

Theoretical module:
**Innovation and design for
sustainability**

Authors: Cristina Rocha | Oihana Hernáez
With contributions from: Anna Gulmann | Maria Kalleitner-Huber |
Graça Bonifácio | Dionísia Portela





Introduction to this module

Objectives of the module

- To explain what product innovation is and how it relates to sustainability and design;
- To present the different levels of innovation and how they relate to factor X thinking;
- To establish the relationship between the different innovation levels and the SInnDesign modules and tools.

Introduction to Innovation

Innovation is a broad concept that can be used in many different contexts, and therefore there are many definitions of innovation. When one thinks about innovation, the immediate idea that pops into mind is “new”: new technologies, products or services, new processes, new markets, new organizational structures and management, new businesses, etc. But “new” is not all, the concept of innovation also embraces the idea of being “successful”, in the sense that it has some impact in the market or in society.

- Innovation: something original, new, and important in whatever field that breaks in to a market or society (Frankelius, 2009).

In the context of design for sustainability, the focus lies on product and/or service innovations that contribute to achieve a long-term balance between the economic, environmental and social pillars of sustainable development. SInnDesign methods and tools support design teams in developing new, more sustainable solutions, ranging from marginal improvements in existing products to completely new product-service combinations.

The most innovative solutions often require changes in consumers’ behavior and changes in companies’ management. So, product innovation comes together with market innovation and business innovation.

Background material

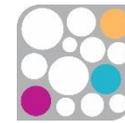
For more in-depth information, consult the background material, available at www.sinndesignproject.eu





Innovation and design for sustainability

Slides



Why is innovation important for sustainability?

There is a **big challenge**: **unsustainability of current production and consumption patterns** in industrialised societies, from the environmental, economic and social points of view.

More population + More consumption



More **environmental impact**



Factor X Thinking is needed:

➤ The index that compares the **increase of value** and the **reduction of the environmental impact of a new product** with those of the product being evaluated; this index expresses the **improvement in terms of a multiple** (factor).



Innovation - Rethinking

To avoid an ecological and social crisis in the long run, production and consumption patterns need to be more efficient **by a factor of 10**.

HOW?

- Design teams need to **rethink not only the product**, but also questioning **the way it is used**.
- **Design for sustainability** is a **promising strategy** to tackle the sustainability challenges.

➤ “[S]mart companies now treat sustainability as innovation’s new frontier.” (Nidumolu et al., 2009)



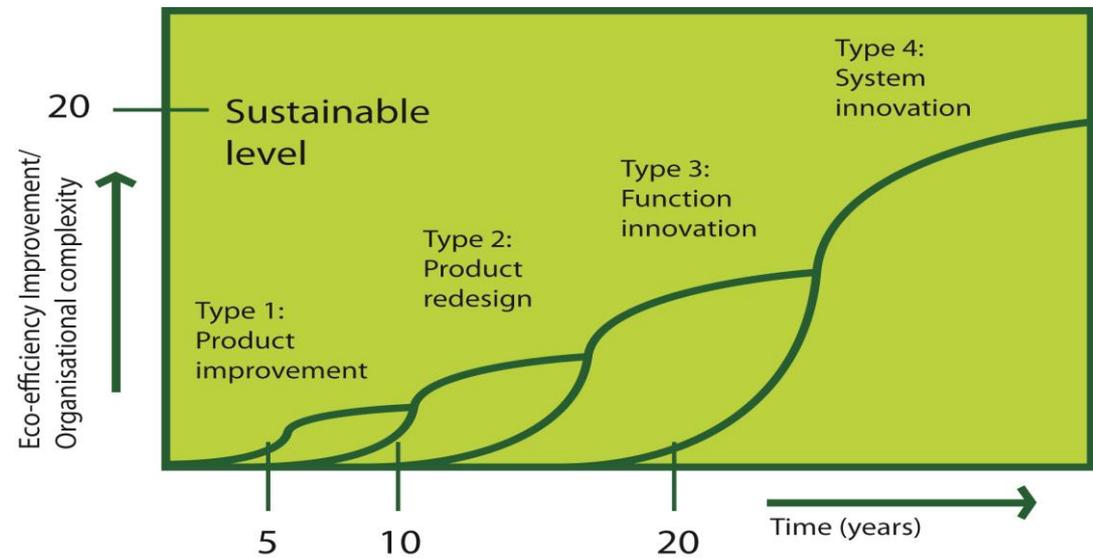
Product and services innovations



Innovation types

Design for sustainability efforts can be divided in **four** types:

According to the **types of changes** undertaken and the **eco-efficiency** attained



Innovation types (Rathenau Institute, 1996)



Innovation type 1: Product improvement

- **Partial changes** and improvements to products already existing in the market.
- The product itself and the production techniques **stay the same** in general.
- **Examples:** use of more environmentally friendly materials, reducing material consumption, improving the energy efficiency, durability, recyclability, etc.

- Example 1: Carpets manufactured with a high-end yarn composed of 100% recycled polyamide yarns



Source: <http://www.balsan.com/en/eco-design.asp>

Image source: pixabay.com

More examples

- Example 2: “Light” tiles:
Ceramic tiles with reduced thickness



Source: www.revigrés.com

Image source: pixabay.com



- Example 3: Organic cotton bed products
Source: <http://www.coyuchi.com/the-naturalista/gots/>

- Example 4: Office chair RH Ambio: compliance with national and international standards, certified according to Öko-Tex 100 and biodegradable

Source:
<http://environdec.com/en/Detail/epd186#.Vdb5FvIPUqN>





Innovation type 2: Product redesign

- **Incremental** or **step-by-step environmental** improvements on **all technical** aspects and parts of a product.
- The existing product concept stays the same, but the **components** of the product are improved or replaced.
- **Examples:** use of non-toxic materials, recycling and disassembling, improved distribution, reuse of parts and energy use reduction with respect to all components over their life-cycle.
- **Substantial changes** are required in the production, supply and distribution activities.

- Example 1: Natural mattresses handmade: natural materials / use of traditional techniques / mattress adjustment and repair service



Source: <http://www.prirodni-matrace.cz/novinky/natural-mattress>

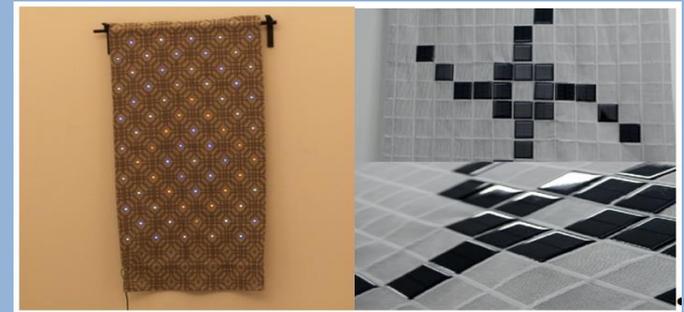


Innovation type 3: Functions innovation

- The way the **function** is fulfilled is changed.
- The focus of a new design is in the **service** that the consumer receives from a product and on the way the customer uses a product's function.
- A **new way of marketing**.
- **Multi-functional** products.
- **Examples:** integration of functions, shared use of products, leasing, etc.
- **Changes** in the design and production processes, as well as in the supply chain.
- **Cooperation** between industrial companies and research institutions.

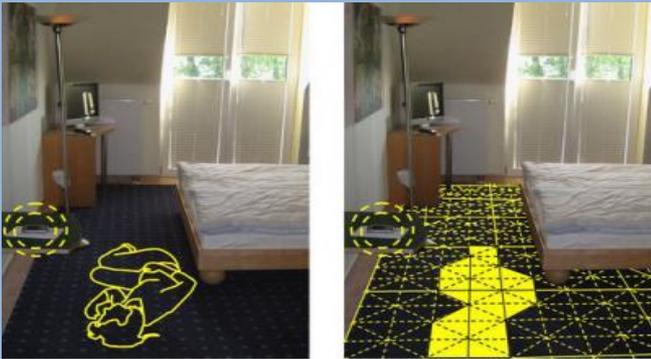
- Example 1: Functions integration: Textile structures that promote different functions such as LED integration and photovoltaic panels. Reduction of energy consumption.

Source: Newlight Project



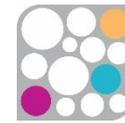
Innovation type 4: System innovation

- Example 1: SensFloor® – large-area sensor system



(<http://future-shape.com/se/technologies/127/sensfloor-large-area-sensor-system>)

- The **entire technological system** (the product, the production chain, associated infrastructure and institution) is replaced by a **new system**.
- **Radical innovations**: Besides the technological aspects, social and cultural aspects are also intensely considered.
- **Substantial changes** at the production and organizational level.
- **Extensions of relationships** and implementation of **new forms of partnerships**.
- This results in an **integrated solution** for the customer and final consumer, supported by a solid infrastructure and new validated business models.



Product-service systems overview



Product-service systems (PSS) overview

PSS, which have a **high potential for sustainability**, are based on business models that **combine the delivery of products and services** in order to add value to and meet the needs of users **in a more sustainable way**.

- Potential sustainability of servicing: **Replacement** of a **tangible product** (answering machine) by a **service** (voice mail).
 - **Instead of** thousands of answering machines being manufactured, distributed, used and disposed at the end of life, the already existing phone is enough.
 - **Consumer satisfaction** is higher.



To own or to use?

What does the consumer really need: to own an answering machine or to be able to use the function of receiving phone messages?



Categories of PSS

Categories	Ownership of the product	Examples
Category A: Product oriented Services	The product is owned by the user/consumer	<p><u>Product extension service</u>: upgrading, repair, guarantees, financing schemes, supply of consumables, etc.</p> <p><u>Advice and consultancy</u>: most efficient use of the product.</p> <p><u>Vertical Integration</u>: delivering strategies to supply products to customers or retailer who get directly involved in the process of production (production on demand).</p>





Categories of PSS

Categories	Ownership of the product	Examples
Category B: User oriented Services	Product is owned by the service provider who sells functions instead of products (modified distribution and payment systems)	<p><u>Leasing</u>: The provider retains ownership and often is responsible for maintenance, repair and control. The leaser pays a regular fee for the use of the product. Individual and unlimited access to the leased product.</p> <p><u>Renting or Sharing</u>: The user does not have unlimited and individual access to the product. The same product is sequentially used by different users.</p> <p><u>Pooling</u>: There is a simultaneous use of the product.</p>
Category C: Result oriented Services	There is not a pre-determined product involved in this category	<p><u>Activity Management</u>: The supplier gives incentives for the customer to consume more efficiently and optimises a system.</p> <p><u>Functional result</u>: Products are substituted by new solutions; the delivery is a result which is not related to a specific technology system; pest control service instead of pesticides, delivery of a “pleasant climate” instead of selling heating or cooling equipment, etc.</p>



Are PSS more sustainable?

PSS: **High potential** to **decouple revenues from material flows** and to **increase resource productivity**.

- **Decoupling**: the **incentive for profit changes**.
- In a product-oriented business model, the company revenues depend on the number of units sold (the more the better); in a PSS business model the company sells a result and owns the products: the less products they need, or the longer the products last with good quality, the better for the company.

- Example 1: PSS for carpets (user-oriented service): A carpet company owns the carpet and replaces portions periodically as necessary in order to ensure that the client is provided with adequate floor covering.
- **Functional oriented PSS** gives the service provider **higher freedom** to design a **low environmental impact system**, while **maximizing the customer satisfaction**.
- Not all PSS correspond to type 3 innovations: **product-oriented PSS** would fall into type 1 or type 2 innovations.

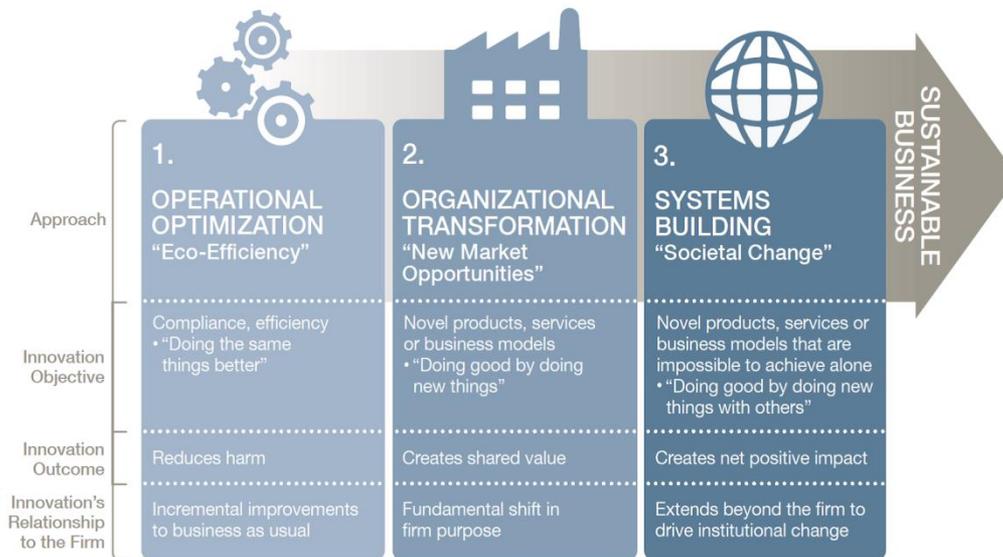


Organizational innovation level



Three levels of business strategies

Companies will have to drastically change **the way they address their business strategy, product development and co-operation with stakeholders.**



Source: Three stages of innovatingSource: Network for Business Sustainability, 2012.

Stage 1: Organizations **add environmental and social criteria** to existing quality or profit criteria in their product development processes.

Stage 2: Organizations see the business opportunity in **developing new products and services** that **fulfill human needs** and **benefit the environment.**

Stage 3: Organizations engage in **totally new product and service** developments with an improved **sustainability profile.**



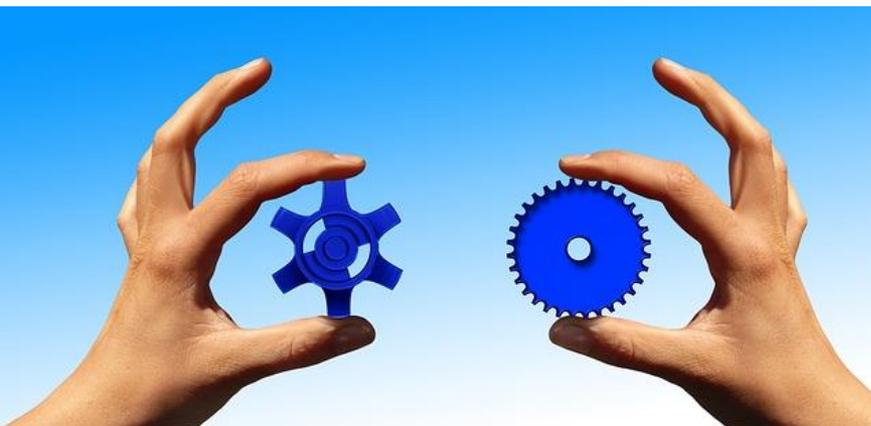
SinnDesign and innovation types



SInnDesign and innovation types

SInnDesign methods and tools help designers and product developers to sustainability-driven improvements of existing products in the habitat sector.

- In a given DfS process, the level of ambition in terms of innovation and sustainability outcomes will **depend on** the company's strategy, the market, the technological options available, the possibility of establishing partnerships, etc.
- The same tools can be used for **very different development process and provide quite different results** in terms of innovation level and sustainability improvements.



- **Type 4 innovation is not supported by SInnDesign** because this type of innovation involves companies, policy makers and other stakeholders, i.e., occurs at macro level, not at micro-level.
- **But if a company is engaged in such process**, it may use SInnDesign methods and tools to specific projects that would contribute to the whole.



SInnDesign process types and tools, and innovation types

Innovation types SInnDesign processes + tools	Type 1	Type 2	Type 3	Type 4	1 “Operational optimization”	2 “Organizational transformation”	3 “Systems building”
Product improvement / redesign process	Yes	Yes	No	No	Yes	No	No
Product-service systems development process	Yes	Yes	Yes	No	Yes	Yes	Yes
Motivating factors	Yes	Yes	Yes	No	Yes	Yes	Yes
Design brief	Yes	Yes	Yes	No	Yes	Yes	Yes
DfS checklists	Yes	Yes	Yes	No	Yes	Yes	No
Ecodesign Pilot	Yes	Yes	Yes	No	Yes	Yes	No
QFD	Yes	Yes	Yes	No	Yes	Yes	Yes
Matrix for evaluation of DfS ideas	Yes	Yes	Yes	No	Yes	Yes	Yes



Innovation and design for sustainability

References and further reading



References and further reading

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