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**1. The next industrial revolution**

The Next Industrial Revolution is the emerging transformation of human industry from a system that takes, makes, and wastes to one that celebrates natural, economic, and cultural abundance.

*The First Industrial Revolution*

The industrial framework that dominates our lives now is fairly primitive. It is conceived around a one-way manufacturing flow—what is known as a "cradle to grave" lifecycle. This cradle to grave flow relies on brute force (including fossil fuels and large amounts of powerful chemicals). It seeks universal design solutions ("one size fits all"), overwhelming and ignoring natural and cultural diversity. And it produces massive amounts of waste—something that in nature does not even exist.

Consider looking at the industrial revolution of the 19th century and its aftermath as a kind of retroactive design assignment, focusing on some of its unintended, questionable effects. The assignment might sound like this: design a system of production that

- Puts billions of pounds of toxic material into the air, water, and soil every year
- Produces some materials so dangerous they will require constant vigilance by future generations
- Results in gigantic amounts of waste
- Puts valuable materials in holes all over the planet, where they can never be retrieved
- Requires thousands of complex regulations to keep people and natural systems from being poisoned too quickly
- Measures productivity by how few people are working?
- Creates prosperity by digging up or cutting down natural resources and then burying or burning them
- Erodes the diversity of species and cultural practices

Does this seem like a good design assignment?

Even though none of these things happened intentionally, we find this "design assignment" to be a limited and depressing one for industries to perpetuate—and it is obviously resulting in a much less enjoyable world.

*A New Design Assignment*

We are proposing a new design assignment where people and industries set out to create the following:

- Buildings that, like trees, are net energy exporters, produce more energy than they consume, accrue and store solar energy, and purify their own waste water and release it slowly in a purer form.
- Factory effluent water that is cleaner than the influent.
- Products that, when their useful life is over, do not become useless waste, but can be tossed onto the ground to decompose and become food for plants and animals, rebuilding soil; or, alternately, return to industrial cycles to supply high quality raw materials for new products.
- Billions, even trillions of dollars worth of materials accrued for human and natural purposes each year.
- A world of abundance, not one of limits, pollution, and waste.

**2. Eco-Effectiveness: Nature's Design Patterns**

Cradle to Cradle design is a new strategy for business growth and prosperity that generates ecological, social, and economic value. It represents a fundamental conceptual shift away from the flawed system design of the Industrial Revolution, not just a damage management strategy.

*Background*
In response to widespread environmental degradation, many industries have adopted a strategy known as "eco-efficiency"-minimizing waste, pollution, and natural resource depletion. But eco-efficiency is not a strategy for long-term success. It seeks to make the current, destructive system sustainable.

*Waste Equals Food*
Minimizing toxic pollution and the waste of natural resources are not strategies for real change. Designing industrial processes so they do not generate toxic pollution and "waste" in the first place is true change. Long-term prosperity depends not on the efficiency of a fundamentally destructive system, but on the effectiveness of processes designed to be healthy and renewable in the first place.

Cradle to Cradle Design's strategy of eco-effectiveness is rooted in the systems of the natural world, which are not efficient at all, but effective. Consider the cherry tree. Each spring it makes thousands of blossoms, which then fall in piles to the ground-not very efficient. But the fallen blossoms become food for other living things. The tree's abundance of blossoms is both safe and useful, contributing to the health of a thriving, interdependent system. And the tree spreads multiple positive effects-making oxygen, transpiring water, creating habitat, and more. And it is beautiful!

Eco-effectiveness seeks to design industrial systems that emulate the healthy abundance of nature. The central design principle of eco-effectiveness is waste equals food.

When waste equals food, the "be less bad" imperatives of efficiency fade. When a product returns to industry at the end of its useful life and its materials are used to make equally valuable new products, the minerals or plastics of which it is made do not need to be minimized-because they will not become waste in a landfill. Industry saves billions of dollars annually by recovering valuable materials from used products. Similarly, products designed to be made of natural, safely biodegradable materials can be returned to the soil to feed ecosystems instead of depleting them.

*Transforming the Making of Things*
This fundamental conceptual shift leads to design strategies that some might find surprising. For example, instead of minimizing the consumption of energy generated from coal, oil, and nuclear plants, why not maximize energy availability using solar and wind sources? Instead of using only natural, biodegradable fibers like cotton for textile production (a pesticide-intensive agricultural process), why not use non-toxic synthetic fibers designed for perpetual recycling into new textile products? Instead of directing intelligence towards regulation compliance and liability reduction, why not design industrial processes and products so safe they do not need regulation, and direct creativity towards maximizing economic, social, and ecological benefits?

Eco-effectiveness has profound implications for industries everywhere. Rather than lamenting a world of hazardous waste, scarce resources, and limited opportunities, it celebrates an abundance of continuously valuable industrial and natural materials, of rich and diverse living systems, of economic and environmental wealth.

The eco-effective future of industry is a "world of abundance" that celebrates the use and "consumption" (by people, nature, and intelligent industrial systems) of products and materials that are, in effect, nutritious-as safe, effective, and delightful as a cherry tree.

## 3. The Cradle to Cradle Design Protocol

To assist companies in (re)designing eco-effective products, the Cradle to Cradle Design Protocol is used to assess materials used in products and production processes. The Protocol is founded on the "Intelligent Products System" developed by Michael Braungart and his colleagues at EPEA.

In applying the Protocol, materials in products are first inventoried and then evaluated according to their characteristics within the desired application, and placed into one of four categories (Green, Yellow, Orange, or Red) based on human health and environmental relevance criteria. After all chemicals are assessed, the materials in a product application are optimized by positively selecting replacements for chemicals characterized as Red and using Green chemicals as they are available.

The four categories are:

- Green: little or no risk. This chemical is acceptable for use in the desired application.
- Yellow: low to moderate risk. This chemical is acceptable for use in the desired application until a green alternative is found.
- Orange: there is no indication that this is a high risk chemical for the desired application, but a complete assessment is not possible due to lack of information.
- Red: high risk. 'Red' chemicals (also sometimes referred to as 'X-list' chemicals) should be phased out as soon as possible. 'Red' chemicals include all known or suspected carcinogens, endocrine disruptors, mutagens, reproductive toxins, and teratogens. In addition, chemicals that do not meet other human health or environmental relevance criteria are 'red' chemicals.

Human health and environmental relevance criteria used to rank chemicals are listed below.

Human Health Criteria

- Carcinogenicity
- Teratogenicity
- Reproductive Toxicity
- Mutagenicity
- Endocrine Distruption
- Acute Toxicity
- Chronic Toxicity
- Irritation of Skin/Mucous Membranes
- Sensitization
- Carrier Function or Other Relevant Data

Environmental Relevance Criteria

- Algae Toxicity
- Bioaccumulation (log Kow)
- Climatic Relevance/Ozone Depletion Potential
- Content of Halogenated Organic Compounds (AOX)
- Daphnia Toxicity
- Fish Toxicity
- Heavy Metal Content
- Persistence/Biodegradation
- Toxicity to Soil Organisms (Bacteria and Worms)

**4. Glossary of Key Concepts**

BIOLOGICAL METABOLISM

The natural processes of ecosystems are a biological metabolism, making safe and healthy use of materials in cycles of abundance.

BIOLOGICAL NUTRIENT

A biodegradable material posing no immediate or eventual hazard to living systems that can be used for human purposes and can safely return to the environment to feed environmental processes.

CRADLE TO CRADLE DESIGN
Cradle to Cradle Design is a design paradigm, based on principles and an understanding of the pursuit of value, as well as processes for product and material research and development, and for educating and training. At a fundamental level, the new paradigm proposes that human design can learn from nature to be effective, safe, enriching, and delightful. Cradle to Cradle Design models human industry on nature's processes, in which materials are viewed as nutrients circulating in healthy, safe metabolisms. Industry must protect and enrich ecosystems—nature's biological metabolism—while also maintaining safe, productive technical metabolism for the high-quality use and circulation of mineral, synthetic, and other materials.

CRADLE TO CRADLE DESIGN PROTOCOL
A scientifically based, peer-reviewed process used to assess and optimize materials used in products and production processes in order to maximize health, safety, effectiveness, and high quality reutilization over many product life cycles.

DESIGN CHEMISTRY
The incorporation of scientific and ecological knowledge into product and process design.

DESIGN FOR DISASSEMBLY
Designing a product to be dismantled for easier maintenance, repair, recovery, and reuse of components and materials.

DOWNCYCLING
The practice of recycling a material in such a way that much of its inherent value is lost (for example, recycling plastic into park benches).

ECO-EFFECTIVENESS
Strategy for designing human industry that is safe, profitable, and regenerative, producing economic, ecological, and social value.

ECO-EFFICIENCY
The strategy for "sustainability" of minimizing harm to natural systems by reducing the amount of waste and pollution human activities generate.

ECOLOGICAL INTELLIGENCE
A product or process designed to embody the intelligence of natural systems (such as nutrient cycling, interdependence, abundance, diversity, solar power, regeneration).

LIFE CYCLE ASSESSMENT
A technique for assessing the potential environmental impacts of a product by examining all the material and energy inputs and outputs at each life cycle stage.

THE NEXT INDUSTRIAL REVOLUTION
This emerging movement of production and commerce eliminates the concept of waste, uses energy from renewable sources, and celebrates cultural and biological diversity. The promise of the Next Industrial Revolution is a system of production that fulfills desires for economic and ecological abundance and social equity in both the short and long terms-becoming sustaining (not just sustainable) for all generations.

PRODUCT OF CONSUMPTION

A product designed for safe and complete return to the environment, which becomes nutrients for living systems. The product of consumption design strategy allows products to offer effectiveness without the liability of materials that must be recycled or "managed" after use.

PRODUCT OF SERVICE
A product that is used by the customer, formally or in effect, but owned by the manufacturer. The manufacturer maintains ownership of valuable material assets for continual reuse while the customer receives the service of the product without assuming its material liability. Products that can utilize valuable but potentially hazardous materials can be optimized as Products of Service.

TECHNICAL METABOLISM
Modeled on natural systems, the technical metabolism is a term for the processes of human industry that maintain and perpetually reuse valuable synthetic and mineral materials in closed loops.

TECHNICAL NUTRIENT
A material that remains in a closed-loop system of manufacture, reuse, and recovery (the technical metabolism), maintaining its value through many product life cycles.

UNMARKETABLES
Materials to be eliminated from human use because they cannot be maintained safely in either biological or technical metabolisms.

WASTE EQUALS FOOD
A principle of natural systems that eliminates the concept of waste. In this design strategy, all materials are viewed as continuously valuable, circulating in closed loops of production, use, and recycling.

*Bron: McDonough & Braungart Design Chemistry*

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# Bedrijfsprofiel: Innovatie Management

Bluelarix ondersteunt bedrijven bij het ontwikkelen en vermarkten van technologie door middel van innovatieve bedrijfs- en productconcepten. Soms met advies, soms door zelf producten te vermarkten via licentieovereenkomsten en soms door deel te nemen in bedrijven of projecten.

**Werkgebied**
Wij richten ons met name op de apparatenbouw, machinebouw en duurzame technologie, waaronder energie, milieu, afval en reiniging technologie.

**Expertise**
In onze dienstverlening worden wij gedreven door onze ambitie om innovatieve technologie beschikbaar te maken voor de markt. Samen met onze klanten werken wij aan het vermarkten van de technologie, versterken van de concurrentiepositie, het optimaliseren en innoveren van bedrijfsprocessen en het verbeteren van de kwaliteit van producten en dienstverlening.

Onze klanten hebben wij onder meer ondersteund met het ontwikkelen van strategische ondernemingsplannen, het verkennen en bewerken van nieuwe afzetmarkten, strategische inzet van technologie en opzetten van verkoopkanalen van innovatieve technologie in eigen beheer. Wij beschikken over een sterke bedrijfskundige basis en we hebben inhoudelijke kennis en vaardigheden opgedaan in productontwikkeling, marketing en technologie.

**Team**
*Gerard Roddeman*
Met een achtergrond in werktuigbouw en vele jaren ervaring als constructeur bij Philips ondersteunt Gerard binnen Bluelarix met productconcepten en ideeën.

*Maria Kouzmina*
Na een brede universitaire opleiding geschiedenis in Rusland komt zij in Nederland terecht en pakt daar onder andere een opleiding marketing op. Maria houdt zich nu zowel bezig met de marketing van Bluelarix alsook met marketing opdrachten voor klanten.

*Andreas Knol*
Na het afronden van zowel werktuigbouwkunde als bedrijfskunde, vele jaren ervaring op verschillende posten in de industrie in Nederland en Rusland, ondersteunt Andreas binnen Bluelarix met bedrijfsmodel ontwikkeling, innovatie management en marketing.

**Onze diensten**
We bieden diensten en producten aan van verschillende omvang: van het maken van een innovatie plan, via het ontwikkelen en vermarkten van technologie in eigen beheer tot doorlopende ondersteuning en deelneming in bedrijven en projecten.

*Ontwikkelen*
- Productconcept ontwikkeling
- Technische en economische haalbaarheidsstudie
- Patentonderzoek
- Innovatie project management
- Partners zoeken
- Financiering

*Participatie in projecten*
- Licentieverkoop van technologie
- Deelneming in projecten
- Participatie in start ups

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*Vermarkten*
- Marktonderzoek
- Bedrijfsmodel bepaling
- Marketing ondersteuning
- Export ondersteuning
- Zoeken van (internationale) partners

**Projecten**
Hieronder vindt u een aantal projecten met resultaten die in het verleden zijn behaald.

*SenterNovem*
- projectadvisering in het kader van Innovatie in Bedrijf in de provincie Overijssel.

*CIS vanden Broeck BVBA*
- export ondersteuning Oost Europa

*Aquahit BV*
- verkoop en marketing van innovatieve reinigingstechnologie in eigen beheer in Rusland en de Baltische Staten
- ontwikkeling van marketing, verkoop en export strategie voor Rusland

*IWM*
- verkoop en begeleiding bij export van machines naar Oost Europa en Afrika
- opbouwen van een nieuwe business unit bij nieuwe distributeur voor West Europa voor de verkoop en marketing van industriële reinigingsmachines.
- invoering van een kwaliteitssysteem en behalen ISO 9000-2000 certificering bij distributeur

*ANO Plision*
- opzetten van dienstverlener (projectmanagement, facilitaire diensten, export / import) in St. Petersburg, Rusland.
- advisering bij bedrijfsvoering en strategie
- ondersteuning bij overdracht en integratie met Amerikaanse organisatie

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*Bluelarix participeert in de volgende projecten:*

www.iceblast.ru
Vermarkten en ontwikkelen van specialistische industriële ijsstraal reinigingsapparatuur voor de Russische markt, Baltische Staten en Oekraïne. Dit project wordt uitgevoerd in samenwerking met Aquahit BV.

www.promlines.com
Internet portaal ondersteuning van de commercialisatie van industriële machines op de Russische markt, in samenwerking met Industrial Washing Mashines Ltd, Aquahit BV en Proceco Ltd.