Steps and Criteria for ecological design

It is highly unlikely that an independent category of ecological design will emerge if one limits oneself to "ecologizing" current products, because these products were created, optimized and used under "un ecological" conditions. Design should therefore not try to "ecologize," but should bring forth new ecologically optimized concepts. A deliberate strategy in this direction could proceed according to the following steps:

Step 1: detailed description of the service needs

The first step toward dematerialized products, systems and services of the future must be a clear definition of what is needed or desired. At this stage, the question should absolutely not be how to technically improve existing systems according to ecological criteria, as this often leads to the invention of "outboard motors for dinosaurs," such as filters, catalytic converters and devices which automatically turn off the car engine while waiting at stoplights or railroad crossings. Besides obscuring the actual goal, such mechanical wizardry requires additional material displacement.

Step 2: the search for the most dematerialized solutions--concept, planning, draft

Here we are looking for ways to meet those service needs. New and unconventional ideas are what we are seeking. What must be kept in mind is that while people buy goods because they are under the impression that doing so will meet their service needs, they might also have very different reasons. Aesthetics and status considerations figure in to the purchase of many an object.

Step 3: First evaluation of the results

In the first round, unrealistic suggestions are thrown out. In this phase the first test takes place. Can these ideas that emerged during the brainstorming phase as environmentally friendly actually be turned into environmentally friendly products? Mass production must be possible, for instance, and the production costs should remain within a realistic range.

Step 4: Detailed inspection of the selected options

In this step the remaining suggestions are assessed with the help of the above list of criteria for ecological design--step by step. At the conclusion it should be clear how each suggestion fares with respect to all criteria.

Step 5: Assessment of the remaining suggestions

In a further assessment procedure, the prototypes are compared with the above list of criteria, the goal being to find which entrant has met the terms best and with the least impact on the environment. The first criteria are the MIPS, and, as far as they are known, the human- and eco-toxicity. Additionally, traditional design criteria are brought into the picture at this stage, such as safety, healthfulness, and, last but not least, aesthetics.

Step 6: Implementation of the selected optimal solution--or a return to step 2

If a winner emerges, the solution is now implemented; the draft process is completed and the product is produced. If no winner emerges, the option of returning to step two, to the brainstorming, exists. If that is neither desired nor sensible, other criteria within the existing list must be emphasized more heavily.

If no solution was found, it could mean that no ecologically appropriate good exists for the job. The result might be to stick with existing products, or to do without the service provision entirely. A business that is subject to innovation pressures and competition will in all likelihood find doing without to be a difficult step.

Without a doubt, the price has to play an important role in the assessment of the chosen solution. But as long as prices refuse to "tell the ecological truth," this criterion can lead to ecologically devastating results.

The procedure just introduced for selecting an ecological design is not just stodgy theory. Ursula Tischner of the Wuppertal Institute has followed this path in her Master's Thesis, working on a new concept for the service "keeping produce cool in the household." We introduce her results under the heading "Does a refrigerator have to travel?" Precisely this question was the key that opened the door in step two to a new solution in line with our goal of dematerialization as it is demanded in this book.

Ecologically relevant product characteristics

Manufacture

•*Material intensity of raw materials, processes, structures, facilities.

•*Energy intensity of raw materials, processes, structures, facilities.

•*Use of renewable materials. This is advisable only if the total material intensity is lower than if the materials were non-renewable.

•*Amount of useful products produced. This includes linked products, as, for example, in the chemical industry: those chemicals that are by-products, but that can be used anyway.

•*Waste intensity. Emissions into the air and water are included here.

•*Scrapping rate. This is determined by the quality control as well as by process management.

•*Transport intensity.

•*Packaging intensity.

• Dangerous materials (either materials entering the product itself or as waste materials; see section on "use").

• Surface appropriation.

Use

•*Material throughput, i.e. the amount of detergent required by the operation of the washing machine, fuels, cleaning agents or lubricants.

•*Energy input.

•*Energy output (in the case of facilities, those that yield energy in a useable form, such as power plants and waste incinerators).

•*Weight. This can be an important decision making criteria for the purchaser, as it is one (albeit a rough) estimate of the amount of material that is contained within a product (see also the chapter on "Market Signals").

•*Self-regulation and self-optimization. This category would include the electronic regulation of the flow of consumables (energy, detergent, ...), the "intelligent house" or the "screen saver" option on computers.

•*Multifunctionality. A touring bicycle that can be used both for recreation and commuting is preferred to a highly specialized (racing) bicycle, in an ecological sense. Buildings, for instance, can be constructed in such a way that different use-patterns can be accomodated.

•*Second-hand option. Second-hand clothing stores do an excellent job of organizing this concern, as do all other second-hand retailers.

•*Option of joint use. All products that are used only rarely could qualify here. Electric drills, washing machines and other household appliances, video cameras, lawn mowers or even yachts.

• Size and surface appropriation. This would include the requisite access roads and parking lots.

•*Durability. This is a collective term for a list of characteristics. These include:

-- timeless design, or a design that remains outside the world of fashion and obsolescence--retaining its appeal over time;

-- corrosion resistance;

-- likelihood of material fatigue (especially in the case of plastics);

-- reparability;

-- partibility/separability (for maintenance and repair);

-- resilience and reliability;

-- adaptability to technical progress. Products should be put together in such a way that individual parts can be exchanged for newer, improved ones (car engines or refrigeration units). This holds true not only for durable goods, but also for goods that can change very quickly such as computers.

After the end of the first intended use

•*Durability is also a relevant criterion in this phase of the product. Included in this list are:

-- Material composition and complexity. This determines how easily the product can be reused, or parted out.

-- All forms of continued use; reusability of parts for the same purpose or for other purposes; reuse of raw materials for the same purpose and for new and different purposes.

-- The option of collecting, sorting and transporting the product after its initial use without great material effort.

•*Flammability, or the ability to capture some of the energy content through burning the product.

• Compostability.

• Effects on the environment after the final storage or dispersion into air, soil or water