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EcoDesign ABCs: How to develop a sustainable product design?

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Note: Hesam Ostad has worked more than five years in the field of Ecodesign at the Technical University of Vienna (VUT). There he is responsible for the development of new methodologies and approaches for the implementation of Ecodesign into product development, especially into the early decisive design stages. He contributed to lots of projects carried out at the VUT. He is also responsible for the adaptation of the Ecodesign PILOT, a tool developed at the Institute for Engineering design- Ecodesign which helps to optimize product from the view of environment, to the needs of companies. He is also the project manager of the Ecodesign Company (www.ecodesign-company.com). Currently he also works on his PhD thesis in the field of Ecodesign.

A Brief Introduction to "Ecodesign"

When thinking about the quality of a product, what considerations are usually taken into account? What qualities of a product are evaluated before it is bought by the consumer? What properties of a product give direction to this decision?

Beneath the sales price, the design and appearance of the product sometimes are the two most important parameters which are taken into account when a product is bought.

But in terms of sustainable product development and consumption there is more than that. Here, the entire life cycle and the environmental impacts caused by the product are taken into account. The environmental performance of a product is considered as an important quality criterion.

By applying Life Cycle Thinking and evaluating the product (e.g. by applying Life Cycle Assessment in accordance with ISO 14040 series) interesting results can be obtained: suddenly a usual office chair may have produced some radioactive waste (without containing any radioactive material of course), usual jeans trousers may have travelled about 50000km around the world before they can be bought in a store or it results that for the production of a

common personal computer more than 14000kg of materials and additional 30000 litre of water were used.

To be able to cut down environmental impacts during the life cycle of products and, related to the decrease of environmental impact gain economical benefit, Ecodesign can be applied.

Ecodesign can be interpreted as the design of products with respect to the ecological as well as the economical effects the design and the product has. Ecodesign assumes that the contribution of the product to the environment should be considered through all of its life cycle phases.
The term ‘product’ includes hardware as well as software respectively services.

The five life cycle phases of a product are briefly introduced in the following:

1. Extraction of raw materials

In the first life cycle phase resources (materials and energy) are extracted from nature raw and ancillary materials are produced from the extracted resources.

2. Manufacturing processes

In this phase materials are processed to parts and components during manufacturing. The components can be assembled to form the final product.
For manufacturing tools and machine tools are necessary. Machine tools require energy, e.g. electrical energy. Beneath that, process materials such as chemical substances, coolants, glue or water could be necessary.
If we want to go into more detail, all energies needed to lighten, warm or cool the factory must be taken into considerations too. These additional energies are called “overhead energies”. Experience shows that the overhead energies can rise up to 200% of the energy needed for manufacturing.

3. Transport

The final product is packaged and delivered to the customer or consumer. Depending on the mode of transport, e.g. airplane, ship, train or lorry, energy is used and emissions are generated.

In a more detailed look all transport between the different suppliers of a factory must be taken into account as well. These suppliers could be for example material suppliers as well as suppliers for parts or components.

4. Use

In the use phase the product is used. To operate properly, the product may require energy or secondary materials, e.g. lubricants, water or coolants.

A product has to fulfil its functionality in the use phase. The lifetime of the product is the time the product can fulfil its functionality properly. Most customers and consumers are directly confronted with the product in this phase. Any impact to the environment in this phase may also be a strain or stress for the user: Imagine products, e.g. household products, which cause high noise and vibrations during use; they will not be really appreciated. Also imagine for

example products which need batteries to function: beneath the high environmental impacts caused by the batteries when they are treated after reaching their end of life, the user of such products has to spend a lot of money for the purchase of batteries. In case of battery using products one can see that by reducing the need to batteries not only the environmental impact of the product can be reduced but also the operating costs for the product decrease.

In the use phase of a product, the interaction between the user and product takes place. Usually this interaction ends when the product is not able to operate properly anymore and is disposed by the user. The product enters another phase called the 'end of life' phase.

5. End of Life

There are several and different ways to treat the product and its part in the end of life phase. The product can be for example disassembled. The components and the parts can be used again or the materials used in the product can be entered into a recycling cycle.

Ecodesign wants to use resources intelligently and therefore increase benefit for all involved actors through the value creation chain and, at the same time, reduce environmental impact. This should be achieved under social fair conditions.

The motivation for implementing Ecodesign can be divided into three main groups. These groups are:

- Ecological reasons: currently mankind uses more than 120% of the biosphere. To secure an intact environment for future generations, consumptions of non- renewable resources and impacts to the environment must be reduced now. Ecodesign is an effective approach to translate this aim into reality.
- Economical reasons: implementing Ecodesign in companies can lead to innovative products with improved quality and optimized functionality. This can open new consumer segments. Ecodesign also helps to build up confidence and credibility in stakeholders and achieve better ratings of the company. Reduced use of materials and energy helps to save costs.
- Social reasons: socially compatible conditions and quality of life as well as job creation, which are all factors for socially and politically steadiness, can be provided by the implementation of Ecodesign.

Nowadays the idea of Ecodesign is widely spread over the different technical disciplines such as architecture, civil engineering, mechanical engineering or industrial design.

Companies show interest in implementing Ecodesign. This is not only because laws and directives of the European Union, such as the Waste Electrical and Electronic Equipment (WEEE) directive or the Restriction of certain Hazardous Substances (RoHS) directive, forces them to. They have realized that Ecodesign is part of future oriented technology; Ecodesign is considered as an investment in a technology which allows, beneath other advantages, saving a lot of internal costs.

Since engineers in product development are not necessarily environmental experts, the implementation of Ecodesign still is a challenging task. Industrial projects often show that Life Cycle Thinking is still not well established among engineers in product development. The influence of the design of a product to its environmental performance, viz the caused

impacts to the environment by the product, is still obscure to most engineers in product development. Still, there is much to do!

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