EXPRIENCES WITH STIGMERGIC PROTOTYPING

(RE)CREATING THE INDUSTRY

HOWEST | INDUSTRIAL DESIGN CENTER
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

<table>
<thead>
<tr>
<th>AND</th>
<th>Select</th>
<th>Let it happen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diverge</td>
<td>DEFINE Problem</td>
<td>CREATE Ideation</td>
</tr>
<tr>
<td></td>
<td>(opportunity) definition</td>
<td></td>
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<tr>
<td>Converge</td>
<td>SELECT Decisions,</td>
<td>TEST Behavior</td>
</tr>
<tr>
<td></td>
<td>realisation</td>
<td>valuation, validation</td>
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</tbody>
</table>

Two categories of design assignments

Well Defined    |    Wicked
Approach for **well defined** assignments

The spiral in milestones

Modular strategy = defined start and end

Wicked aspects: the design paradox

Designing is translating possibilities into constraints

The cost of acquiring more knowledge to make a decision versus the potential benefits/harms
Prototyping

- **Prototype etymological**
  - Greek: “προτοτύπον – 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
Nominal measuring compares entities and determines that they resemble or notes that they differ.

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.

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.
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.

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**LANGUAGE OF THE PROCESS**

Stigmergic prototypes as conversation language between different agents
Scenario 1: DIRECT stigmergy
Prototype or hack of agents
Scenario 2: INDIRECT stigmergy followed by direct
ADAPTATION STRATEGY

Define aspects and design

ADAPTATION STRATEGIES

- convenience adaptation
- performance adaptation
- economy adaptation
- identity adaptation
- pleasure adaptation
- ...

Different prototypes make a trade-off of different aspects.

Laddering Technique
LET IT HAPPEN

PENTAPRISMA 1.1

Periscope 2.0

PENTAPRISMA 1.0

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

## LET IT HAPPEN

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<tr>
<th>Positive Feedback</th>
<th>Expected Aspect</th>
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<td>say do make</td>
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OPTIMAL EXPERIENCE

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.


[Diagram showing the relationship between Challenge and Skill with emotions such as Arousal, Anxiety, Worry, Apathy, Boredom, Control, and Relaxation.]

SEBASTIAN IJSJESHULP 1.12
D4E1
http://badmintonracket-2010.blogspot.com/
Co-construction is a social process in which people and objects and their relationships influence each other and impact upon potential outcomes

2-way control = 1 Button for caretakers and 1 button for Stefanie

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

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

Be open on failure.
LEARNING-CURVES

CLASSIC DESIGN

DO-IT-YOURSELF

THANK YOU!
QUESTIONS?
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