Industrial Symbiosis as a sustainable business model: theoretical and empirical findings

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Abstract

Business model redesign that includes life cycle management of physical resources acquired by firms as a core organizational issue is an important means of improving sustainable environmental performance. This paper investigates how a multi-firm approach, "industrial symbiosis" can serve as a sustainable business model. Industrial symbiosis is based on one of the founding ideas of industrial ecology, recognizing industries wherein "the consumption of energy and material is optimized, waste generation is minimized and the effluents from one process serve as the raw material for another" (Frosch and Gallopoulos 1989). Industrial symbiosis has the potential to connect traditionally separate industries and collectively create competitive advantage through exchange of materials, energy, water, and/or by-products (Chertow 2000). Although one company may be able to create industrial symbiosis internally through its own diverse business lines, typically this approach involves collaboration and the synergistic opportunities offered by geographic proximity of a diverse set of business. Despite the appeal of this potentially cooperative and efficient system, uptake of symbiotic practices has not matched market potential. By-products are not pursued with the same interest as products and collective approaches are often seen as entangling rather than enriching. Through an examination of numerous cases of industrial symbiosis collected over 15 years at Yale University’s Center for Industrial Ecology, this paper investigates under what circumstances industrial symbiosis can serve as a sustainable business model that significantly mitigates resource use and reduces waste streams. Key findings address the types of businesses that join symbiotic clusters most regularly, common behavioural hurdles, the role of intermediaries, and the longevity of such cooperative approaches. Recommendations illustrate the utility of industrial symbiosis to practitioners and suggest how sustainable business models can be conceived with the intent of reaping the greatest benefits from industrial symbiosis.

Keywords: Sustainable development, cooperative business practices, collective resource management, transformation

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