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The front-end of eco-innovation for eco-innovative small and medium sized companies

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ABSTRACT

This paper studies the Front End of Eco-Innovation (FEEI), the initial phase of the eco-innovation process. Incorporating environmental concerns at the front-end of innovation is important, as product parameters are still flexible. This paper investigates the FEEI for 42 small and medium sized eco-innovators in the Netherlands by using a survey. The results show that SMEs embrace informal, systematic, and open innovation approaches at the FEEI. Teams appear to be multidisciplinary, and creativity and environmental knowledge are essential. Experimentation played a significant role at the FEEI. The paper concludes with recommendations for future research and implications for managers.

Background

To reduce environmental pressures caused by a growing and developing global population demanding more products, *eco-innovations* are important: competitively priced products and technologies with better environmental performance than relevant alternatives. Reid and Miedzinski (2008) define eco-innovation as the creation of novel and competitively priced goods, services, systems, processes, and procedures to satisfy human needs and provide a better quality of life for everyone with a life-cycle minimal use of natural resources per unit output, and minimal release of toxic substances.

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Eco-innovations may be new to the world or new to the company adopting it (Arundel and Kemp, 2009; Kemp, 2010; Bocken et al., 2012) and may lead to varied levels of environmental improvement. In this paper, the focus is on new to the world eco-innovations created by frontrunner companies: defined here as those companies, which have created eco-innovations with significant environmental benefits compared to industry incumbents (established firms in an industry).

The front-end process of eco-innovation – defined in this paper as the initial stages of the eco-innovation process – is considered to be an important stage for the ultimate performance of products; because once product specifications are decided upon, only minor changes concerning the sustainability of the product can be made (Herstatt and Verworn, 2001). Research focused specifically on the front-end stages of innovation has received increasing attention through the past decade, both within academia and among industry practitioners. Example contributions include Kim and Wilemon's (2002) strategies for managing the front-end process, Reid and de Brentani's (2004), initial framework to explain the fuzzy front-end, and de Brentani and Reid (2012) description of the roles of key individuals in the fuzzy front end of innovation. Koen et al. (2002) identified various tools and mechanisms, to be effectively used at the front end of innovation such as technology roadmapping, (competitive, customer and technology) trend analysis and scenario planning. Kurkkio et al. (2011) investigated front-end activities for process innovation.

In contrast, the Front-End of Eco-innovation has received little attention in the literature. The front-end of eco-innovation can be expected to be different from the front-end of normal innovation in the sense that special knowledge and tools are needed for dealing with environmental issues. Motivations of responsibility may also play a bigger role. The need for eco-innovation is increasingly recognised and viewed as becoming even more urgent in a world of a growing population and changing consumption pattern (The Royal Society, 2012). Integrating environmental aspects at an early stage in the design of products has the benefit of minimising environmental impacts right from the start. Once product specifications are being made, only minor changes are usually possible. Hence, the Front End of Eco-Innovation (FEEI) is becoming an increasingly important area of investigation.

Despite the attention given to eco-innovation by business, academia and governments, there is limited understanding of how initial new ideas and concepts develop (e.g., at the shop floor or an organisation's research and development lab), and how these ideas become the basis for product development. Moreover, there is little understanding of organisational mechanisms, tools, activities and techniques employed within innovation projects, which enable environmental-specific innovation to arise and commercialise in particular in the early stages of the innovation process.

This paper draws on the front-end of innovation literature, but sets out to make an empirical research contribution by considering FEEI activities by small and medium-sized companies (SMEs), as there is little research to date on this topic. The literature on innovation for sustainability largely focuses on large companies (Bos-Brouwers, 2010). This research also seeks to make a contribution to the limited literature on eco-ideation (Nissen, 1995; Bocken et al., 2011 are two of the few examples) by investigating eco-ideation processes for the research sample. The main research question investigated in this paper is: *How do eco-innovators undertake the front-end stage of eco-innovation projects, which lead to advancements towards environmental sustainability?* As this is a broad question, the following four sub questions are investigated in particular:

1. What are the drivers for eco-innovators?
2. What are the mechanisms and tools used for idea generation?
3. Who is engaged in the FEEI and which skills are required?
4. With which external parties do SMEs interact and how?

The front-end of innovation and eco-design in the literature

The front-end of innovations and eco-design tools and concepts have independently been discussed extensively in the literature, but the combined area of front-end eco-innovation has received little attention. This section explains the rationale for this research.