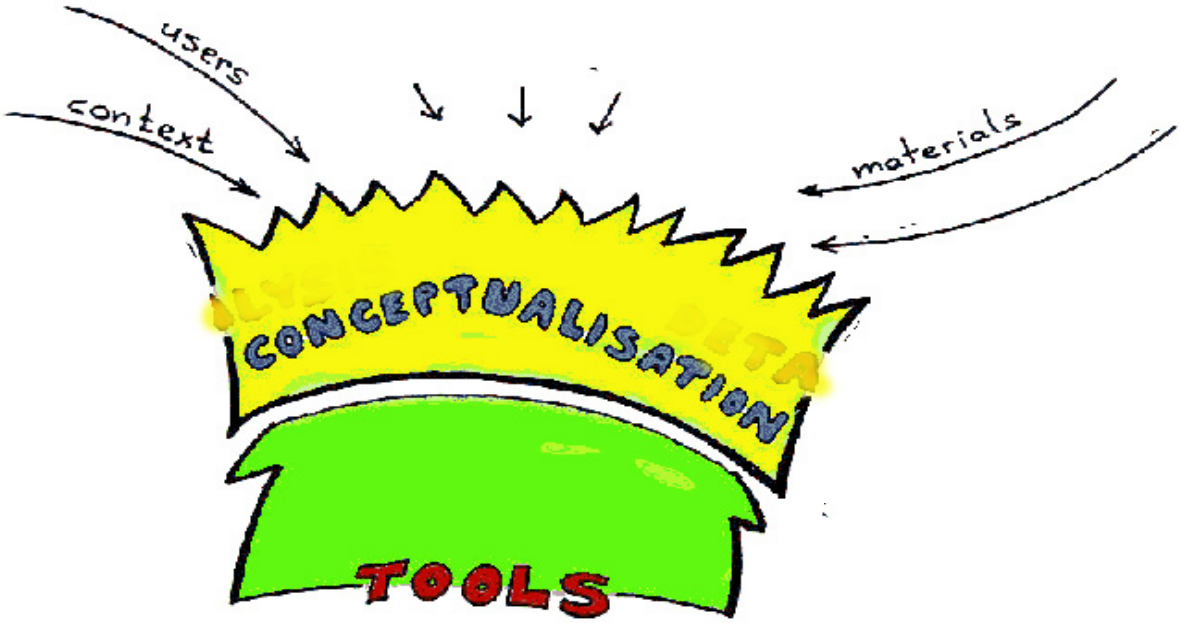

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LINKX movie about autistic children

Just type Linkx on Youtube or Google. The designer /researcher is Helma van Rijn

http://studiolab.io.tudelft.nl/vanrijn/