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## Study on sustainability developments in industrial practice

Kai Lindow<sup>a,\*</sup>, Andrea Kaluza<sup>b</sup>, Rainer Stark<sup>a,b</sup>

<sup>a</sup>Fraunhofer-Institute Production Systems and Design Technology, Pascalstr. 8-9, 10587 Berlin, Germany

<sup>b</sup>Technische Universität Berlin, Pascalstr. 8-9, Office PTZ4, 10587 Berlin, Germany

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### Abstract

Traditionally, manufacturing companies focus on the value-adding processes at production sites but during the last decades, life-cycle thinking is emphasized. The principle of Sustainable Development contributes as a significant driver for this way of thinking. It demands manufacturing companies to implement sustainable aspects into their engineering actions. The state of the art shows that theoretical solutions to integrate sustainability into a company exist at all corporate levels (normative, strategic and operational). Against this background, the question arises how companies are actually implementing sustainability. Within this study, the company's internal implementations were examined. Eventually, the need for action is identified and future recommendations are described.

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*Keywords:* Life-cycle thinking; Sustainability; Sustainable Development; Responsibility

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### 1. Introduction

During the last decades, life-cycle thinking within manufacturing companies is emphasized. The UNEP (United Nations Environment Programme) defines life-cycle thinking as it “[...] is essential to sustainable development. It is about going beyond the traditional focus on production site and manufacturing processes so to include the environmental, social, and economic impact of a product over its entire life-cycle. Extended Producer Responsibility and Integrated Product Policies mean that the producers can be held responsible for their products from cradle to grave and therefore, should develop products, which have improved performance in all stages of the product life-cycle [...]” [1] According to Jensen, life-cycle thinking is the extension of the classic value chain, consisting of product

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\* Corresponding author. Tel.: +49-30-39006-214.

E-mail address: [kai.lindow@ipk.fraunhofer.de](mailto:kai.lindow@ipk.fraunhofer.de)

development, production and distribution, to the entire product life. The approach can be extended to the product life-cycle phases use, service, maintenance and end-of-life situation. [2]

UNEP and the approach of Jensen illustrate that the principle of Sustainable Development contributes as a significant driver for life-cycle thinking. It demands manufacturing companies to implement sustainable aspects already into their engineering processes. As companies are becoming increasingly responsible for their products and processes, they are committed to integrate economic, environmental and social aspects across the product life-cycle into their value-adding processes. On the other hand, a growing customer interest in sustainable products and services can be recognized. This action can even provide companies with a competitive advantage and thus help to secure the company's success in the long term. Starting from the principle of Sustainable Development, life-cycle thinking is the basis for the further consideration of sustainability within a company (Figure 1, [3, 4]). That way, life-cycle thinking and life-cycle concepts form the normative level for a life-cycle-oriented action within a company. This means that the principle of Sustainable Development must be integrated into the company's value system in the first place. This is done mainly due to the adoption of sustainable principles in a company's philosophy. Sustainable objectives are also anchored in corporate principles and corporate governance. This anchoring is particularly important for the development of sustainable products and processes, e.g. the product (design) helps to communicate the sustainability concept of the company to its customers. The product embodies the convictions, values and visions of the company [5] in its elaboration, its functions and its appearance.

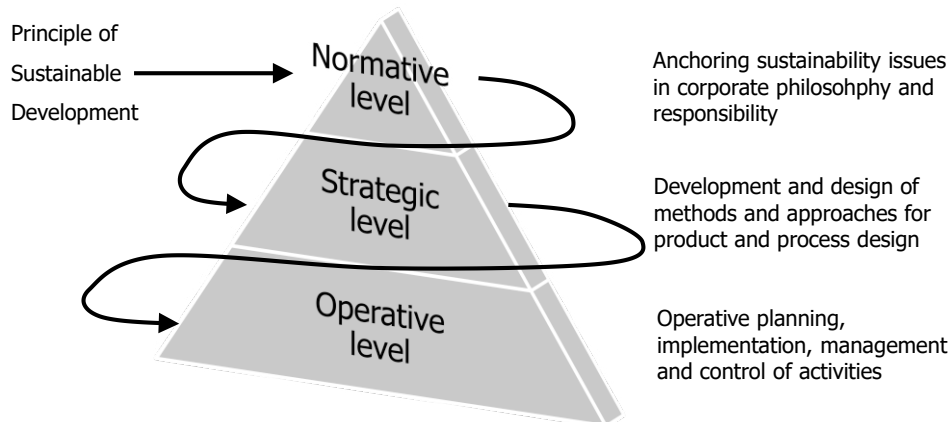


Fig. 1. Top-down approach to implement sustainability thinking on different corporate levels [4].

At the strategic level, sustainability demands, which have been defined at the normative level, need to be integrated into the design of methods and processes of engineering processes (e.g. integration of "Design for Sustainability" into company-internal design methods and process guidelines).

At the operational level, engineering activities must be coordinated with sustainability requirements and brought into line with engineering methods and procedures. This is accompanied by the implementation, planning and control of engineering projects with regard to the three sustainability dimensions.

The implementation of sustainability into manufacturing companies has been empirically investigated from an industrial perspective. The main challenge was to figure out the hurdles in the implementation and realization. The study focused on examples and experiences of experts within the mobility sector.

## 2. Leading question

The state of the art shows that theoretical solutions to integrate sustainability in a company exist at all levels (normative, strategic and operational). Current approaches show the theoretically possible implementation of basic principles of sustainable development into product and process development. Against this background, the question arises how manufacturing companies are actually implementing.

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