Current and Emerging Issues in Operations Management

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FOREWORD

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CHAPTER 4

ECO-INNOVATION TOWARDS SUSTAINABILITY: AN IMPLEMENTATION PERSPECTIVE
Kanagi Kanapathy & Sedigheh Moghavvemi

INTRODUCTION

In the past few decades, the world witnessed a shift of consumer's preference to 'green' products. Consumer purchase is now guided by principles such as how products are sourced, produced, packed and disposed. An increasing number of people are willing to pay premium for 'green' products. 'Green or eco' encourages innovative products that enhance consumer value, improve brands and create a sturdy company (Yenipazarli, 2012). Manufacturing firms are moving towards eco-innovation to cope with the 'green' shift in consumer purchase.

Kemp and Pearson (2007, p. 16) defined eco-innovation as 'the production, application or exploitation of a good, service, production process, organizational structure or management or business method that is novel to the firm or user and which results, throughout its life cycle, in a reduction of environmental risk, pollution and the negative impacts of resource use (including energy use) compared to relevant alternatives.' According to Horbach, Rammer and Rennings (2012, p. 119), eco-innovations are 'product, process, marketing and organizational innovations, leading to a noticeable reduction in environmental burdens.' Explicit goals or side effects of innovations can serve as positive environmental effects and they can occur within the respective companies or through customer use of products or services. Eco-innovation diminishes the environmental impact of consumption and production activities without considering whether the outcome is intentional or not (OECD, 2010).

Several sustainability frameworks have been presented by researchers' Sustainable Operations Management (Kleindorfer et al., 2005; Gimenez et al., 2012; Gunasekaran et al., 2014; Walker et al., 2014), Green Supply Chain Management (Sarkis, 2003; Cousins et al., 2004; Zhu & Sarkis, 2004; Rao & Holt, 2005; Green et al., 2012, Hsu et al., 2013; Lin, 2013) and Sustainable Supply Chain Management (Seuring & Muller, 2008; Carter & Rogers, 2008; Carter & Easton, 2011; Beske, 2012, Seuring, 2013, Brandenburg et al., 2014). These researchers have viewed innovation
as a key factor in sustainability but have not paid much attention to what drives firms to develop eco-innovations or the status of eco-innovation adoption in firms within the supply chain.

In recent times, manufacturing has grown considerably in emerging economies. However, this has been achieved at an environmental cost (Chen & Hung, 2014). At present, these countries, particularly those who compete in the global market, face growing pressure to generate products in an environmentally sustainable manner. Although these firms are progressing towards eco-innovation, research that measure the key dimensions of eco-innovation and the status of its implementation remain lacking. In this chapter, we discuss the key dimensions of eco-innovation activities, barriers, drivers and benefits as well as the level of eco-innovation implementation in manufacturing firms.

**DRIVERS OF ECO-INNOVATION**

Communities gain from eco-innovation as firms assume expenditures in order to conform to regulations and decrease their environmental load (Rennings, 2000; Rennings, Ziegler, Ankele & Hoffman, 2006). Thus, firms spending on eco-innovation incur more costs than their contaminating rivals and the positive externalities work as a deterrent for them (Rennings et al., 2006). For this reason, technological push and market pull factors navigate firms towards the implementation of general innovation, whereas regulatory push/pull forces should be considered for stimulating eco-innovation (Porter & van der Linde, 1995; Rennings, 2000; Beise & Rennings, 2005; Wagner, 2008; De Marchi, 2012; Horbach, 2008; Schmidt et al., 2010; Van den Bergh et al., 2011; Fernando et al., 2016).

A research project on eco-innovation, IMPRESS (Impact of Clean Production on Employment in Europe: An Analysis Using Surveys and Case Studies) was based on 1,594 telephone interviews with randomly selected manufacturing and service firms in eight sectors (Rennings & Zwick, 2012). Interviews were conducted in five countries (Germany, Switzerland, Italy, the Netherlands and the United Kingdom). The research focused on eco-innovation and encompassed questions regarding the kinds of environmental novelties initiated in the preceding three years, the motivations for the eco-innovations and the organization’s most significant eco-innovation. The study found other drivers for eco-innovation in addition to regulations. These drivers are as follows:

a) Improving the firm’s representation.
b) Reducing costs.

c) Obtaining certification for product and service innovations.

d) Retaining current markets and expanding market shares.

The IMPRESS project also determined that conforming to environmental regulations was more important for pollution control innovations than for other types of eco-innovation, especially service, distribution and product innovations.

Eco-innovation drivers are classified as internal or external drivers (Fernando et al., 2016; Agan et al., 2013; Del Río González, 2009; Gadenne et al., 2009; Horbach, 2008; Horbach et al., 2012; Lewis & Cassells, 2010; Sharma, 2001; Testa & Iraldo, 2010; Van Hemel & Cramer, 2002; Walker et al., 2008; Yen & Yen, 2012).

Del Río González (2009) pointed out that internal drivers refer to the internal preconditions and features of a company that facilitate its involvement in environmental technological shift. Thus, environmental management systems (EMS) can depict key in-house capabilities which facilitate the constant generation/adoptions of eco-innovation (Wagner, 2007). Firm size, technological push (R&D), EMS (specifically ISO14001) and a company’s green capabilities are key internal factors that facilitate either the development or implementation of product eco-innovation.

External drivers are induced and motivated by a wide range of factors that apply pressure to which firms react; thus, external drivers characterize interaction with other institutional, market and social performers (Del Río González, 2009). Market pull factors and regulations are the two main external drivers that trigger product eco-innovation (Fernando et al., 2016).

**BARRIERS TO ECO-INNOVATION**

The European Commission’s Environmental Technologies Action Plan identified the following barriers to environmental technologies:

a) Economic barriers stretch from market prices which do not show the external costs of products or services to the increased cost of investments in eco-friendly technologies due to their apparent risk, the size of initial investment or the sophistication of shifting from conventional to eco-friendly technologies.

b) Regulations and standards can also surface as barriers to innovation when they are ambiguous or too precise whereas good legislation can spur eco-friendly technologies.
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Current and Emerging Issues in Operations Management

Operations management has been recognized as an academic discipline in business education programmes since 1980. Despite the initial struggle in differentiating itself from operations research, management science and industrial engineering, it has emerged as an exciting discipline in business schools worldwide with significant changes in terms of scope and techniques used in the last few decades. Starting from Enterprise Resource Planning (ERP), Supply Chain Management (SCM), Just in Time (JIT) and agile manufacturing, the field of operations management has continued to evolve in line with the extensive global competition and dynamic environment. The ever-shrinking product life cycles, new demands on the labour market, sustainability concerns and digitization of processes require innovative approaches, paradigms and methodologies to operations management. The dynamism of operations management field has led to the emergence of trends and developments which must be considered by any business that wishes to position itself strategically. In response to this, this book intends to discuss current and emerging topics in the field. The first chapter explains how the information technology revolution of mobile technologies, 3D printing and social networks are changing manufacturing philosophy and production mode of conventional practices to one that is more socialized and collaborative, hereby termed as social manufacturing. The second chapter focuses on how design science research could be applied in operations management, in the light of big data and cloud-based technologies. In the third chapter, the authors investigated the possible roles of the chief supply chain officer in aligning the management of supply chain with the strategic direction of an organization. Meanwhile, chapter four highlights the dimensions of key eco-innovation activities and how they are implemented in manufacturing firms. In chapter five, the authors discuss the concept of “bullwhip effect” in the context of today’s organization. It is hoped that these chapters will highlight the current and emerging issues in operations management that can affect the success of an organization.