



Cost and Environmental Impacts in Manufacturing: A Case Study Approach

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Abstract

According to the Brundtland report, sustainable development “meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations 1987). The 3 pillars of sustainability have been identified as economic development, social development, and environmental protection (United Nations 2005). These components interact and affect each other in any real world application. For manufacturing companies, sustainable manufacturing is one way to decrease the environmental impact of their products. In the literature, there are different approaches to assess sustainability. However, approaches which improve sustainability and reduce costs are difficult to realize, because these goals are often seen as conflictive and cannot be achieved at the same time. An overlap between cost reduction and sustainability can push companies to expend more effort in order to achieve long term business success while decreasing the environmental impact of their products. This case study aims to demonstrate this overlap. Besides an assessment of the current state of manufacturing processes, alternative future state models are determined, which are more sustainable and decrease the costs of production.

Keywords: sustainability, cost reduction, manufacturing, Life Cycle Assessment, case study

1 Introduction

Customers are increasingly environmentally conscious in their purchase decisions, putting more pressure on the producers to create more sustainable products (Windsor 2011). In addition to this, environmental legislation is becoming stricter in order to extend the producer’s responsibility (Lindahl 2006). To fulfill customer desires and current environmental laws, companies have to redesign their products and still stay competitive within the market. Therefore, the costs of the products have to be kept on the same level or decrease as a result of any redesign process. While different techniques such

as Design for Environment (DFE) and Design for Sustainability aim to decrease the environmental impact of a product, Design for Cost represents the traditional goal of decreasing the costs of a product. However, it can be difficult to combine those approaches and design a successful product while only focusing on its sustainability. Referring to the definition by Brundtland, sustainable development is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations 1987). The 3 pillars of sustainability have been identified as economic development, social development, and environmental protection (United Nations 2005). These components interact and affect each other in any real world application.

To avoid higher prices, reducing costs is one of the most important goals for every company. Therefore, it is indispensable to reduce the cost of the product in the early stages of product development, since they highly influence future costs of the product, as seen in Figure 1. Raw materials and energy costs represent over 50% of the total cost of a product (Figure 2), thus, optimizing the use of resources is essential for sustainable green growth of a company and remaining competitive at the same time. To identify the environmental impact of different stages in the life of a product, Life Cycle Assessment (LCA) is used. LCA is a common method to evaluate and report the environmental impact of a product during its life cycle. LCA is based on the ISO 14001/14004 standard and provides a focused framework for the environmental impact evaluation (Haapala et al. 2011).

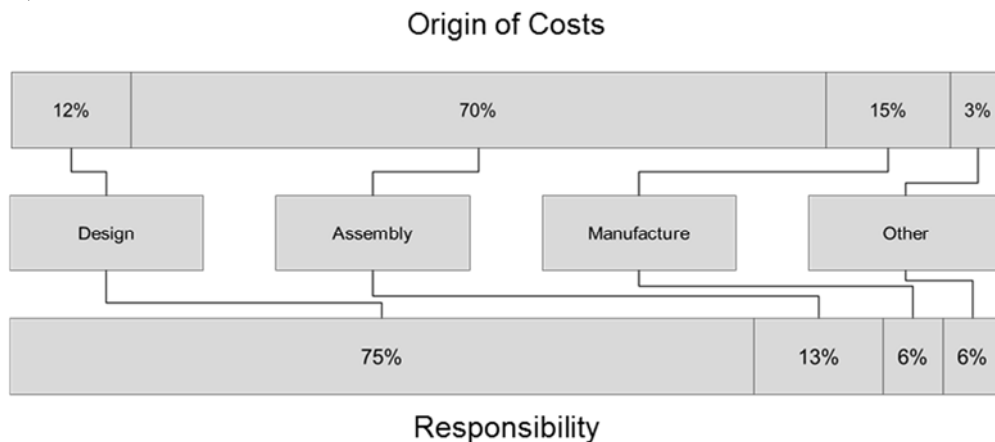


Figure 1: Comparison of Origin and Responsibility of Costs (Bullinger and Warschat 1995)

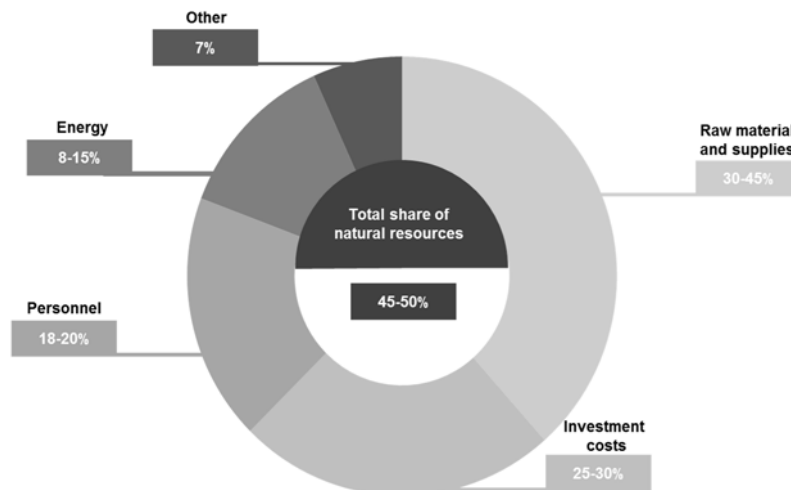


Figure 2: Structure of the total costs in manufacturing (Europe INNOVA 2012)

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