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Radical Innovation for Sustainability: The Power of Strategy and Open Innovation

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Sustainability oriented innovation continues to garner increasing attention as the answer to how firms may improve environmental and/or social performance while simultaneously finding competitive advantage. Radically innovating new products and services to replace harmful market incumbents is central to this thesis, yet studies to date have found it to be a highly expensive process with high degrees of uncertainty and risk. Extant research however has largely neglected to examine the details of the actual product innovation process itself and has under appreciated the influence of corporate strategic context. Our paper addresses this gap in the literature through an in-depth case study of a sustainability oriented innovation process for a radical new product within a multinational life sciences company, DSM. Our findings identify five critical organizational practices through which strategic direction has enabled the innovation process: technology super-scouting throughout the value chain, search heuristics that favor radical sustainability solutions, integration of sustainability performance metrics in product development, championing the value chain to build demand for radical sustainability oriented product innovation, and harnessing the benefits of open innovation.

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Introduction

“We feel the world needs something else than oil based, fossil-based resources and we also feel we should limit our impact on the environment in terms of greenhouse gas emissions” (Interviewee M)

Corporate sustainability has continuously risen on the business agenda as companies have sought to address the environmental and social problems to which they are intrinsically entangled (Bansal and Hoffman, 2012; Hart and Milstein, 2003; Whiteman et al., 2013). While sustainability was traditionally seen as a cost of doing business (Porter and van der Linde, 1995), sustainability oriented innovation (SOI) positions this as a business driver that can simultaneously improve performance and offer a source of competitive advantage (Hall and Wagner, 2012; Hart and Milstein, 2003). Many companies have embraced incremental innovations in the form of ‘end-of-pipe’ technical additions or ‘eco-efficient’ optimization of current organizational processes (Adams et al., 2015; Carrillo-Hermosilla et al., 2010). While successful in helping firms avoid unnecessary waste and costs, such innovations alone fail to address the root causes of global problems (Hart and Milstein, 2003; Whiteman et al., 2013). Encouragingly, some corporate frontrunners, alongside sustainability driven start-ups (Hockerts and Wüstenhagen, 2010), have called for the integration of radical product innovation for sustainability at the core of business strategies (Dangelico et al., 2013; Hart and Milstein, 2003). Yet radical product SOI remains understudied (Hansen and Große-Dunker, 2013) with scholars often failing to differentiate between radical and incremental forms of innovation (Dangelico, 2015).

SOIs are defined as “realized ideas that improve environmental and/or social performance compared with the current situation” (Arnold and Hockerts, 2011, 394). SOI concerns the efficient use of resource inputs, the creation of improved products and services, and the formation of new business models: all of which are aligned to traditional business principles (Nidumolu et al., 2009). Debates of whether or not it pays to be ‘green’ (Wu and Pagell, 2011) are now fast being replaced by the question of how to most effectively innovate to maximize the value of meeting sustainability demands (Wagner, 2007). Contemporary management literature gives preliminary insights to these new discussions (see Adams et al., 2015; Klewitz and Hansen, 2014, for systematic literature reviews), including an initial understanding of specific factors for SOI success (Dangelico, 2015; De Medeiros et al., 2014; Driessen et al., 2013).

As the need for radical SOI becomes increasingly apparent (Tukker and Butter, 2007), companies require insight into the mechanisms that may enhance their radical innovation activities for new sustainable products. Important differentiators of SOI are the degree of novelty and the scope of intended environmental and/or social performance improvement. Research suggests that innovations seeking radical improvements in sustainability performance have a number of outstanding issues

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such as high complexity, uncertainty and insufficient financial returns (Geels et al., 2008; Hall and Wagner, 2012) making them less attractive for investment. What is missing is a coherent picture of the practices within the radical innovation process for sustainability, including an explicit examination of how these practices connect to corporate strategy (Arnold and Hockerts, 2011; Boons and Lüdeke-Freund, 2013).

Our paper addresses this gap and investigates a case of radical SOI for new products within one multinational firm from the life sciences industry called DSM. By inductively exploring this case, our study gives insight into how corporate sustainability strategy influences SOI through the execution of five organizational practices: (1) technology super-scouting throughout the value chain; (2) search heuristics that favor radical sustainability solutions; (3) integration of sustainability performance metrics in product development; (4) championing the value chain to build demand for radical SOI; and (5) harnessing the benefits of open innovation. We believe these insights into the specifics of the innovation processes contribute to our understanding of radical SOI, but also add to discussions of strategic influence within the traditional innovation management literature.

We begin our paper with a brief review of the literature on radical SOI and the influence of strategic context. Next, we describe the exploratory qualitative case study approach and our research procedure. We then present our case findings and a process model of radical product SOI. This is followed by discussion of the implications of our findings for research on SOI and traditional product innovation. Finally, we draw conclusions, offer limitations of the study and provide directions for future research.

Radical product SOI

Innovation has long been part of corporate strategy, recognized as a potential source of sustained growth for firms (Schumpeter, 1934) through changes in products, processes, business models and/or organizational structures (Dewar and Dutton, 1986). More recently, new product innovation has been recognized as a key way in which firms can make progress on sustainability performance while simultaneously improving marketplace competitiveness (Dangelico, 2015; Hart and Milstein, 2003; Nidumolu et al., 2009).

SOI for new products seeks to achieve market differentiation, but also a relative improvement in environmental and/or social performance compared to the current situation (which in itself may be a market differentiator). What exactly constitutes SOI for new products has been a matter of much debate in management research, and there remains a range of definitions and terminology such as 'green product innovation', 'eco-innovation' and 'sustainability-driven innovation' (see Carrillo-Hermosilla et al., 2010). We adopt the term product SOI as it implies a process deliberately seeking outcomes to improve current environmental and/or social performance (Hansen and Große-Dunker, 2013). The term directs firms to consider both environmental and social dimensions in the innovation process, but does not dictate that a performance improvement of both is necessary for every innovation; i.e. a portfolio of environmentally and socially focused innovations may be more effective to improve overall sustainability performance of a firm.

Characterizations of product SOI commonly use two dimensions. The first is an assessment of novelty, relying on the radical and incremental distinction used in conventional innovation research. Incremental innovations are understood as competence-enhancing, small adaptations made on a continuous basis (Carrillo-Hermosilla et al., 2010), while radical innovations are episodic, 'frame bending' (Plowman et al., 2007) and often replace existing parts or entire systems (Carrillo-Hermosilla et al., 2010). A second dimension is a consideration of the extent to which product innovation improves sustainability performance, or its 'greenness' in ecological terms (Driessen et al., 2013). Innovations seeking radical sustainability improvements to systems will likely require different practices within the innovation process than those aiming for marginal improvements to existing ones (Adams et al., 2015; Hall, 2002). This paper refers to radical product SOI as innovations that are high in novelty and also aim for significantly improved sustainability performance of systems.¹

Understanding the process of radical product SOI

Innovation research has shown radical product innovation as a particularly difficult process as it requires fundamental changes to existing practice (Dewar and Dutton, 1986; Sandberg and Aarikka-Stenroos, 2014), including a departure from the present knowledge base and/or market relations (Bower and Christensen, 1995; Humble and Jones, 1989). By nature, radical innovation involves greater uncertainty than its incremental counterpart and is more likely to be discontinued due to the greater time needed in development and demands for high investment return over short time frames (Green and Welsh, 2003). Furthermore, incumbent companies are less likely to initiate processes for radical innovations as they may prefer less disruptive innovation that seeks to leverage current competencies (Bower and Christensen, 1995; Hall and Vredenburg, 2003; Hockerts and Wüstenhagen, 2010).

Management studies have also shown that there are unique sets of issues specific to sustainability that need to be addressed throughout the product innovation process (Geels et al., 2008; Hall, 2002). For instance, innovation teams often face the added complexity of reconciling potentially opposed sustainability dimensions and stakeholder demands (Dangelico

¹ We acknowledge that in certain circumstances, radical improvements in sustainability performance may be possible through either: (1) innovations with low novelty; or (2) continuous incremental change leading to radical transformations (Plowman et al., 2007).

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