ECCO Seminar 2011 - BRUSSEL – 3 JUNE 2011
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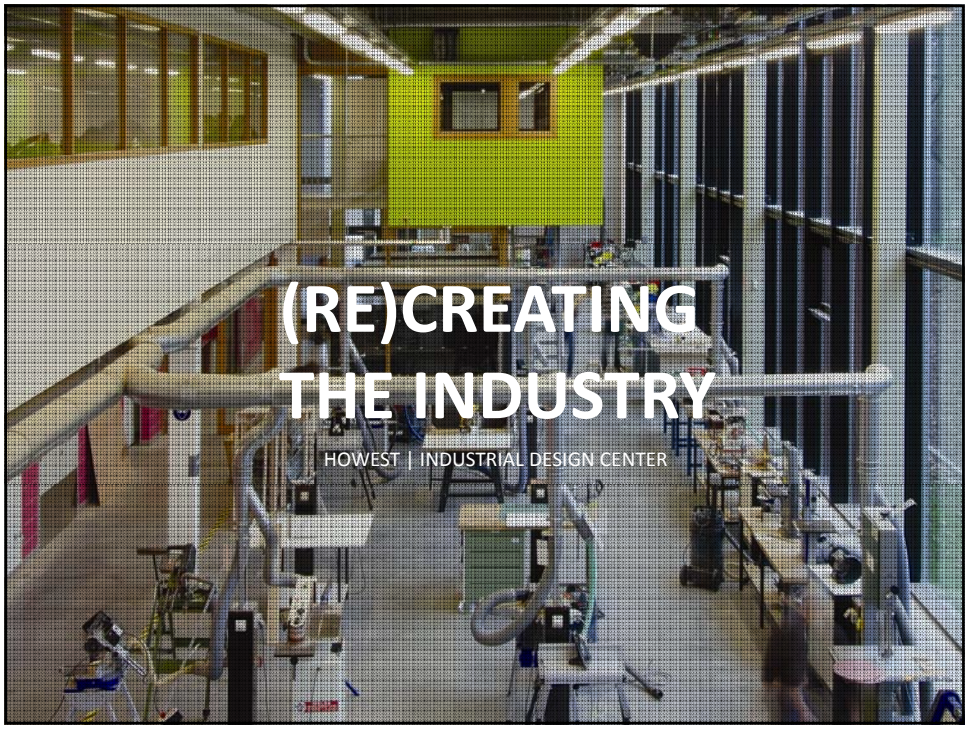
EXPERIENCES WITH STIGMERGIC PROTOTYPING

INDUSTRIAL DESIGN CENTER howest



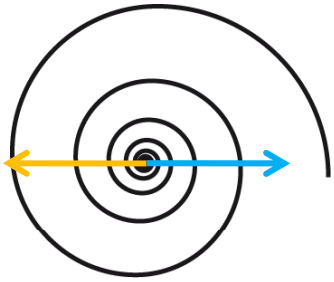
Innovation is change

- Society asks for the competences of designers to embody change for all stakeholders
- A change is needed if stability **is not wanted** any more
- Stability in a **dynamic** environment is given when changing entities (products) and changing environments (contexts) ***define each other***
- How do product designers manage the process of spontaneously evolving products and contexts aiming to **change** both, for a new and **preferred** direction?

Natural evolution

Arbitrary variation

disrupts an existing self-organised equilibrium



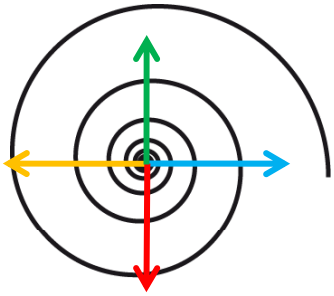
Reality shows

by self-organising if the changed entity can survive (or is better fit)

Directed evolution

Well documented models show the relevant aspects

Arbitrary variation (creativity) creates more **choices between possibilities**



The realization in a larger but bounded context **is a test without irreversible consequences** (in anticipation), **revealing new aspects and new relevance.**

More possibilities allow for the selection and embodiment of **relevant aspects for a certain context**

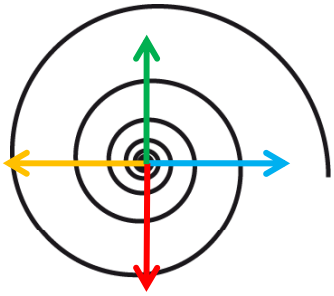
Design strategy

Define

and document the level of knowledge

Create

new possibilities



Test

in reality and hope that the model survives (is fit in the environment)

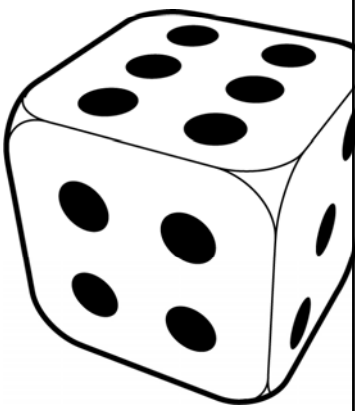
Decide

for some possibilities using an integrating model

Designing is (inter)action

- Select (variety is needed) and realize a model

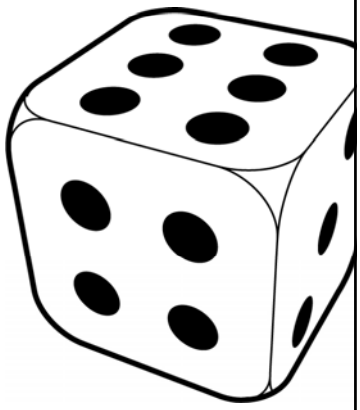
- Make it interact with the context and observe that always also "something different" happens from what could be selected or what was expected (the amount of pips showing on a die)



"Something different" and binary logic

- Diverge/converge aspects (variety)
- Select/let it happen

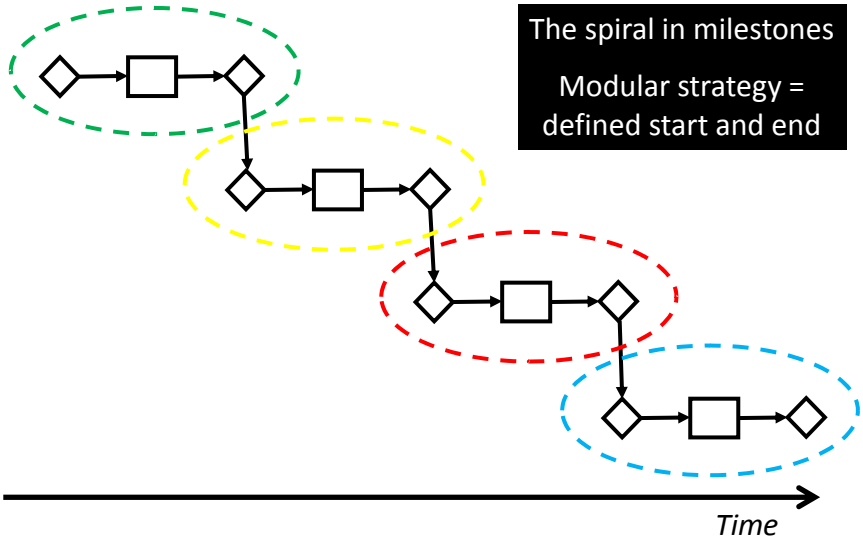
AND	*Select*	*Let it happen*
Diverge	**DEFINE Problem (opportunity) definition**	**CREATE Ideation**
Converge	**SELECT Decisions, realisation**	**TEST Behavior valuation, validation**



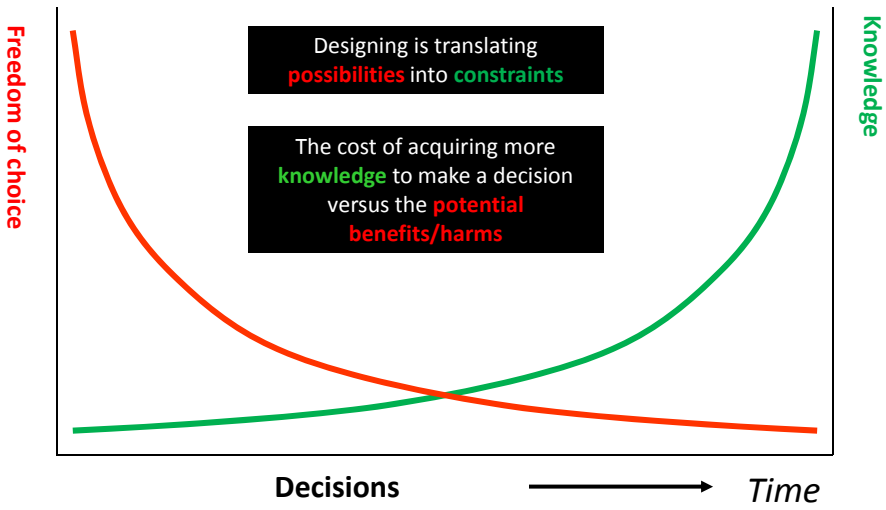
Two categories of design assignments

Well Defined | **Wicked**

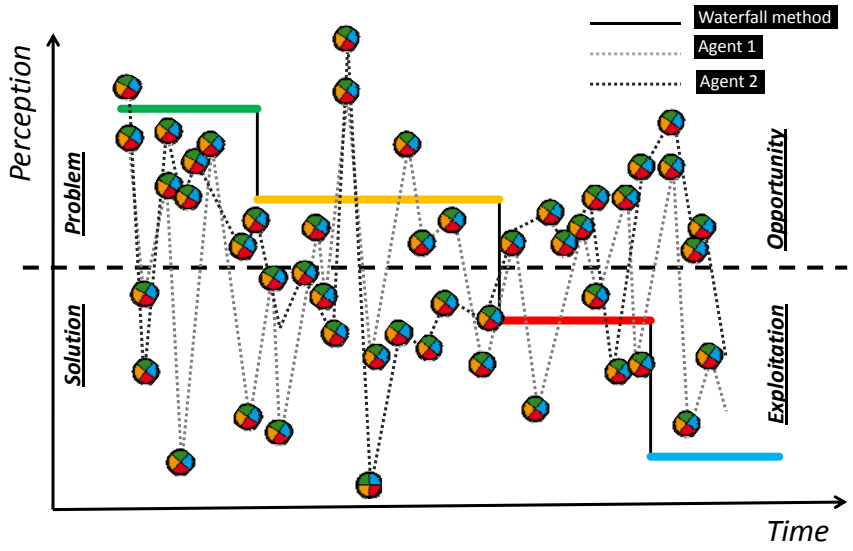
Approach for well defined assignments



Wicked aspects: the design paradox



Wickedness and perception over time



Prototyping

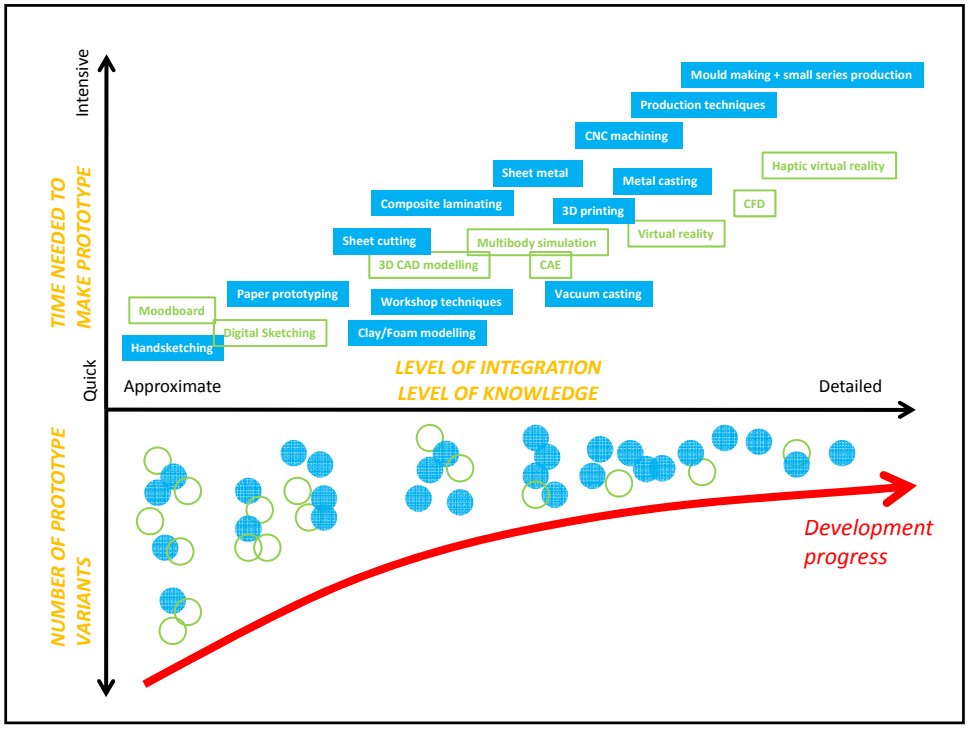
- ***Prototype etymological***
  - Greek: "πρωτοτυπον – ΠΡΟΤΟΤΥΠΟΝ" : Protos" (First) + "Typos" (Impression)
  - Primitive form of an object
- ***Definition of a prototype***
  - Intermediate representation format (model) of a design used to validate specific features or aspects of the final product
- ***Meaning***
  - It materializes an idea that was before only apparent in the developers mind
  - Each technique that translates an idea into a tangible format can be considered as a prototyping method

Prototyping formats

- ***FORMATS***
  - Physical models
    - Allow to investigate aspects of a design that are not tangible with a computer models
  - Virtual models
    - Design variants can often be compared easily without materialization
- ***PARADOX***
  - Early use of physical models: insight in complexity
  - Late use of physical models: postpone cost for building prototypes
- ***Solving the paradox:***
  - Prototyping has a different role in each design stage
  - Other requirements are put on each prototype
  - Prototyping should be used to obtain better insight in design decisions

Prototyping in the design process

- ***Prototypes during design process***
  - for a specific purpose
  - bonus aspects
- ***Main purpose***
  - Understand/grasp the complexity of a design
  - Improve/stimulate communication amongst stakeholders
    - customers, designers, consumers, marketing suppliers, project leaders, …
  - Investigate multiple aspects simultaneously
    - functionality, esthetics, form and shape, usability or production.
- ***Consequence of using prototypes***
  - Opens up errors/misunderstandings more quickly
  - Reduces the number of design iterations
  - Development time is shortened



Stigmergic prototyping

- ***Direct stigmergic prototyping***
  - A prototype is realized step by step
  - In each consecutive step the designer can better understand/grasp its complexity
  - By creating intermediate stable prototype formats, agents get stimulated to pick them up for performing an activity
- ***Indirect stigmergic prototyping***
  - A prototype has features (pheromones) to attract an agent to stimulate interaction
  - By performing this activity a number of expected/unexpected aspects will occur
  - Designers must be able to measure (quantify) these aspects without direct contact (intervention) but by indirect observation

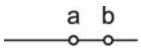
Strive For The Highest "Level Of Measurement"

$a = b \quad a \neq b$

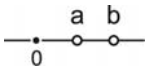
Nominal measuring compares entities and determines that they resemble or notes that they differ.

$a < b \quad a > b$

Ordinal measuring compares entities and notes that they differ concerning certain property. In the differences can be determined an order.



Interval measures compares entities and determines that they differ concerning a certain property, in the differences an order can be note within a continuum where a standard entity is defined.



Ratio measurement, the distinguishing feature of a ratio scale is the possession of a non-arbitrary zero value.

19

DESIGN FOR (EVERY)ONE

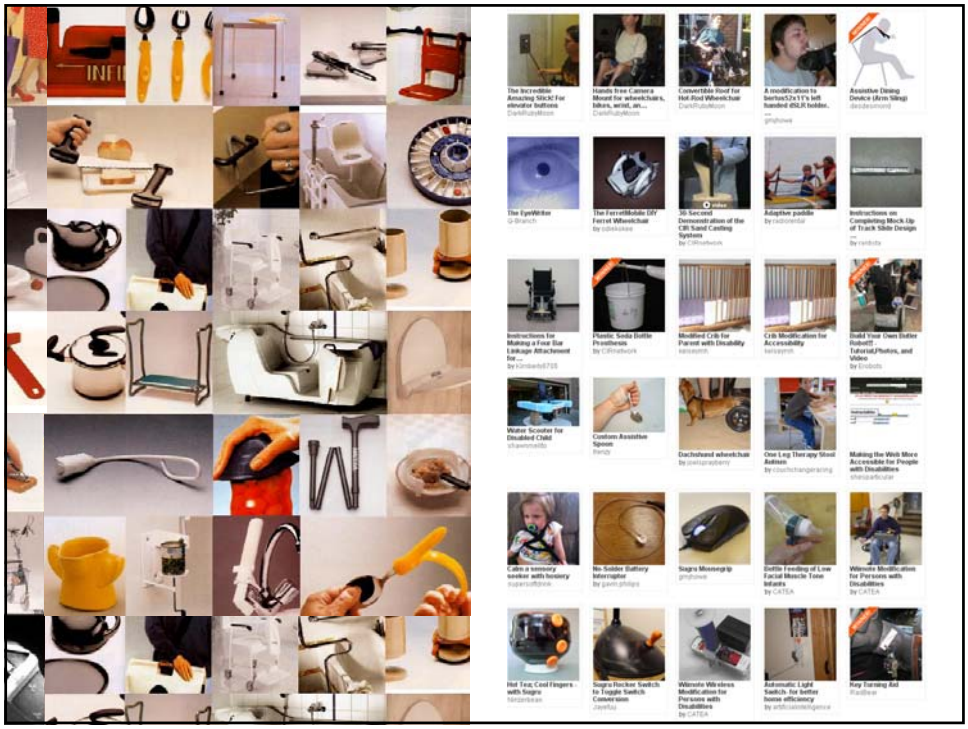
FIELD : community-based rehabilitation.

FOCUS : phenomenon of open design assistive artifacts

METHOD: participatory action research

PARTNERS: Handicap international, TuDelft Medisign

http://designforeveryone.howest.be/



Open Design = Stigmergic Prototyping

All **information** involved in **creating** the object or system is **made available** – such as text, drawings, photographs and 3D computer-aided design (CAD) models – so that other people can **freely re-create it**, or help contribute to its further **evolution**.

Users / Self-manufacturers

DIRECT stigmergy:
Cheap and powerful **prototyping tools** have become easier to use by **non-engineers**; it turns them into users as well as **self-manufacturers** of their **personal meaning full** assistive devices**.**

INDIRECT stigmergy:
The rise of the internet and social media empower users to **document and share** these **stigmergic artifacts**. The long tail of things.

Handicap international, Bricoleur du coeur.c

Setting up co-design simulations

- Launch a **call for** participation + reactions on past projects

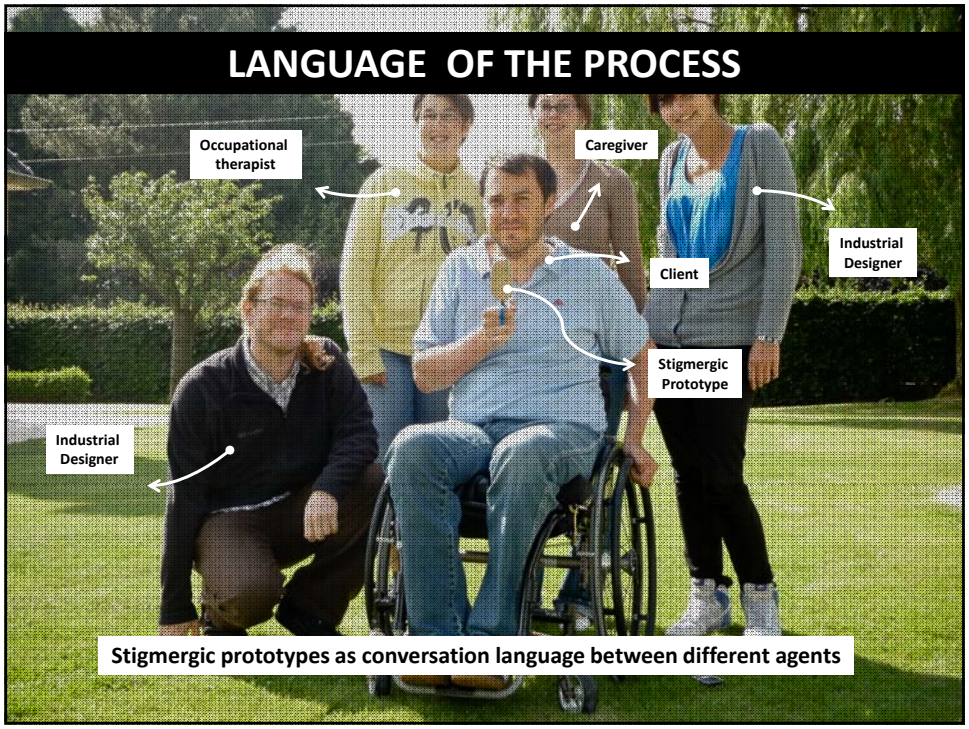
- Focus of cases is **100% demand-driven**

- Building co-design **teams** : client, care-giver, industrial designer, occupational therapist and other random stakeholders from the local context…

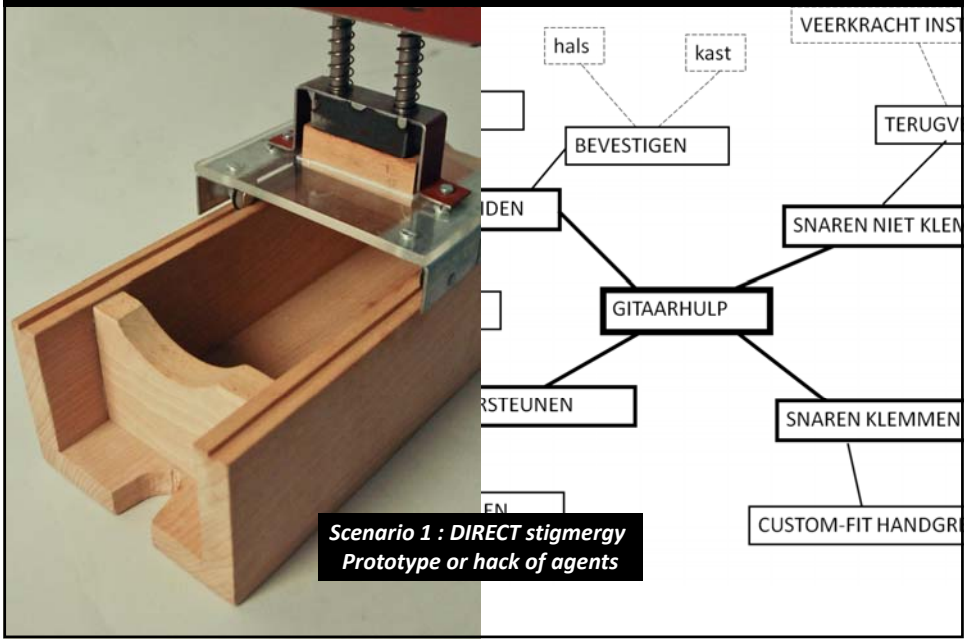
-**Average members** in one team = **5 persons**.

- 1 co-design project = **duration 12 weeks** or …

-Up till now **40 blogs cases**, **200 people** involved.



START OF THE PROCESS 1



START OF THE PROCESS 2
Scenario 2 : INDIRECT stigmergy followed by direct
http://ijsjeshulp2009.blogspot.com/2009_02_01_archive.html
http://ijsjeshulp2009.blogspot.com/2009_03_01_archive.html

SEBASTIAN
IJSJESHULP 1.12
D4E1
http://ijsjeshulp2009.blogspot.com/

ADAPATION STRATEGY

CONVENIENCE
WEEK 1

CONVENIENCE
WEEK 2

PERFORMANCE
WEEK 3

PERFORMANCE
WEEK 3

ECONOMY
WEEK 5

CONVENIENCE
WEEK 6

CONVENIENCE
WEEK10

IDENTITY
WEEK 12

Define aspects and design

ADAPTATION STRATEGIES

- convenience adaptation
- performance adaptation
- economy adaptation
- identity adaptation
- pleasure adaptation
- …

[**Boztepe, S**. 2007. *Toward a framework of product development for global markets: a user-value-based approach*, Design studies, 28(5), 513-533.]

Méderic
FLEXISEAT 1.8
D4E1
http://flexiseat2010.blogspot.com/

DIRECTED VARIATION

CONVENIENCE
WEEK 3

CONVENIENCE
WEEK 3

CONVENIENCE
WEEK 3

CONVENIENCE
WEEK 3

CONVENIENCE
WEEK 3

CONVENIENCE
WEEK 3

CONVENIENCE
WEEK 3

Different prototypes make a trade-off of different aspects.
Laddering Technique

GILBERTE
NAGELKNIPPER 1.7
D4E1

http://nagelknipper2010.blogspot.com

LET IT HAPPEN

PENTAPRISMA 1.1

	Expected aspect	Unexpected aspect
Positive feedback	- Klein en compact - Goed als het beter instelbaar is	- Hij zag er een hulpmiddel in dat mits enkele aanpassingen zeker door hem gebruikt zou worden (vernst dor compactheid) - Dat hij inzag dat hij met zulk hulpmiddel glasramen en kunstwerken volledig zou kunen zien zonder op afstand te gaan staan
Negative feedback	- zoon	- zoon

PERISCOOP 2.0

	Expected aspect	Unexpected aspect
Positive feedback	-geen	- Hij gebruikt de kleine spiegel niet
Negative feedback	-geen	- Als hij in de kleine spiegel kijkt dan ziet hij vooral de grond, zo kan hij niet gewoon lopen

PENTAPRISMA 1.0

	Expected aspect	Unexpected aspect
Positive feedback	-Dat hij vooruit kon zien	- Hij zag het plafond (door de correctie die hij zelf doet met zijn been
Negative feedback	- Instelbaarheid	- Veel te klein voor zijn hoofd - Heeft geen behoefte aan en hulp om vooruit te kijken - In de positie hoe hij zich zet (hoek van zijn rug) kan hij zelfs niet vooruit kijken - Hij ziet de grond niet als hij wandelt

In situ testing of prototypes, which affordances are stigmergic prototypes evoking and which hidden wicked aspects do they reveal.

http://prismabril2011.blogspot.com/2011_03_01_archive.html

LET IT HAPPEN

	EXPECTED ASPECT	UNEXPECTED ASPECT
POSITIVE FEEDBACK	say do make	say do make
NEGATIVE FEEDBACK	say do make	say do make

LEVEL OF MEASUREMENT

a < b a > b

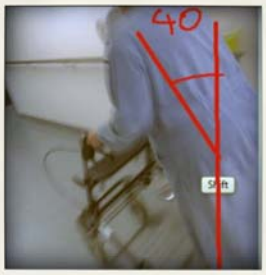
Ordinal measuring

a b

Ordinal measuring

a b

0



Ratio measuring

In situ testing of prototypes, which affordances do they evoke and which wicked aspects do they reveal.

OPTIMAL EXPERIENCE

http://badmintonracket-2010.blogspot.com/2010/03/enkele-filmpjes-van-de-training.html

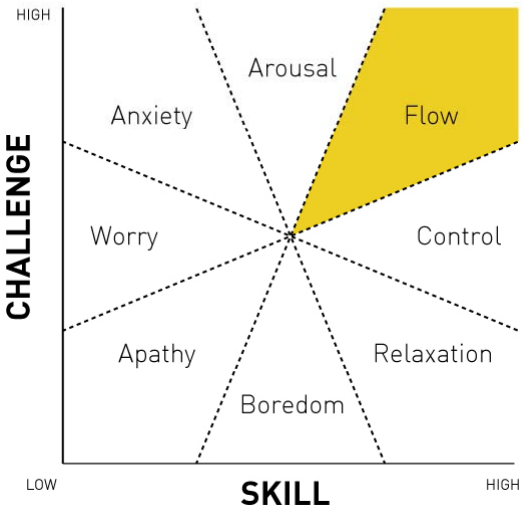
http://badmintonracket-2010.blogspot.com/2010/04/compilatie-video-onderhands.html

When does it all stops? What is the optimal experience and fit with the context.

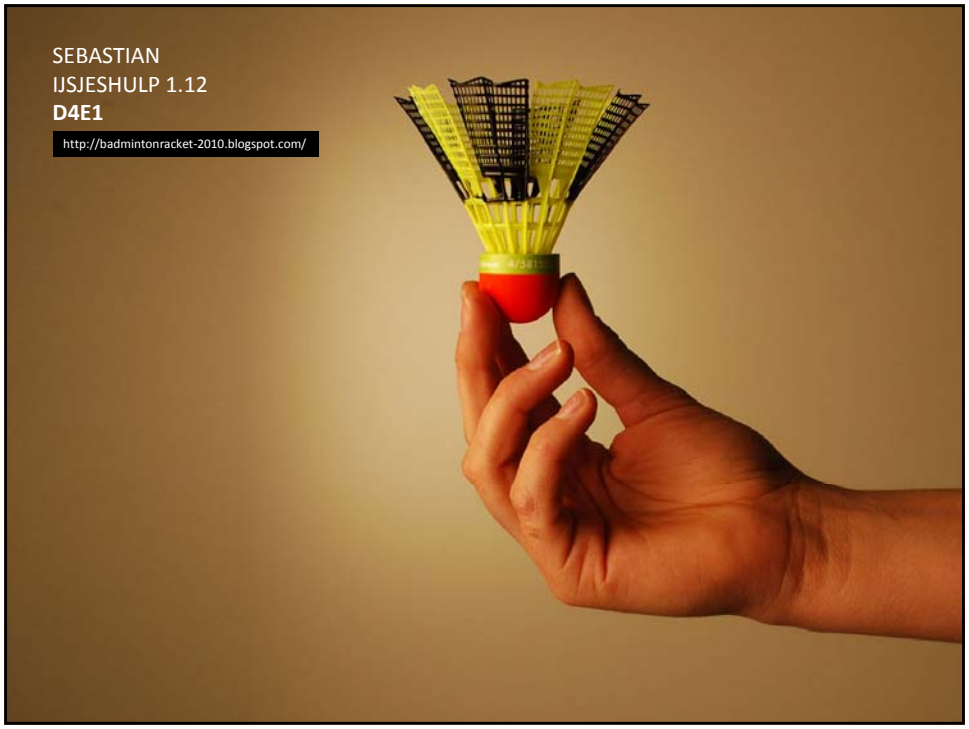
FLOW

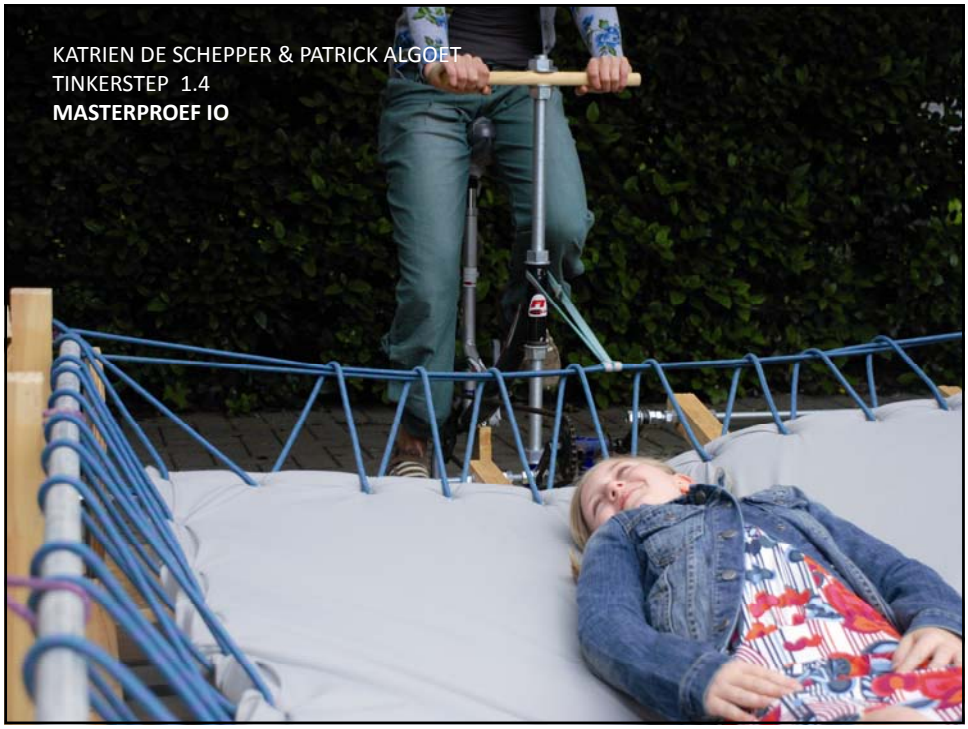
Flow is the **mental state** of operation in which a person in an activity is **fully immersed** in a feeling of energized **focus**, **full involvement**, and **success** in the process of the activity.

[**Csikszentmihályi, M.** (1990), Flow: The Psychology of Optimal Experience, New York: Harper and Row]

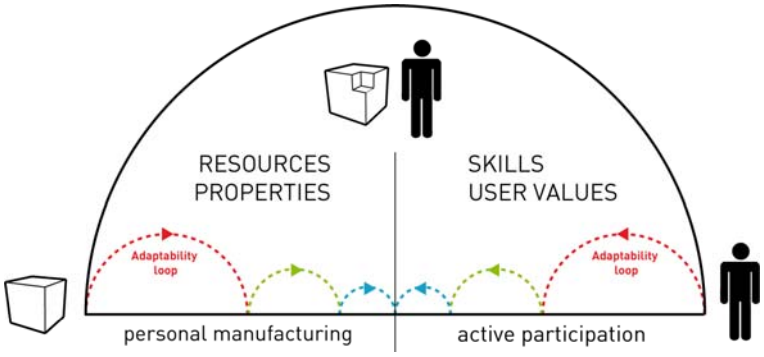


[**Csikszentmihályi, M.** (1990), Flow: The Psychology of Optimal Experience, New York: Harper and Row]



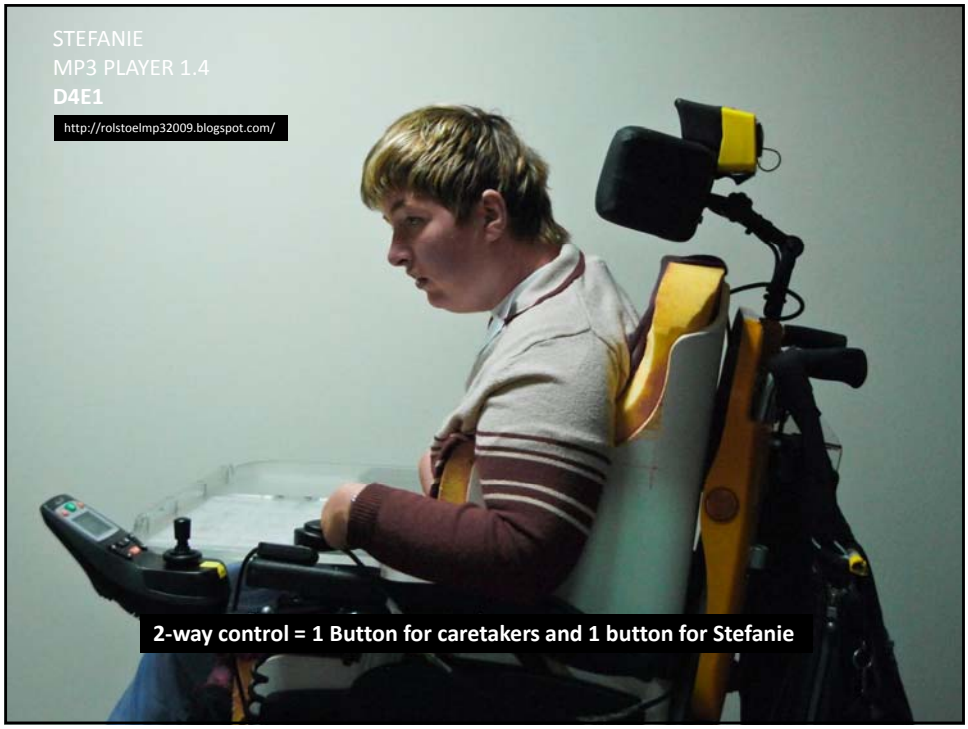


CO-CONSTRUCTION

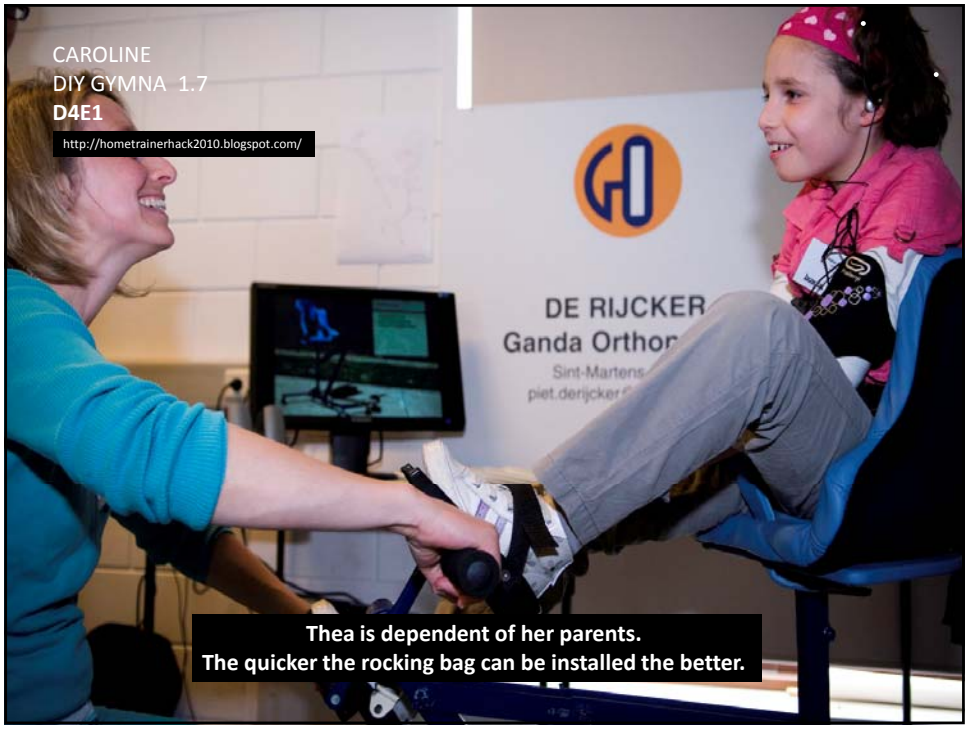


Co-construction is a social process in which people and objects and their relationships influence each other and impact upon potential outcomes

[De Couvreur, L., Goossens, R., (2010). Design for (every)one : Co-creation as a bridge between universal design and rehabilitation engineering, Proceedings of design and emotion conference 2010, Chicago.]


STEFANIE
MP3 PLAYER 1.4
D4E1
http://rolstoelmp32009.blogspot.com/
2-way control = 1 Button for caretakers and 1 button for Stefanie

THEA
SCHOMMELKUIP 1.8
D4E1
http://schommelkuip2010.blogspot.com/
Thea is dependent of her parents.
Installation time and transport are key.

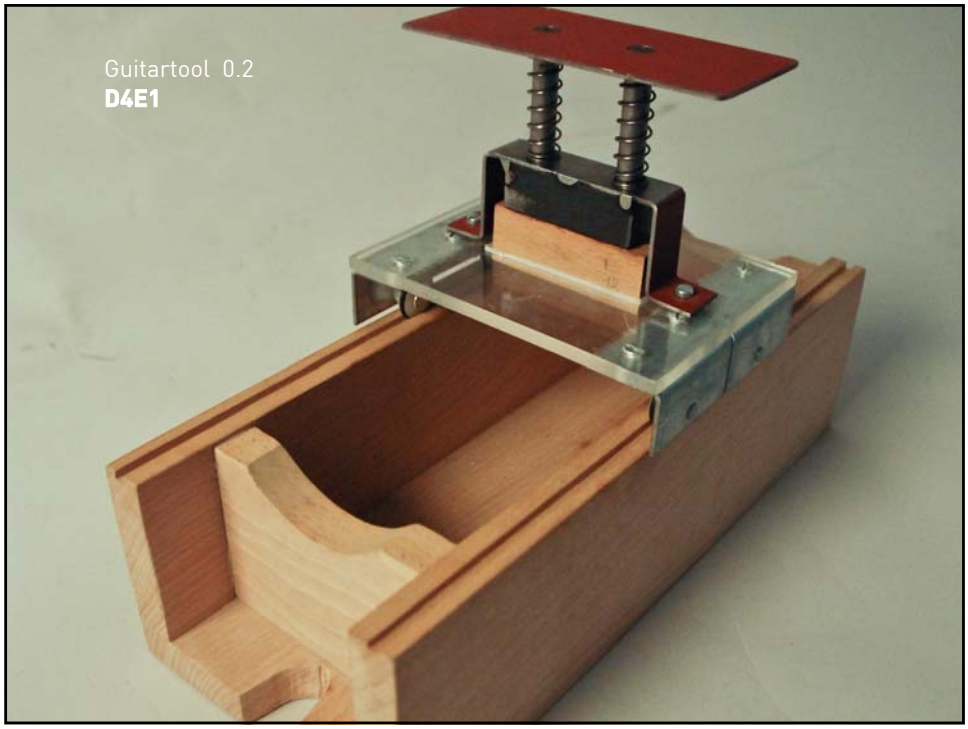


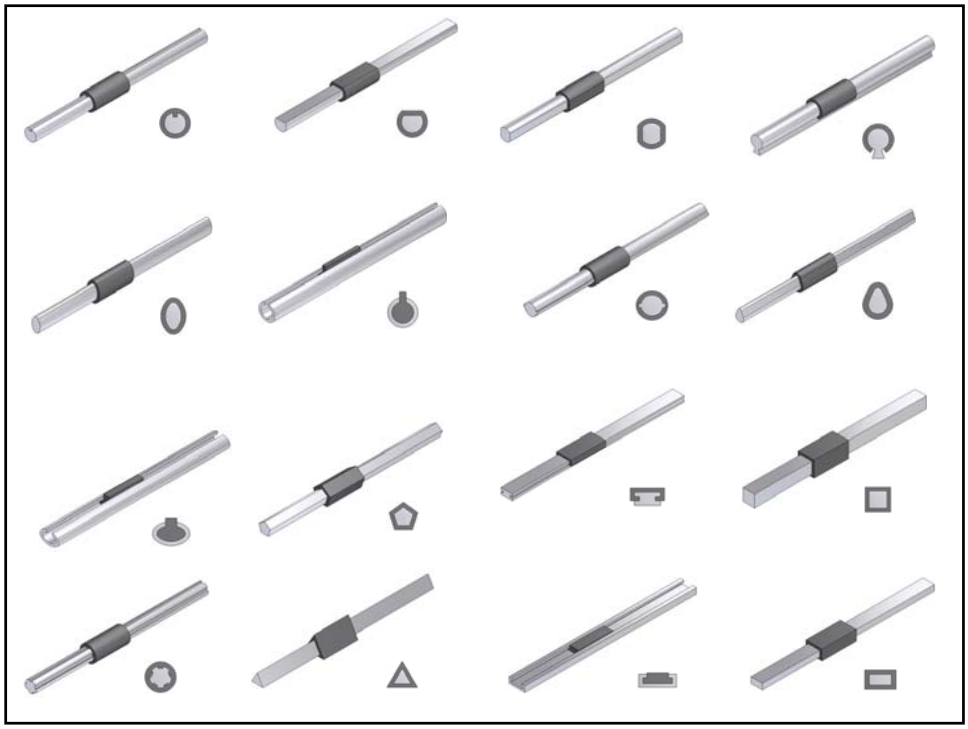
INTEGRATION OF KNOWLEDGE

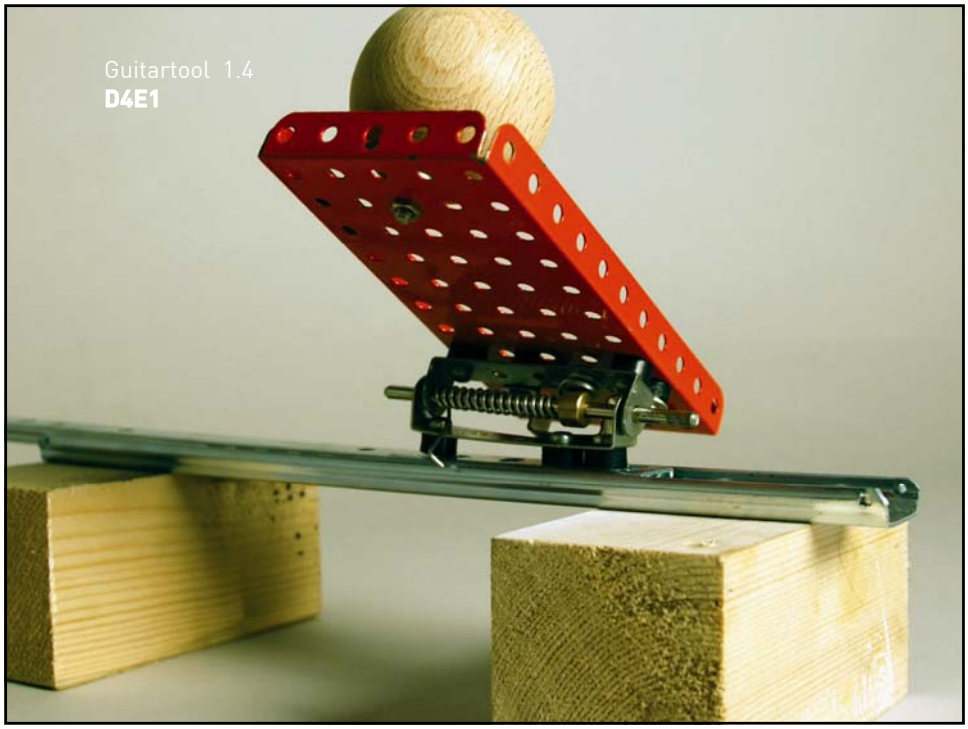
"**Experience prototyping** techniques as tool in the **design process**.

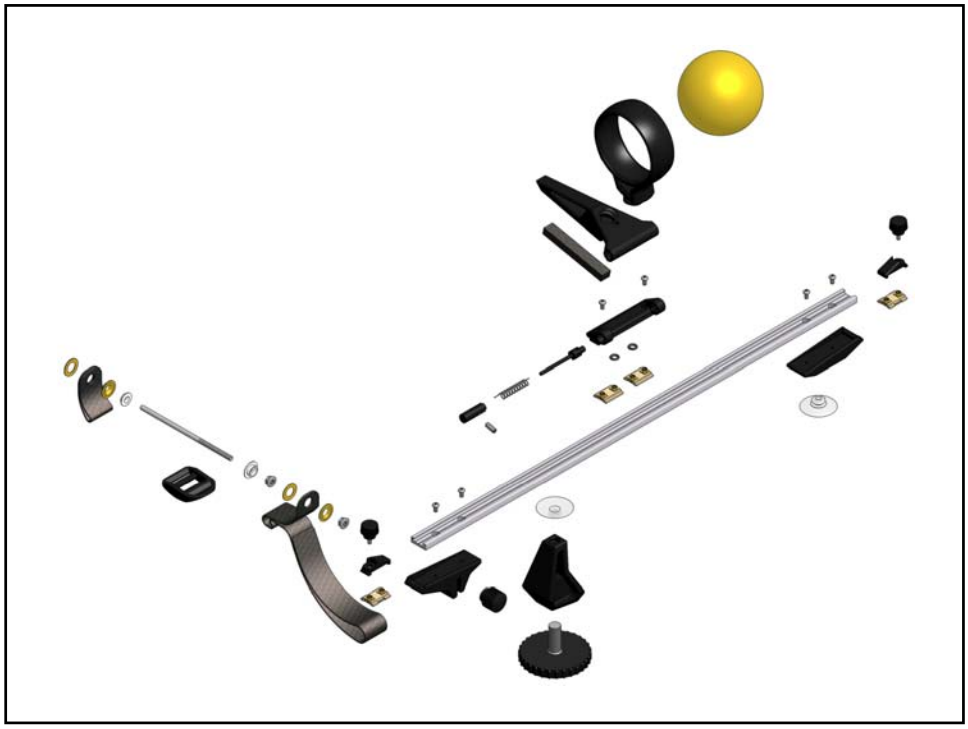
↕

Rapid manufacturing technologies are the enabling technology for **personal manufacturing**."


Guitartool 0.2
D4E1

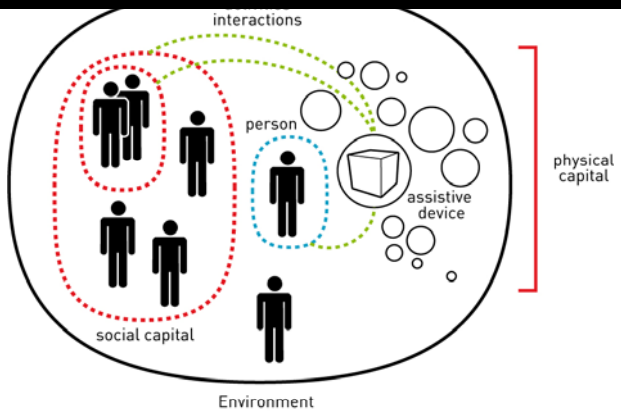



Guitartool 1.4
D4E1



Guitartool 2.7
D4E1

PRODUCT ECOLOGY

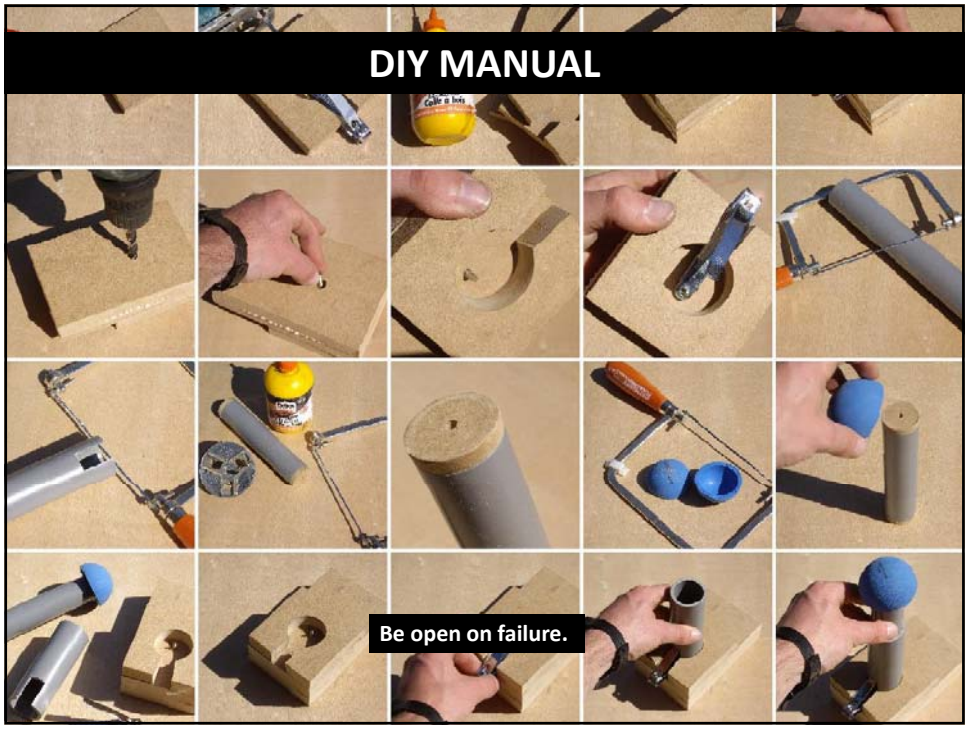


If one wants to build meaningful assistive devices, one should take into account the whole product ecology of an individual context.

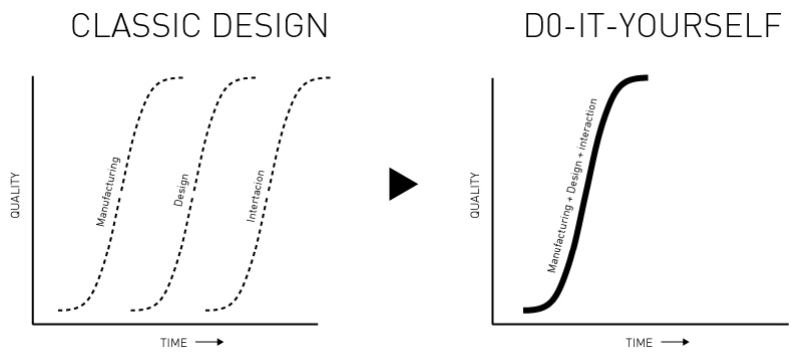
[De Couvreur, L., Detand, J., Goossens, R., (2011). The role of flow experience in co-designing open-design assistive devices, ,Proceedings of Include conference 2011, London.]

DYLAN
BUMBOSEAT 1.7
D4E1
http://bumboseat2010.blogspot.com/

NESCAFÉ


DIY MANUAL
Be open on failure.

LEARNING-CURVES



THANK YOU!
QUESTIONS?

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