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Cradle to Cradle: Effective Vision vs. Efficient Practice?

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Abstract

Cradle to Cradle is a development paradigm with a focus on eco-effectiveness; improving the 'positive footprint' in contrast to the more conventional eco-efficient approaches; reducing the 'negative footprint'. Industry is supported in their Cradle to Cradle efforts by an elaborate five level certification framework. The accredited institutes necessary for certification focus in practice mainly on material health, underexposing other aspects. The aim of this paper is to explain why the eco-effective Cradle to Cradle vision in practice results in a mere eco-efficient approach by discussing several conflicts between theory and practice. This is illustrated with a case study resulting in a development method for Cradle to Cradle compliant packaging.

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1. Introduction

Since the introduction of the Cradle to Cradle[®] ¹ philosophy, publications often dealt with the success stories [1]. Companies mainly communicated their Cradle to Cradle certified products through press releases [2]. However research on the actually application of Cradle to Cradle as design paradigm is rather limited. Especially research on evaluating the applied business models versus the philosophy and the consequences for product development seems to be lacking.

To discuss consequences of the current practice for product development, this paper starts with explaining the principles of the Cradle to Cradle philosophy. Followed by a description of a packaging development case study to illustrate the application in industry. From this case study it becomes clear in section 5 that in practice the good intentions are actually limiting the necessary innovations to achieve Cradle to Cradle products. This paper concludes with a proposal for

reconsidering the current business models to improve efficiency of developing more sustainable and Cradle to Cradle compliant products.

2. Cradle to Cradle

Concerns for the environmental impact and depletion of resources as a result of unlimited economic growth [3], have stimulated engineers, for many years, to reduce the impact of product lifecycles. Guidelines for product development were often restrictive, with a negative touch, resulting in the feeling of limiting economic and industrial growth. As a reaction to these restrictions Braungart and McDonough introduced their vision on effectiveness that uses positive growth as driving force behind the transition towards a more sustainable world. In 2002 they published their book *Cradle to Cradle: Remaking The Way We Make Things* [4]. The Cradle to Cradle philosophy focuses on an ideological transition from 'less bad' to 'more good'. The well-known conventional eco-efficient approaches strive for reducing the ecological footprint to minimize the damage inflicted on the world. Instead of this negative message, Cradle to Cradle focuses on eco-effectiveness by stimulating to do the right things in order to improve our positive footprint. For this transition a continuous

¹ Cradle to Cradle[®] is a trademark of McDonough Braungart Design Chemistry, LLC.

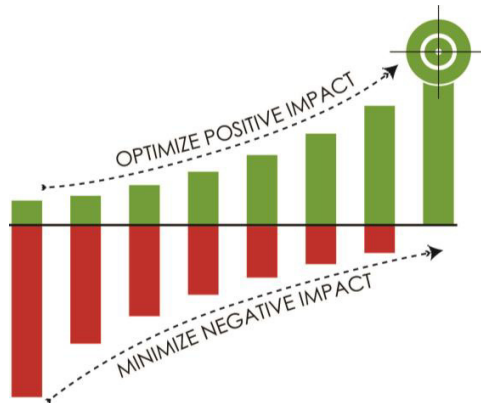


Fig. 1. Eco-effective vs. eco-efficient (edited from [5]).

improvement in product development, industry and economy will be necessary, see also figure 1 [5]. Instead of limiting economic and technologic growth, Cradle to Cradle actually uses this growth to drive the necessary innovations for these transitions. The positive message of Cradle to Cradle attracts a lot of enthusiastic reactions from industry and government in the Netherlands. Examples are illustrated in a recently published impact study [6] on Cradle to Cradle certification by the Cradle to Cradle Products Innovation Institute. Several important business, social and environmental benefits were recorded from the experience of ten early Cradle to Cradle adopting companies.

2.1. Three main principles

In order to achieve a sustainable world based on the Cradle to Cradle philosophy, products should be beneficial in health, environmental and economic terms. The Cradle to Cradle design paradigm consists of these three main principles [7];

Waste equals food, based on the analogy of metabolism cycles, all materials should be seen as nutrients for other product lifecycles either in a biological metabolism or technical metabolism (see also section 2.2).

Use current solar income for sustainable energy. In order to create, operate and dissolve Cradle to Cradle products only sustainable energy sources should be applied. Within the design paradigm it is assumed that these renewable energy sources are widely and abundantly available without practical restrictions.

And finally celebrate diversity. To improve a system's resilience, diversity is necessary. Focusing on one criterion could cause instability and imbalance in a wider context [8]. Biodiversity, cultural and conceptual diversity improve relationships, creativity and innovation.

2.2. Two material type metabolic cycles

Within the Cradle to Cradle framework, two distinct metabolisms are acknowledged: the biological metabolism and the technical metabolism. Within the biological cycle, typical consumption products can be identified; products of which the materials are returned to the environment by diffuse pathways,

like water or air emissions, even during the use phase. These products should be made from renewable sources and act as (biological) nutrients in the production of new resources.

In the technical cycle mainly service products are identified without material loss during their use phase. Non-renewable materials should flow into industrial systems to act as nutrients in manufacturing new products. Within the Cradle to Cradle philosophy mere recycling is not enough, in fact the materials should be of equal or preferably of higher quality, for which the term upcycling [9] is introduced.

A third possibility to keep the materials in a semi-closed loop is the cascade model where materials are kept within a technical cycle for a certain amount of iterations, while down-cycling in properties before flowing back into the biological cycle. Paper recycling is a typical example of the cascade model within the Cradle to Cradle design paradigm.

2.3. Certification

An important difference between the Cradle to Cradle design paradigm and many other approaches to achieve a sustainable world is the elaborate and well-developed certification framework. Cradle to Cradle is not only a philosophy on sustainability, but it has its own framework for certifying compliant products. This framework is mainly intended to support companies creating Cradle to Cradle products. A certification can be considered a reward for the achieved results.

For certification, products are evaluated against criteria from five distinct categories; material health, material reutilization, renewable energy, water stewardship and social fairness. Important within the category material health is the applied ABC-X assessment methodology, classifying materials based on chemical risk and recyclability in (theoretical) biological and technical cycles. Resulting scores include A, B, C, X or Grey (unknown) and determine to a large extent the actual certification level. Overall, the certification framework is not merely a pass/fail model, instead it incorporates the concept of continuous improvement. The level of product certification depends on the scoring on the previous mentioned criteria categories, resulting in a basic level to start with, up to the platinum level for complete Cradle to Cradle compliant products.

The certification framework is designed to be applicable to materials, sub-assemblies and finished products. This scope is not limited to specific industries or product types [7].

As a result of the certification process companies can obtain a certification mark for their Cradle to Cradle product. This mark, expressing the certification level, can be displayed on the product. Except for the basic level mark, for which this is not allowed.

3. Cradle to Cradle business

In theory Cradle to Cradle appears to be an effective vision with its positive message of doing more good instead of doing less bad. From our experiences and numerous dedicated events, the Cradle to Cradle philosophy with positive growth as driving force to innovate and expand was well-received in

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