Section 3 - Thesis

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Augusto Cuginotti

Freek van der Pluijm

Karen Miller

http://kafthesis.pbwiki.com

The understanding of Cradle-to-cradle

In a 1998 speech William McDonough, architect and co-author of the book Cradle to Cradle, describes the three defining characteristics that we can learn from natural design as follows:

1. Everything we have to work with is already here.
   Everything is cycled constantly with all waste equalling food for other living systems.
2. Energy comes from outside the system in the form of perpetual solar income.
   It is an extraordinary complex and efficient system for creating and cycling nutrients, so economical that modern methods of manufacturing pale in comparison to the elegance of natural systems of production.
3. Biodiversity is the characteristic that sustains this complex and efficient system of metabolism and creation.
   What prevents living systems from running down and veering into chaos is miraculously intricate and symbiotic relationship between millions of organisms, no two of which are alike. (McDonough 1998)

Based on this understanding, and on the understanding that society is inherently part of nature, of the biosphere, we can design our systems for producing and living in accordance to this way of design. The intention of cradle-to-cradle design is to apply the intelligence and effectiveness of these systems to product and process design. From an industrial design perspective this means developing materials, products, supply chains, and manufacturing processes that replace industry's cradle-to-grave manufacturing model. (McDonough and Braungart 2002b) The design of a system takes place in such a way that materials become part of either the open biological[1] cycles or the closed-loop technical[2] cycles, that current solar income is used when building and driving the system, and that biodiversity is protected and diversity celebrated.

For the biological cycle this means that products of consumption are designed in such a way that they can be brought back in nature after use. For services that can only be provided by using materials that have to be kept in closed-loops an infrastructure has to be developed that supports this need: the technical metabolism. (McDonough and Braungart 2002a) In order to achieve a system in which all material flows can be either part of the biological or part of the technical metabolism, a societal infrastructure needs to be in place that is designed for this intent.

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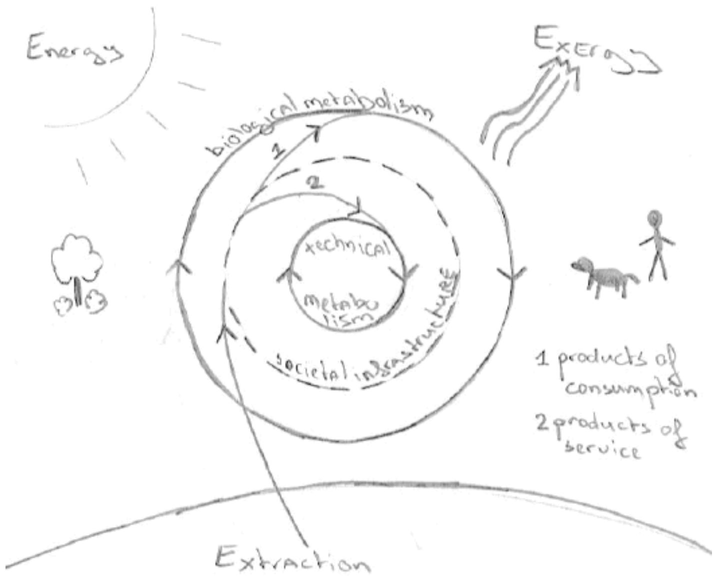
[1] **Biological Metabolism (2003 rem)**
In the biological metabolism, **the nutrients that support life on Earth** - water, oxygen, nitrogen, carbon dioxide - **flow perpetually through regenerative cycles of growth, decay and rebirth**. Rather than generating material liabilities, the biological metabolism accrues natural fecundity. Waste equals food.

[2] **Technical Metabolism (2003 Rem)**
The technical metabolism can be designed to **mirror natural nutrient cycles**; it's a closed-**loop system in which valuable, high-tech synthetics and mineral resources circulate in an endless cycle of production, recovery and remanufacture.**

Cradle-to-cradle societal infrastructure

In order to perpetuate the current rate of consumption in our society whilst not degrading the environmental system, a societal infrastructure needs to be in place that enables the stream of materials either into a biological metabolism or into a technical metabolism. The current societal infrastructure is not designed with that intent and for that reason a picture is drawn of a society in which this infrastructure is in place.



Information flows within and beyond the supply chain will increase in order to support the coordination of the nutrients flows into the metabolisms. Manufacturers require information from suppliers concerning the exact composition of their intermediate products and disassembly capabilities at recovery sites; customers need information on how to deal with the product after its use period; recyclers need information on appropriate dismantling processes and material composition. As a result, collaborative business structures with the role of coordinating the flow of materials and information throughout the product life cycle need to be developed. (Braungart et al. 2007)

Not all kinds of materials are suitable to be taken up into either of the metabolisms. For that reason, the process of deciding on the materials to use has to incorporate nature's cyclical material model into all product and system design efforts. McDonough and Braungart suggest that this can be done through a process of inventory of material flows, impact assessment according to the life cycle of individual products, and optimization for a cradle-to-cradle life cycle. This process is referred to as life cycle development. (McDonough and Braungart 2007)

Another type of structure for the management of eco-effective nutrient flow metabolisms is intelligent materials pooling . To safely and effectively manage the flows of polymers, rare metals, and high tech materials for industry, Braungart has developed a nutrient management system for the technical metabolism, called Intelligent Materials Pooling (IMP). (Braungart et al. 2007) IMP is a collaborative approach to material flows management involving multiple companies working together to entirely eliminate hazardous materials. Partners in an IMP form a supportive business community, pooling information and purchasing power to generate material intelligence and profitable cradle-to-cradle material flows. (McDonough and Braungart 2007) The development of an IMP goes trough the phases of building a community with companies committed to cradle-to-cradle design, discovery of shared values and complimentary needs, the phase-out and development of innovative alternative materials, defining material flows within the partnership by establishing the infrastructure that supports the product of service concept, and finally the strengthening of the business partnership through ongoing support.

The heart of an intelligent materials pooling community is a *materials bank*, which maintains ownership of technical nutrient chemicals and materials. The materials bank leases these substances to participating companies, who in turn transform them into products and provide them to consumers in the form of a service scheme. After a defined use period, the materials are recovered and returned to the materials bank. The materials bank also manages the information associated with these materials, integrating and sharing related information amongst relevant actors. In this manner, it ensures the accumulation of intelligence relating to a particular material over time, and a true *upcycling* of the material. (Braungart et al. 2007)

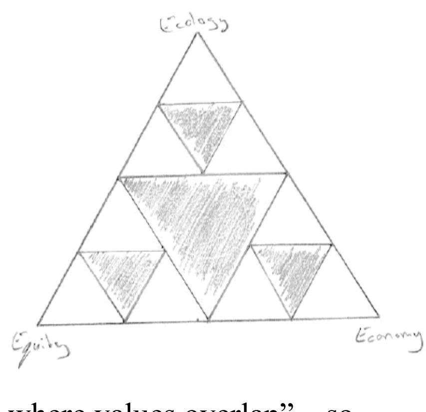
The optimal design of a societal infrastructure based on the cradle-to-cradle metabolisms is a discussion that is only just about to start. At the same time, strategies need to be developed that support the transition towards this infrastructure and tools need to be developed that support entrepreneurs and community builders in their efforts of making their contribution in the transition towards a cradle-to-cradle infrastructure.

Cradle-to-cradle Thinking

In the words of McDonough and Braungart, cradle-to-cradle distinguishes itself from sustainability in the way it approaches efficiency; “It is about doing good instead of being less bad.” Cradle-to-cradle strives for eco-effectiveness instead of eco-efficiency.

Eco-efficiency strategies focus on maintaining or increasing the value of economic output while simultaneously decreasing the impact of economic activity upon ecological systems (Verfaillie and Bidwell 2000). Whereas the concept of *eco-effectiveness* proposes the transformation of products and their associated material flows such that they form a supportive relationship with ecological systems and future economic growth. (Braungart et al. 2007). McDonough and Braungart nonetheless do acknowledge that efficiency and effectiveness can be complementary strategies. (Braungart et al. 2007)

Eco-effectiveness is in the core of cradle-to-cradle thinking with which it looks for opportunities to create. The tool that is currently most used to provoke and implement cradle-to-cradle thinking is the fractal triangle (Appendix i). It is used to show how ecology, economy and equity are interconnected and to find out how value can be generated in each category. In the planning process for a product or system it is used to optimize and maximize value in all areas of the triangle. (McDonough and Braungart 2002b) In the experience of McDonough and Braungart, the most fruitful insights are discovered “where design decisions create a kind of friction in the zones where values overlap” – so called ecotones which are ripe with business opportunities.(McDonough and Braungart



2002b) What characterizes the fractal tool is that evolves around the intention of the designer by shifting the focus of the design process from negative value judgments to questions of quality. (McDonough and Braungart 2002b) All of the questions asked in the process present an opportunity for creating value. Together, they signal the possibility of acting with positive intentions across a wide spectrum of human concerns. Such intentions introduce a new standard of product quality, performance and success. (McDonough and Braungart 2002b)

Cradle-to-cradle supports sustainable development by looking beyond the minimum requirements for survival and searching for ways to create opportunity. It aims for a strategy that allows us to create a world of interdependent natural and human systems powered by the sun in which safe, healthful materials flow in regenerative cycles, elegantly and equitably deployed for the benefit of all. (McDonough and Braungart 2007) Cradle-to-cradle design can lay the foundation for a transition from products designed for a one-way trip to the landfill to industrial systems that restore nature, eliminate the concept of waste, and create enduring wealth and social value – human industry as a regenerative force. (McDonough and Braungart 2002b)

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Appendix

Fractal Triangle Questions
source: McDonough and Braungart 2002 - Design for the Triple Top Line

When **applying the fractal triangle** to our own projects, we begin asking questions in the extreme, lower-right corner, which represents the **Economy/Economy** sector. Here we are in the realm of extremely pure capitalism. (…) Moving to the **Economy/Equity** sector, we consider questions of profitability and fairness. (…) As we continue on to **Equity/Economy**, our focus shift more towards fairness – we begin to see Economy through the lens of Equity. (…) In the extreme **Equity corner**, the questions are purely social. (…) The **Equity/Ecology** sector (…) might explore the ways in which a product (…) could enhance the health of employees and customers. Continuing to **Ecology/Equity**, we consider questions of safety or fairness in relation to the entire ecosystem. In the pure **Ecology** sector (…) we try to imagine how humans can be "tools for nature". Shifting to **Ecology/Economy**, commerce re-enters the [ecological] picture. (…) Finally, we come to **Economy/Ecology**, where we encounter many questions that relate to the triple bottom line. Here the inquiry tends to focus on efficiency.

Economy – extremely <u>pure capitalism</u>
Can I make my product or provide my service at a profit?

Economy/Equity – <u>profitability</u> and fairness
Are employees producing a promising product earning a living wage?

Equity/Economy – <u>fairness</u> and profitability
Are men and women being paid the same for the same work?
Are we finding ways to honour all stakeholders, regardless of race, sex, nationality or religion?

Equity – purely <u>social</u>
Will the new factory improve the quality of life of all stakeholders?

Equity/Ecology – <u>health</u> of employees and customers
In what ways could the product enhance the health of employees and customers?

Ecology/Equity – <u>safety and fairness</u> in relation to the entire ecosystem
Will our product contribute to the health of the watershed?

Ecology – humans as <u>"tools for nature"</u>
Are we obeying nature's laws?
Are we creating habitat?
How can I create more habitat?
Do our designs create habitat or nourish the landscape?

Ecology/Economy – <u>ecology</u> from a commercial feasibility perspective
Is our ecological strategy economically viable?
Will our ecological strategy enable us to use resources effectively?

Economy/Ecology – Triple Bottom Line / <u>Efficiency</u>

Will our production process use resources efficiently?
Will our production process reduce waste?

Triple Top Line Questions
How can this project restore more landscape and purify more water?
How much social interaction and joy can I create?
How do I generate more safety and health?
How much prosperity can I grow?
How can I grow prosperity, celebrate my community, and enhance the health of all species?

Each of these questions presents an opportunity for creating value. Together, they signal the possibility of acting with positive intentions across a wide spectrum of human concerns. Such intentions introduce a new standard of product quality, performance and success.

1 Forecasting and Backcasting approaches

Backcasting, as opposed to forecasting methods of predicting the future, is about working backwards: setting the desired future state and working to define which steps are needed to attain it. The main difference between the two is that the first focuses on designing how desirable futures can be attained and the latter works on figuring out futures that are likely to happen [Robinson 1990].

In the field of sustainability is not particularly helpful to know scenarios of the future that are most likely to happen. In order to strategically plan, decision makers are after, given multiple possible futures, the most desirable rather than the most likely one [Robinson 1988].

While backcasting, the process of choosing a scenario of what would be the most desirable future can be a hard task for a complex theme such as sustainability. To create a detailed picture of the future in those circumstances would be like attempting to solve a five thousand piece jig-saw puzzle in a room with five hundred people and limited time.

For that matter, instead of finding the one desired scenario, better would be to have a set of principles working as boundary conditions that, if complied, the scenario in question would be considered desirable. Backcasting from basic principles allow creativity on the course of the development of your strategy and actions towards your goal because you have general rules to guide you to the right direction instead of a solidified detailed vision of the future [Holmberg and Robèrt 2000].

Backcasting is an approach that differs from forecasting by points described by Dreborg [Dreborg 1996], among them:

- Backcasting works in a context of discovery rather than a context of justification;
- Backcasting, when working with social issues, carries the principle of teleology (purposefulness) rather than simple causality.

Both approaches have in common that they operate by scenarios. Carlson-Kanyama et al. [Carlsson-Kanyama, Dreborg, Moll, and Padovan 2008] defines three different scenario typologies:

1. Probable: predictive scenarios: methodologies such as forecasting models or trend extrapolations. Answering the question: What will happen?

2. Possible: explorative scenarios. Answering the question: What could happen? Methods are based on ‘push’ driving forces: causal analysis.
3. Preferable: normative scenarios. Answering the question: How a solution to a particular problem might look? Methods based on ‘pull’ driving forces: a teleological[1] analysis.

Taking all these typologies as valid, the question is to decide what questions should be asked when facing a specific situation. When talking about strategy for sustainability, (1) will not serve us since the most probable scenario is only useful for mitigation purposes. We will then look at (2) and (3) by analyzing both what is possible and preferable.

Backcasting approaches already work this way by acknowledging that causality (2) has a role to play, but a *total causal model* [Dreborg 1996], as used in forecasting studies, needs to be complemented by a normative approach (3).

This normative approach in backcasting underlines the assumption that human intentions today influence the shape of the future, while forecasting usually only offers extrapolations of the past drawn by causal derivations. Backcasting is an approach that facilitates the creation of scenarios less bounded by the present, ones that are mental images of a “totally other” reality [Polak 1961].

Backcasting is a normative and goal-oriented process, intuitively the process we use to plan: “we do not so much predict the most likely future as articulate and intention, or set a goal, and then act to realize it” [Robinson 2003]. By being goal-oriented, the process of developing scenarios does not come with an effort to justify the choice, but rather an effort of collective discovery, since in this case what matters are the ideas that can solve the question and not the pursuing of scientific validity [Dreborg 1996].

The development of society towards sustainability is influenced by many actors’ actions and perceptions. If intention plays an important role on human behavior [Dreborg 1996], a shared intention (vision) is essential in organizations [**?**] or a society [**?**]. So when facing goal setting in groups, the importance is not entirely on setting the goal, but also in the social learning process that allows the goal to be perceived as collective.

To both contribute with the social learning process and to access this shared intention, we need to apply participatory backcasting.

[1] the explanation of phenomena by the purpose they serve rather than by postulated causes.

2 Participatory Backcasting

In planning in complex systems, backcasting is used in a way Robinson defines as a "second generation" form [Robinson 2003]. The desired future is not determined in advance by experts and brought to the dialogue, but the analysis is an emergent property as the stakeholders engage in the process.

To define strategies for sustainability, both science and social participation are needed. The approach where the decision is typically science-centered and lies on the hands of experts often puts as secondary matters the social and cultural structure of the system. Include public participation has been, for this model, a matter of just informing rather than consulting [Street 1997].

The use of the method of science in planning in complex systems has its limitations when the complexity of the system increases [Checkland 1981: p. 60]. Social sciences, as opposed to natural sciences, has to consider more undefined variables and relationships since a component of the study "is the individual human being, and even if we depersonalize him as an 'actor' in a 'role' he will be an active participant in the phenomena investigated, attributing meanings and modifying the situation in a potentially unique way" [Checkland 1981: p. 69]. This is theorized by Maturana and Varela [**?**]: according to autopoiesis, a living system is connected to the environment by recurring interactions that each time influence and changes the system.

No laws - as they are understood in natural sciences - can apply to social sciences. The simple fact that the agent observed re-creates his relationship to a situation by giving a different meaning ad hoc, an observer will never be able to have a detailed map of his state of mind in advance to predict his behaviour. "This kind of argument suggests that at best social systems will reveal 'trends' rather than 'laws' [Checkland 1981]. The exploration of social systems are therefore more related to creating a process rather than trying to come up with crystallised laws.

Acknowledging the importance of a participatory process rather than a think-tank of experts, the focus shifts from scenarios (sustainability goals) determined in advance to become an emergent property of the consultation process [Carlsson-Kanyama, Dreborg, Moll, and Padovan 2008].

3 Natural science and boundary conditions

So scenarios of the future, when related to complex issues such as sustainability, need to be created in a participatory way. What is the role of science in planning in complex systems? What is the role of natural sciences when we plan towards sustainable development?

Natural sciences values the predictive approach. A law in science is something that models an event in a way that experience always confirm it, until a better model takes its place [Kuhn 1962; Checkland 1981: p. 248-249]. Gravity is a law because it predicts the behaviour of an object when we hold it a meter off the ground and drop it. A kid in high-school, provided with some data, can give us a good prediction of the velocity of this object based on a Newtonian model.

Analog to this, principles of sustainability are based on the laws of thermodynamics. The laws are models that predict the future of thermodynamic behavior until a new model comes to replace it. Until that happens, the laws are considered the boundary conditions of how systems behave thermodynamically. Scientific studies have been made that defined principles of sustainability [Holmberg 1998; Holmberg and Robèrt 2000] (who else? Holmberg 1995; Holmberg et al. 1996; Holmberg & Robèrt 1997; Robèrt et al. 1997).

If not contradicting any law, i.e. within those boundaries, space is open to any development and creation. When creating scenarios and processes of a future state that is at least sustainable, it is important to acknowledge this boundaries to be able to create within them.

This is the basis of what Robèrt et al. [Robèrt 2007] call "creativity within constrains". Being creative within constrains means, for example, that one knows the laws of nature well enough to be able to engineer a machine heavier than air and put it to fly.

4 Participatory backcasting from principles

To have the overall description of the system set into principles does not aim to be a platform for solutions in complex systems such as sustainability [Holmberg and Robèrt 2000]. Definition of principles is rather a strategy to help make the process of planning simpler, but without reductionism [Broman, Holmberg, and Robèrt 2000].

As we explored, besides the conditions proposed by natural sciences, there is a need to define social principles - and therefore the boundaries - that the collective representing the system wants to set for themselves. This approach integrates science-based and value-based principles as assets to support the process of backcasting from principles.

Dreborg [Dreborg 1996] suggests that backcasting should include a view on the role of values. Street [Street 1997] says that "economic, environmental and social goals are value laden, and thus local values and knowledges need to be integrated into strategies for sustainability".

As discussed above, the nature of complexity between the two sets of principles differs, suggesting a more biased – and that is why more tailor-made – approach when defining social principles.

Social principles can be defined as a social contract over common ground starting points. Robrt represents this in a story of a family moving from one city to another [Holmberg and Robèrt 2000; Robèrt 2007].

This approach to backcasting can be seen as predictive as it limits the possible scenarios in the future, but it actually only displays the boundaries within which many scenarios are possible and creativity is allowed. This sets up a common-ground for the development of scenarios. Backcasting from principles can be considered non-predictive as the general purpose of the analysis is not to predict, but to asess feasibility of desired outcomes [Robinson 2003], even if the outcomes are conditioned to principle boundaries.

At the end, we are using both science-based laws and a stakeholder-defined social principles. The first is defined by the laws of thermodynamics and the latter by consensus on desired system social laws. Details of possible future states are not set, so there is enough flexibility to allow creativity in planning and mid-course corrections in acting.

Not trying to start agreeing on details of a desired future state prevents the group of getting in a infinite jig-saw puzzle-solving exercise [Robèrt 2007]. This approach has no strategy and low value. On the contrary, understand the system in terms of both science and the role of people within it enhances the emergence of a collective desired scenario [Street 1997].

At this point, scenario analysis can be created within those boundary conditions and any method can be used to shape those scenarios. With social principles defined by a participatory backcasting, it is possible to create multiple scenarios as a group or even have one or more smaller groups to define scenarios and offer them to the whole group.

5 Cradle-to-cradle: design and strategy

Cradle-to-cradle is a question of designing systems that serve a purpose while being in partnership with nature. To design a system that serves both humans and nature [McDonough and Braungart 2002: p. 156] requires us to set an intention that is beyond simple causal implications. Backcasting, being "explicitly normative and design-oriented" [Robinson 1990] is therefore a suitable approach for cradle-to-cradle.

According to McDonough and Braungart [McDonough and Braungart 2002: p. 183], "it is important (...) that signals of intention be founded on healthy principles" to make sure we do not substitute one problem for another. This approach is align with using principles, although the authors use it in a different way.

An example of participation of multiple stakeholders can be seen at McDonough and Braungart's work with Ford Motor Company [McDonough and Braungart 2002: p. 157-165]. Their first step was the creation of a design team including representatives from the company, experts and the unions. The importance of joining the system and eventually including other employees brought ideas, understanding and cooperation.

Cradle-to-cradle brings the idea of eco-effectiveness. In eco-effectiveness, instead of making the industrial process create a less bad of an output by minimizing, for example, the waste produced, the focus is on redesigning the product and process to close ecological and technical loops. Effectiveness and efficiency can go together if the target of the efficiency is well designed [Braungart, McDonough, and Bollinger 2007].

As already explored, the cradle-to-cradle concept is design-oriented and therefore suitable for a participatory backcasting from principles. How do the authors of the concept present a practical design framework that is based on the concept of eco-effectiveness? Assuming that society's intention is to operate within the cradle-to-cradle concept, how to strategically step towards this direction?

McDonough and Braungard [McDonough and Braungart 2002: p. 166-181] suggest the steps: (1) get "free of" known culprits; (2) follow informed personal preferences; (3) creating a "passive positive" list; (4) activate the positive list; and (5) reinvent.

1. Step 1: Get "free of" known culprits.

   This stage refers to the removal of dangerous substances when designing a product, so the creation of new products pass by a crude filter of "obviously harm substances" [McDonough and Braungart 2002: p. 168]. This stage works like a checklist: the more we know about substances, bigger the list of culprits.

2. Step 2: Follow informed personal preferences.

   Because it is nowadays impossible to have mapped either the exact impact of a substance on humans or nature, or the process through which they are produced, cradle-to-cradle authors say that decisions about materials comes down to *personal preferences* [Braungart, McDonough, and Bollinger 2007]. When facing decisions to choose between two less than ideal paths, a designer should look at his preferences on (1) ecological intelligence; (2) respect; and (3) delight, celebration and fun [McDonough and Braungart 2002: p. 171-173].

   Based on their own preferences, designers and decision-makers would basically choose between what is available to their knowledge right now, relying on what he personally considers a better trade off. An eventual support from regulatory agencies or stamps such as the Forest Stewardship Council seal of approval when choosing your wood supply or the Fair Food logo when buying your groceries.

3. Step 3: Creating a "passive positive" list.

   According with the authors, this is when one stops to only rely on existing information and starts to actively redesign. The questions and considerations are, however, relying on known issues. A "potential for ozone layer depletion" [McDonough and Braungart 2002: p. 175] would not be an issue at the time CFC started to be used.

   This step also assumes the possibility of having detailed information on every substance used (toxicological, eco-toxicological, persistence in nature, etc). A detailed and shared database of information about substances available could be an asset for decision-making process. Once done, the analysis would be restricted to the interaction between substances, another hard work endeavour, but also more room for collaborative data-sharing. These could be used for a collective active design towards eco-effectiveness, but basically using known issues of a shared database.

4. Step 4: Activate the positive list.

   This step is an optimization of the passive positive list [Braungart, McDonough, and Bollinger 2007] in a way that you start designing from scratch and choose materials from your preferable list. While eco-effectiveness at this point breaks the assumption that one organization or product is something to be fixed, it is clear that every product and process cannot be immediately redesigned. Start products and processes from scratch is not a viable strategy for most of the organizations trying to survive in the market economy. If this complete redesign is not possible immediately, how to make sure the other steps are in the right direction?

5. Step 5: Reinvent.

   The last step on redesigning is about recasting the assignment, going from a product to the purpose of its creation and set up a new innovative and, of course, eco-effective way of seeing and producing it.

   One example is a shift from a product-economy to a service-economy that would bring many advantages. In this eco-effective industrial system, the amount of materials used in a product is no relevant compared to the design of this product in a way that the status of resource is maintained, allowing re-introduction of it into the cycle. [Braungart, McDonough, and Bollinger 2007] The energy used to produce, transport and use the product in his first of future lives are, however, a relevant point. What is the balance between the maintenance of materials as resources and the amount of energy use to produce, transport and re-transport, etc?

When analysing (1), (2) and (3), it is clear that by just having a material pooling or lists does solve most of the problems for a decision-maker going to design in a system. Even when restricted to a product, the process to produce this product is yet not taken into account.

As we explored before, being prescriptive is not the better approach when dealing with complex systems. Being prescriptive, in this case, means that telling people what to do and what not to do has no fundamental difference when looked from a strategically planning perspective. Both are prescriptive methods and does not allow two important things: creativity on planning and mid-course correction when acting. On the other hand, once a clear strategic decision has been made and the process is down to the action's level, having specific directions on how to act is desirable.

Steps (4) and (5) proposed by McDonough and Braungart invite for creativity and innovation in design. It is a fact that, when facing unknown issues, creativity and innovation can emerge to bring a new horizon, a paradigm shift [Kuhn 1962; McDonough and Braungart 2002: p. 175]. Creativity and innovation are surely part of the strategy of becoming eco-effective, but it is not the strategy itself.

While innovation and creativity has a lot of trial and error, it is not limited to this process. Being strategic means designing an overall process (policy, plans of action, etc) to achieve a desired state. People have the ability to recognize natural and social patterns to create scientific models or at least the insightfulness to create an educated guess that can support decision making. When you have no idea where to start, than trial and error becomes an option.

The steps created by the authors are of great value as the first step to the design of a new product or process, but even a completely new endeavor does not come to be without a strategy. By the moment a scientist or designer tries, the response becomes data that allows a more intelligent approach to select the new tentatives.

If working with a system already in place that cannot be started immediately from scratch, the decision-maker needs support to define, having his vision, the smartest next step in the right direction to fullfil it.

6 Backcasting the Cradle-to-Cradle Concept

There are important steps so participatory backcasting from principles can be used to strategically plan.

1. Building the vision.
2. Analysis of current reality.
3. Creating compelling measures.
4. Setting priorities.
5. Creating a strategic plan of action.

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