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Design of Sustainable Products for Behavioural Change

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ekonnect

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CEE PERDO Center of Excellence on Energy Technology & Environment

KMUTT Celebrating 60 years

1960 2020 Transforming society. Defining the future.

UN environment programme

Today's Topics

1. Design/Design for Sustainability
2. Design for Behaviour Change
3. Design of sustainable behaviours / Circular Behaviours/Tools and Triggers

What is **Design**?

What is **Design**?

Design inherently is the **DNA** of any intended creation.

What is **Design**?

All men are designers. All that we do, almost all the time, is design, for design is basic to all human activity. The **planning and patterning** of any act towards a desired, foreseeable end constitutes the design process. Any attempt to separate design, to make it a thing-by-itself, works counter to the inherent value, of design as the primary underlying matrix of life.

Design is the conscious effort to impose meaningful order.

- Victor Papanek

In **Design**

There is **no Single** but **many solutions**
There are many **affordances**
Chaos and ambiguity are **positive**

Look at things from various perspectives

Takes you out of **comfort zone, out of the box**
thinking fosters creativity

Scale of **Design**

Design Caters to **all levels** of production (**large, small, medium, craft**) of objects, messages, services, environments and strategies

Design encompasses everything – from a **safety pin** to a **skyway system**, from a **simple letter form** to a **strategy of communication**

Design Thinking
Mindsets, skillsets, Process

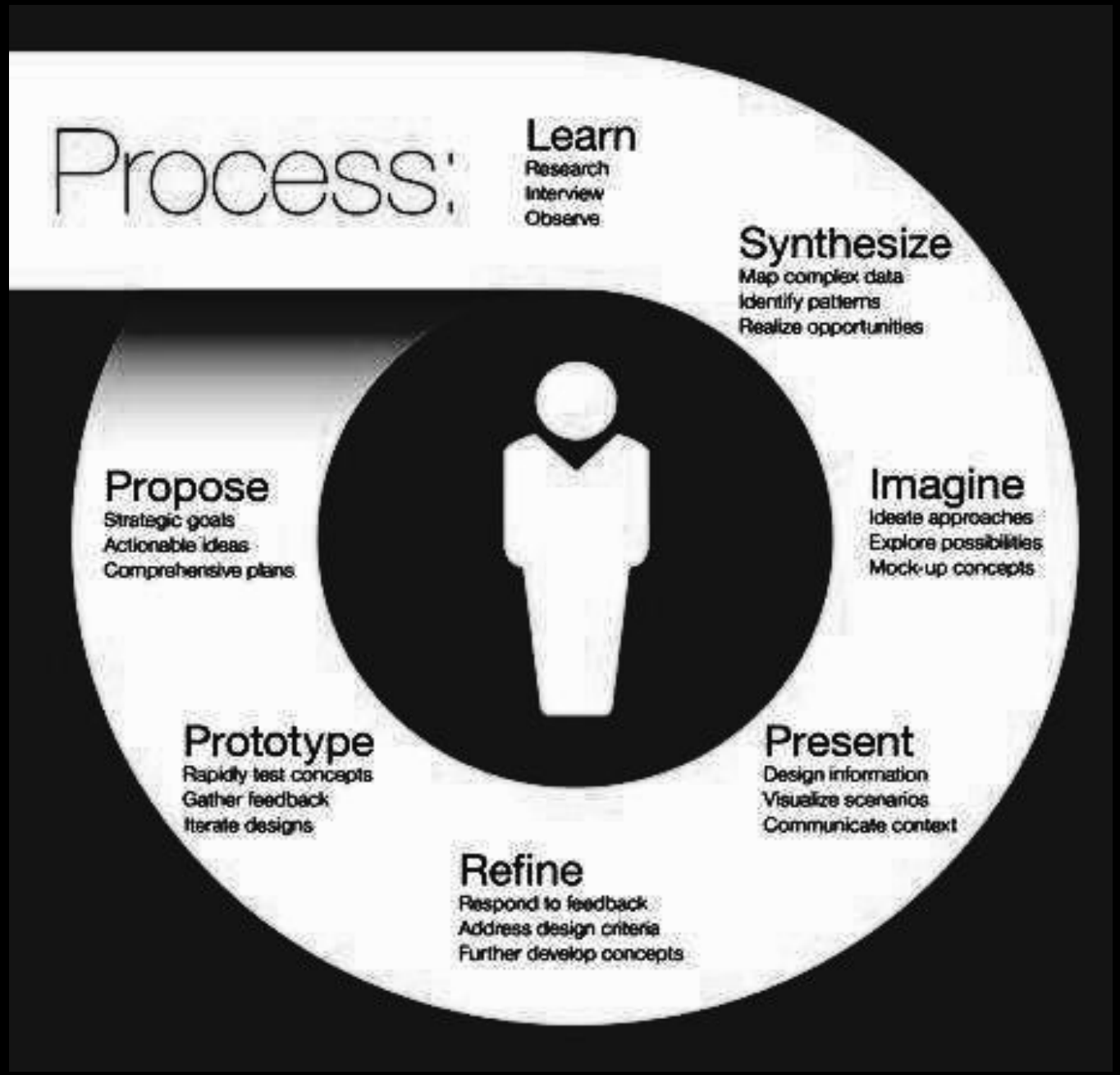
Design Thinking
Mindsets

Empathy

Hands-on
(make fast and fail fast)

Experimentation

Collaborative
(Multidisciplinary)



Source: http://mjsdsgn.com

Design for Sustainability (DfS)

"Products can be considered as the embodiment of environmental harm caused by production, consumption and disposal."

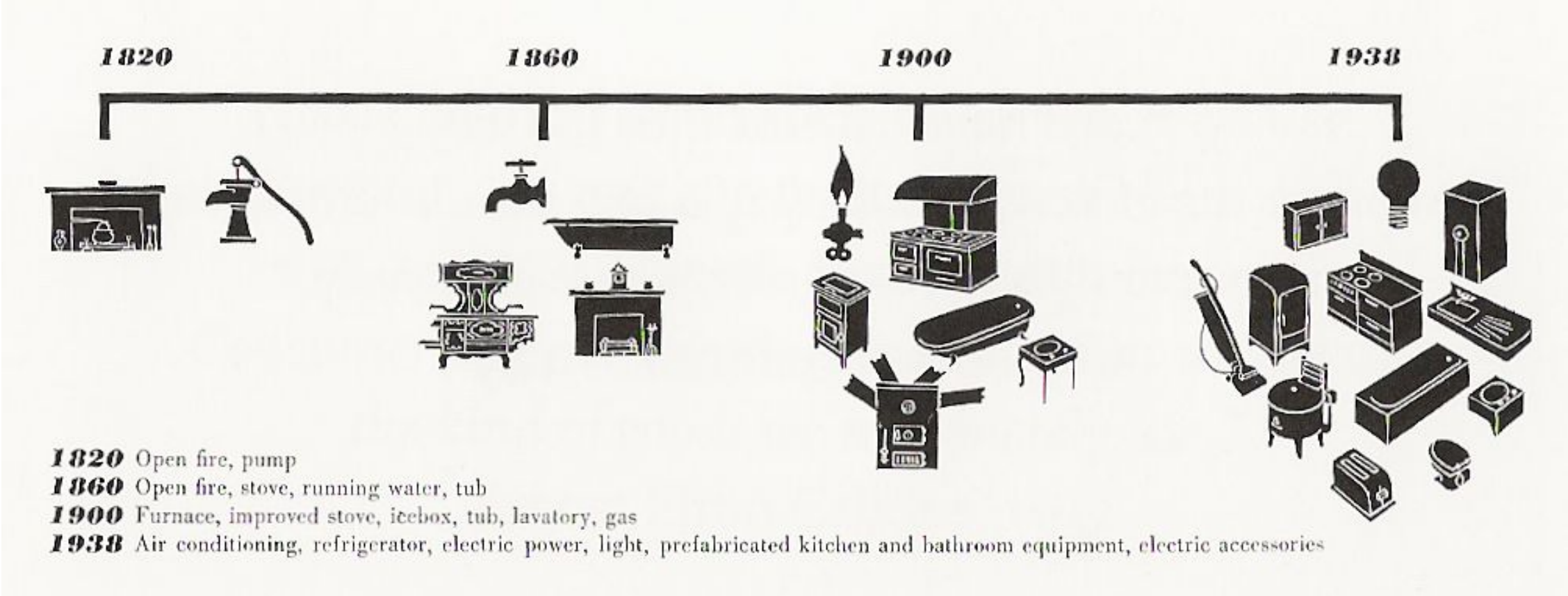
[Eva Heiskanen, Finnish environmental economist]

And

It is estimated that 70% of a product's environmental impact is **locked in at the design stage**.

Design for Sustainability (DfS)

Why the concern?

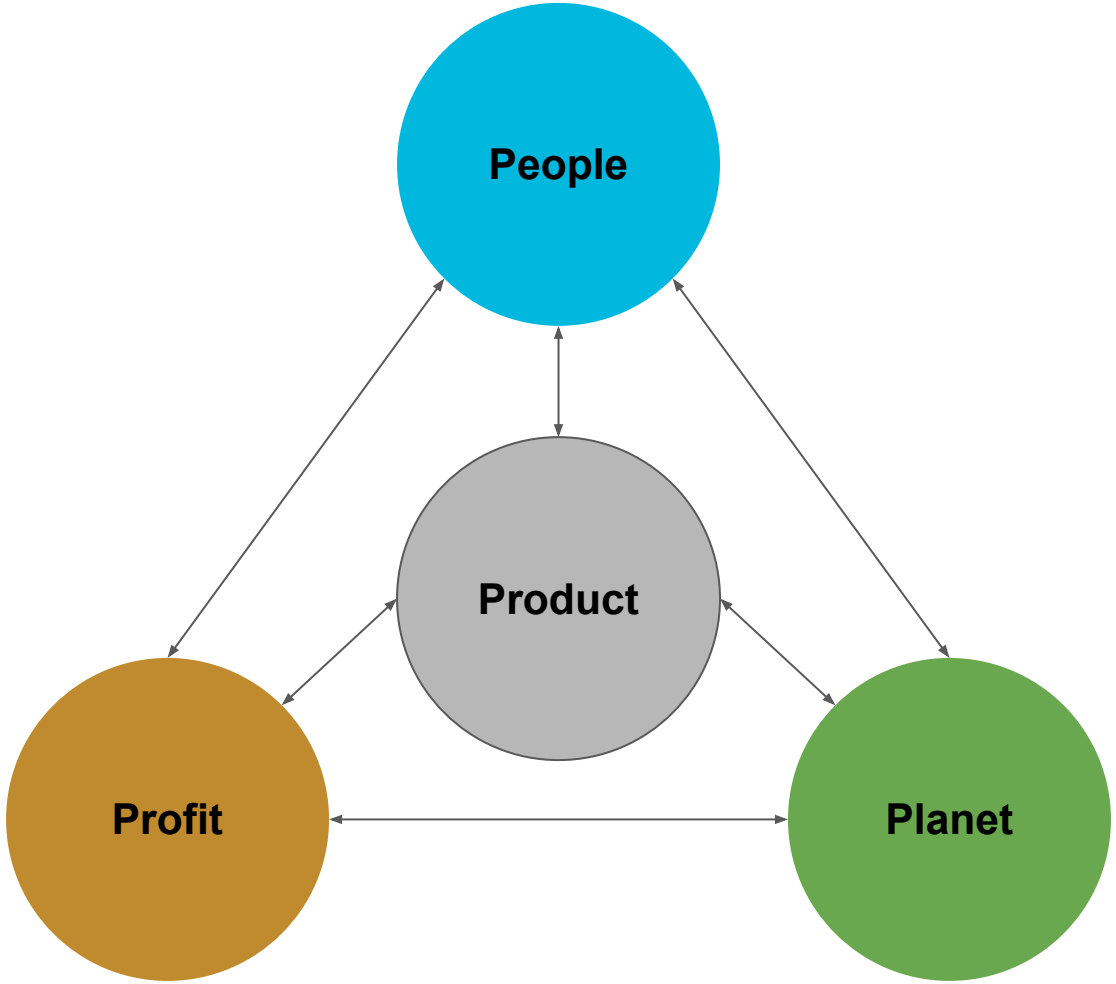


Source: The Bathroom, the Kitchen and the Aesthetics of Waste. (1992) Upton and Abbott Miller.

Pic Credit 1994, Peter Menzel

Design for Sustainability

- DfS means developing products with minimal or no environmental impacts – not ‘eco’ or ‘green’ products - but incorporating environmental considerations into good design practice for everyday products



- Design for Sustainability (D4S) is a key tool in incorporating sustainability concepts into the design and product innovation processes that companies employ.
- D4S goes beyond how to make a ‘green’ product and addresses how to best meet **consumer needs** on a **social, economic, and environmental level**.

Key principles of DfS

- Efficient design - keep the material and resource inputs to a minimum. Do more with less.
- Cyclic design - design to enable materials to be continuously cycled through natural or industrial systems.
- Safe design - avoid toxic and hazardous substances and processes. Keep human health in mind as well as ecological impacts.
- Communications design - ensure product and packaging related communications are informative and accurate. Encourage responsible consumer behaviour.

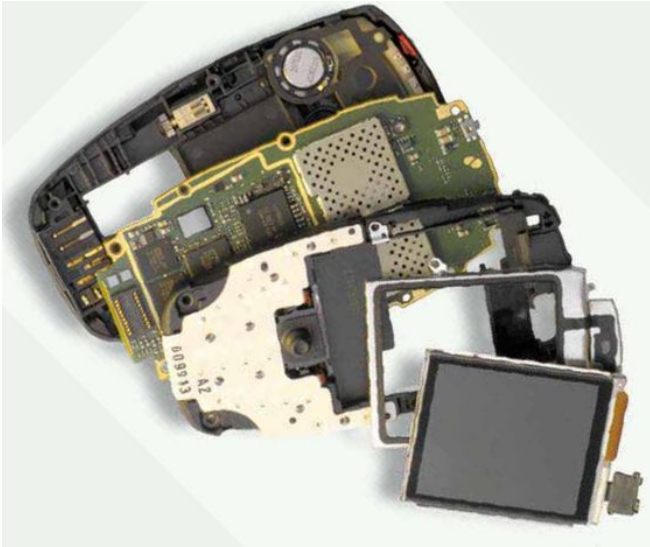
Telecommunication: Nokia

Outline of environmental aspects of Nokia's products

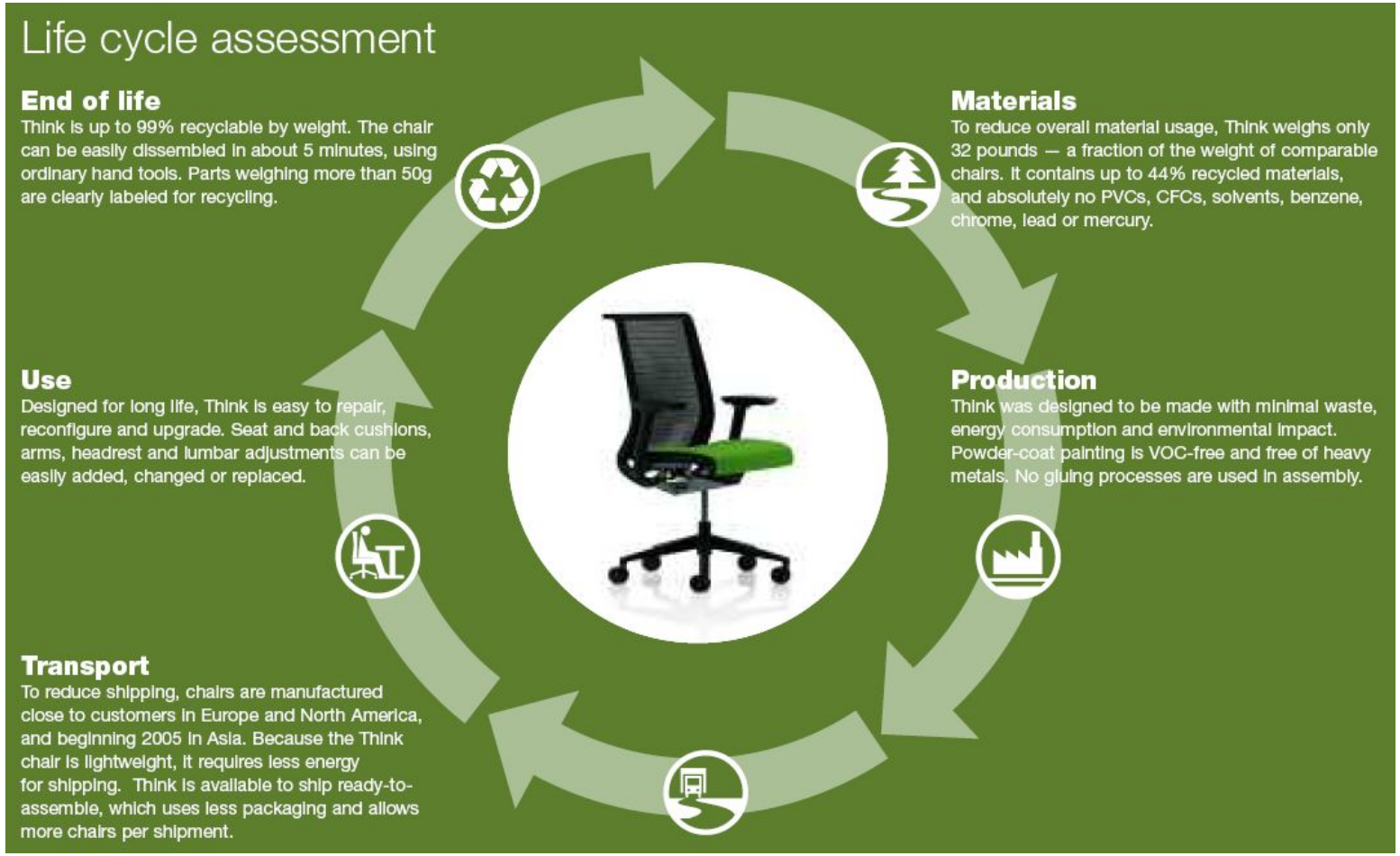
	Raw materials	Component manufacturing	Own operations	Logistics	Use	End-of-Life Practices
Waste	✗✗✗	✗✗✗	✗			✗✗
Use of hazardous materials	✗	✗✗	✗			
Water	✗	✗✗	✗			
Energy	✗✗	✗✗✗	✗	✗	✗✗✗✗	✗
Total environmental impact						

Minor impact	
Moderate impact	✗
Considerable impact	✗✗
Substancial impact	✗✗✗
Crucial impact	✗✗✗✗

The amount of crosses signifies the relative importance of the life cycle phase in question. The crosses can be compared horizontally, but not vertically.



Furniture: Think chair (Steelcase)



Stratus workstation (Zenith Interiors)

- Steel (50% recycled content)
- Aluminium (45% recycled content)
- Plantation sourced E0 MDF
- Ortech Easiboard (is compostable)
- Designed for disassembly – constructed with pins, clips and screws
- Reduced embodied energy and resource demand through use of recycled content and recyclable materials

Mobility: Smart car

- Designed by Swatch and built by DaimlerChrysler
- Only 2.5 metres long
- Environmental policy and guidelines –
  - protection of environment,
  - energy efficiency and
  - preservation of natural resources in all stages of life cycle

Behaviour Change By Design

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Persuasive Design

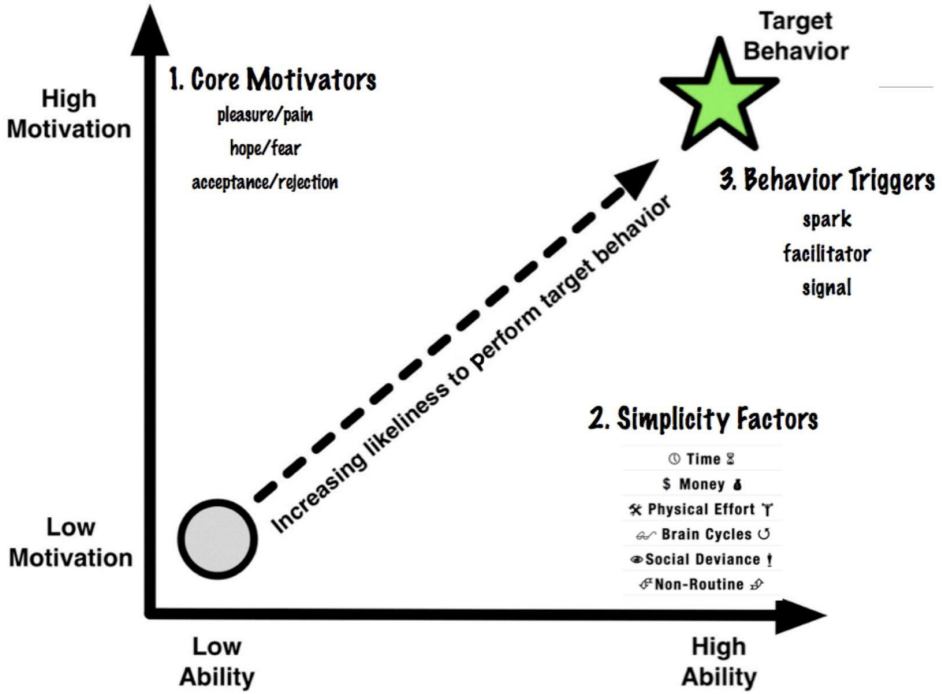
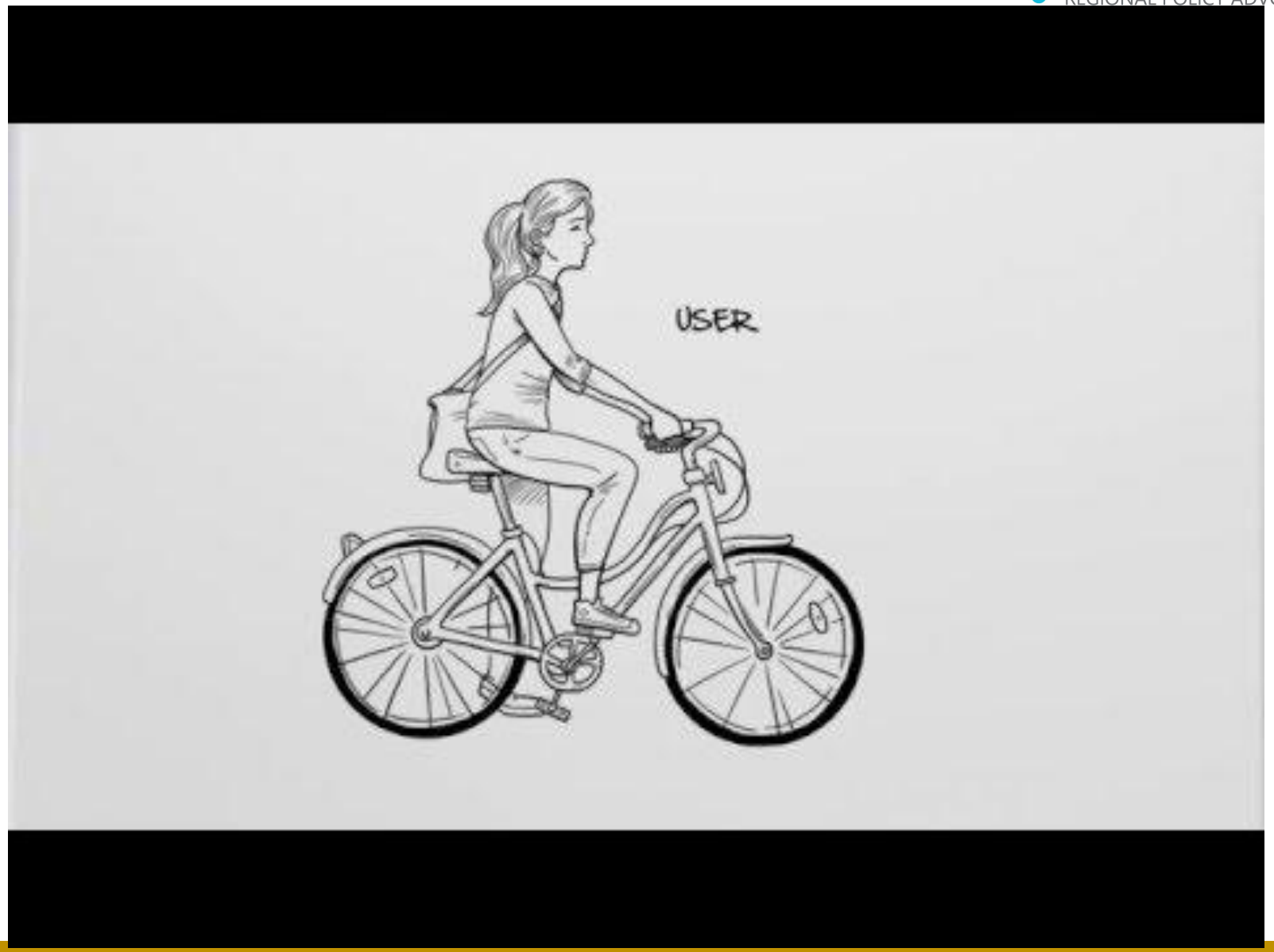


Figure 2: All three factors in the Fogg Behavior Model have subcomponents.

Source: A Behavior Model for Persuasive Design (Foggs BJ, 2009)

https://adamfard.com/blog/persuasive-design

Persuasive Design



Design for Sustainable Behaviour (DfSB)

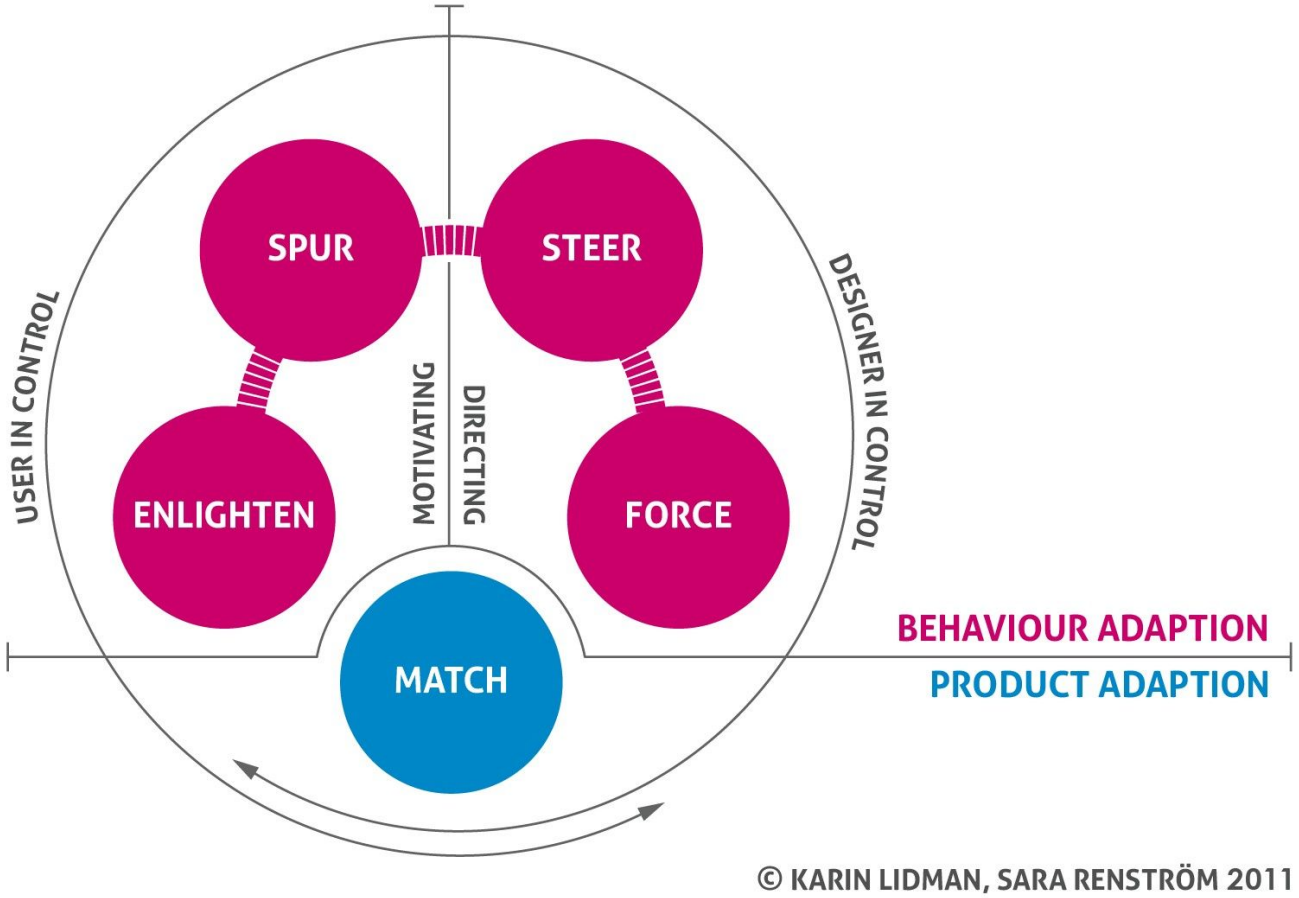
Sustainable design takes into account environmental, economic and social impacts enacted throughout the product lifecycle.

Design for Sustainable Behaviour (DfSB) is an emerging activity under the banner of sustainable design which aims to reduce products' environmental and social impact by moderating how users interact with them.

Understanding of the users

When designing for sustainable behaviour it is fundamental to gain a thorough understanding of the users, their habits and interaction behaviours, as well as how these contribute to people's everyday activities.

Use suitable design strategies



Different design strategies that can be used to design for sustainable behaviour.

Design for Sustainable Behaviour (DfSB) Strategies.

Bhamra, Lilley, Tang, Design for sustainable behaviour

Eco-Information: Design Oriented Education

Aim: to make consumables visible, understandable and accessible to inspire consumers to reflect upon their use of resources.

How it works:

1. Product expresses the presence and consumption of resources e.g. water, energy etc.
2. Product encourages the user to interact with resource use.

Examples:

Power Aware Cord – Seeing Personal Energy Consumption (Interactive Institute, 2004).

Tyranny of the Plug Kitchen Machines – Being involved in powering the product (Van Hoff, 2003).

Bhamra, Lilley, Tang, Design for sustainable behaviour

Eco-Choice-Design Oriented empowerment

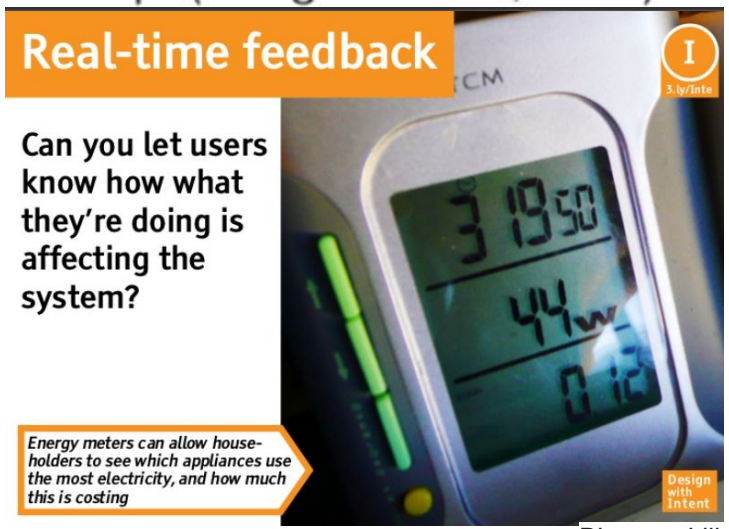
Aim: to encourage consumers to think about their use behaviour and to take responsibility of theirs actions through providing consumers with options.

How it works:

Users have a choice and the product enables sustainable use to take place.

Example:

Domestic Energy Display – household system level concept (Design Council, 2005).



Bhamra, Lilley, Tang, Design for sustainable behaviour

Eco-feedback – design oriented links to environmentally or socially

Aim: to inform users clearly about what they are doing and to facilitate consumers to make environmentally and socially responsible decisions through offering real-time feedback.

How it works:
The product provides tangible aural, visual, or tactile signs as reminders to inform users of resource use.

Example:
Wattson – wireless energy monitor which raises awareness of energy used in the home (DIY Kyoto, 2005).

Bhamra, Lilley, Tang, Design for sustainable behaviour

Eco-spur – design oriented rewarding incentive and penalty

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Aim: to inspire users to explore more sustainable usage through providing rewordings to 'prompt' good behaviour or penalties to 'punish' unsustainable usage.

How it works:

The product shows the user the consequences of their actions through 'rewarding incentives' and 'penalties'.

Example:

Flower Lamp – Rewarding Energy Behaviours (Interactive Institute, 2004).

Bhamra, Lilley, Tang, Design for sustainable behaviour

Eco-Steer-design oriented affordences and constraints

Eco-steer – design oriented affordances and constraints

Aim: to facilitate users to adopt more environmentally or socially desirable use habits through the prescriptions and/or constraints of use embedded in the product design.

How it works:

The product contains affordances and constraints which encourage users to adopt more sustainable use habits or reform existing unsustainable habits.

Example:

Unilever Powder Tablet – Counteracting excessive amounts of washing powder consumption by prescribing correct dose (Unilever, 2000).

Bhamra, Lilley, Tang, Design for sustainable behaviour

Eco-technical intervention – design oriented technical intervention

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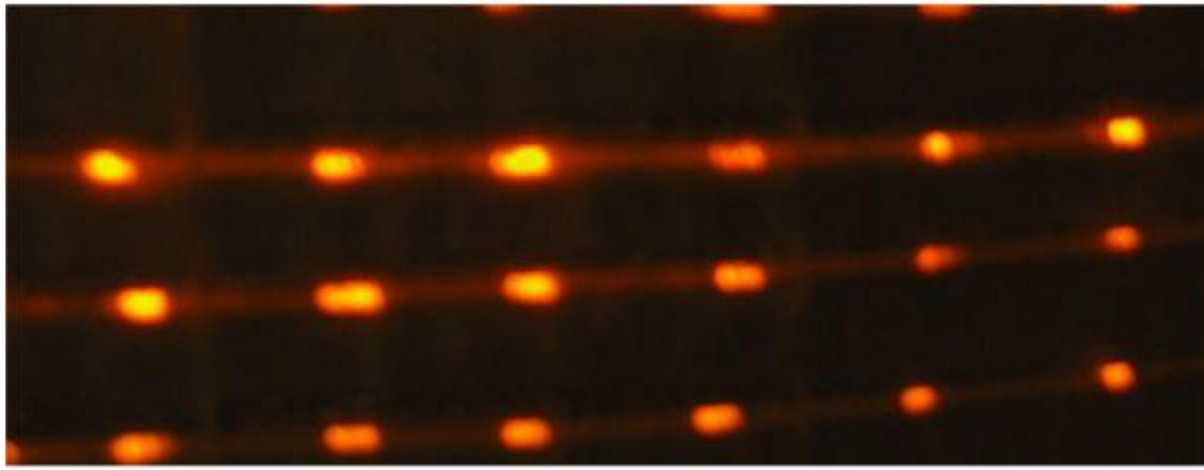
Aim: to restrain existing use habits and to persuade or control user behaviour automatically by design combined with advanced technology.

How it works:
The product utilises advanced technology to persuade or control user behaviour automatically.

Example:
Energy Curtain – Interacting with Daily Light Cycles (Interactive Institute, 2004).



Bhamra, Lilley, Tang, Design for sustainable behaviour

Clever design

Aim: to automatically act environmentally or socially without raising awareness or changing user behaviour purely through innovative product design.

How it works:
The design solution decreases environmental impacts without changing the user's behaviour.

Example:
Integrated toilet and washbasin – decreases water use by re-using water for hand-washing to flush toilet.

Bhamra, Lilley, Tang, Design for sustainable behaviour

Design of Circular Behaviour

PHASE:	USE	END OF USE
User ownership (product orientated)	Establishing relationship	Prolong replacement
	Product care	Return product
	Repair	Sell (via third party)
	Engage with product life extension services	Enable reuse
	Product attachment/ownership	Correct disposal/ recycling
Provider Ownership (use/performance orientated)	Adhere to contractual obligations	
	Product care	Fast circulation of goods
	Engage with product life extension services	Reducing operating costs
	Provide information	
	Avoid Product misuse	
	Avoid Damaging behaviours	

https://www.mdpi.com/2071-1050/10/6/1743

Tools/Methods/Triggers for DfSB

Design with Intent Tool Kit

https://designwithintent.co.uk/

A **Architectural**

Borrowing ideas from achitecture, urban planning, and traffic management

E **Errorproofing**

Drawing on safety-focused theories often found in ergonomic, health, and safety-related design

I **Interaction**

Using some of the more familar Human-Computer interaction ideas established in UI design

L **Ludic**

Using techniques for influencing user behavior derived from games and other "playful" interactions

P **Perceptual**

Drawing on ideas on how the brain processes the world around it

C **Cognitive**

Using ideas based on what we know about how users' decision making

M **Machiavellian**

Centering around a loose collection of useful but perhaps unethical techniques for manipulating user behavior

S **Security**

Taking "deterrent and countermeasure" approaches to altering user behavior

Shikakeology

The mechanism behind a shikake covers a wide range of physical and psychological trigger

1. A shikake is an embodied trigger for behavior change.

2. The trigger is designed to induce a specific behavior.

3. The behavior solves a social or personal problem.

Shikakeology —Studying motivation of human behavior

Changing people's behavior for the better by using gimmicks

Associate Professor, Graduate School of Economics
Naohiro MATSUMURA

A trashcan with a basketball hoop encourages people to throw trash into it. "Shikakeology" is the study to validate effects of gimmicks to motivate people to behave, new research field advocated by Associate Professor Naohiro Matsumura.

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Photo via The Fun Theory


-2.1kcal
-2.0kcal
-1.9kcal
階段使って
-1.8kcal
Photo by @kobutar

Fig. 3 Tiny shrine gate

Shikake Lab, Osaka University

Photo via TANITA

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その他のゴミ
ペットボトル
カン・ビン
新聞・雑誌
その他のゴミ
ペットボトル
カン・ビン
新聞・雑誌
Photo by busy.pochi


Photo by timtak

Design intervention strategies are potentially useful and inspirational tools enables to address issues of use behaviour.

Further work needs to be carried out for “Design for Sustainable Behaviour” with a wide range different product types.

‘Behaviour-changing’ devices need to evaluated for its effectiveness and the ethical considerations.

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