

ANALYSIS OF ENVIRONMENTAL PARAMETERS IN CLOSED-LOOP SUPPLY CHAINS DESIGN

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EXTENDED ABSTRACT

The increasing customer demand for green products and the extended producer responsibility in combination with other regulation and opportunities for profit have introduced the environmental parameter in supply chain design. Environmental requirements may considerably affect the operation of supply chains. The logistical, economic and social dimensions of the recovery and re-use of used products, components and materials, in particular, may have prime importance for the company and society as well. Until lately the main environmental concerns were related with the manufacturing and the disposal phase. Although this approach has helped companies and communities in their efforts against environmental degradation, it has not affected the number of products per household, energy consumption and waste, which have increased significantly and have led to larger environmental impacts. As a consequence, environmental analysts and companies have shifted the environmental focus from the manufacturing processes and the disposal phase to the design of the total supply chain of products so as to minimize the environmental impacts in their whole life cycle.

This paper investigates the environmental factors that contribute to the design and operation of closed-loop supply chains and the scientific approaches available for their analysis. The fundamental differences between the traditional (forward) supply and the reverse supply chains are analysed and discussed aiming at “closing the loop” in their ends and providing a framework for planning closed-loop supply chains. Indeed, the appropriate identification and planning of all life-cycle stages of a product, including its recovery and reuse, is necessary for the establishment and/or optimization of environmental policies. Any activity in the traditional supply chain may have an undesired impact on the reverse supply chain. And vice-versa, any disturbances in the ecological balance may affect production activities and social welfare in the long-term so that it is difficult to meet the strategic target of sustainable development. In this sense, the traditional supply chain is connected in both ends with the reverse supply chain to establish a perpetual cyclical operation. The analysis of the cost-effectiveness of schemes for the recovery of products is difficult; however, it is not sufficient to do so without looking at the whole process chain, combining the traditional supply chain aspects with the recovery ones.

In this framework of analysis of environmental parameters in the design of closed-loop supply chains, the latter are viewed as an application field of Industrial Ecology and the analysis focuses on how they can benefit from each other.

Key words: Closed-loop supply chains, Environmental Management, Industrial Ecology.