Chapter 9
Green and Lean Paradigms Influence on Sustainable Business Development of Manufacturing Supply Chains

Helena Carvalho
Universidade Nova de Lisboa, Portugal

Susana Garrido Azevedo
University of Beira Interior, Portugal

Susana Duarte
Universidade Nova de Lisboa, Portugal

V. Cruz-Machado
Universidade Nova de Lisboa, Portugal

ABSTRACT
Green and lean paradigms have been adopted in a supply chain management context, but nearly always separately and with little understanding of their influence on supply chain performance and sustainable business development. This paper proposes a theoretical framework about the influence of green and lean practices on sustainable business development in a supply chain context. Green and lean upstream supply chain practices, supply chain attributes and a performance measurement system, based on the balanced scorecard, are suggested. An exploratory case study was conducted at a Portuguese automotive supply chain to test qualitatively the validity of the proposed theoretical framework.

INTRODUCTION
Today’s organizations must answer to an increasing rate of change: customer service to relationship management, adversarial to collaborative relationships, forecasting to endcasting, functional to process integration, vertical to virtual integration, share of information among supply chain entities (Carvalho et al., 2010). In this highly demanded environment, organizations must increase their efficiency and responsiveness levels. Supply chain management is crucial for increasing organizational effectiveness, competitiveness and for enhancing customer service, profitability and also to influence the business sustainability. Namely, it promotes the integration between companies
and its suppliers, through the development of partnerships and strategic alliances (Seuring & Muller, 2008). The set of practices deployed to manage the relationships with suppliers is a critical supply chain issue, since it will affect the overall performance of supply chain. The recent emphasis given to sustainability has made this selection more complex (Zhu et al., 2008) since it is necessary to implement not only practices that promote supply chain overall efficiency, but also the ones that focus on social, economic and environmental concerns.

In organizations the sustainable development can be reached through the by implementing a set of practices to maximize the economic benefits while maintaining natural resources over time (Pearce & Turner, 1990). Different management paradigms, such as “green” and “lean” have been adopted for the supply chain management all over the world, but nearly always separately and with little understanding on its influence to business sustainable development. The lean paradigm represents a strategy based on cost reduction and flexibility, focused on process improvements, from the customer order to the delivery, through the reduction or elimination of all “waste” or non-value-adding operations (Anand & Kodali, 2008). Green paradigm has emerged as an organizational management philosophy by which it is possible to achieve corporate profit and market-share objectives by reducing environmental risks and impacts while improving the ecological efficiency of such organizations and their partners (Rao & Holt, 2005; Zhu et al., 2008). In the literature it can be found that researches which focus on lean (Anand & Kodali, 2008; Stenzel, 2007; Wilson & Roy, 2009) and green paradigms (Hu & Hsu, 2006; Paulraj, 2009; Sidiroupoulos et al., 2004) do it individually and mainly with an enterprise focus. Kainuma and Tawara (2006) studied both paradigms in a supply chain context to demonstrate the opportunities for improving not only financial but also environmental performance and to briefly review specific tools and methods. Also, few researchers have highlighted the importance to study the influence of both paradigms on supply chain performance but mainly in an environmental context (Carvalho et al., 2010). There is a lack of studies addressing the relationship between green and lean paradigms, namely in the upstream supply chain and their influence on the sustainable development of businesses.

The purpose of this paper is to investigate the deployment of green and lean upstream supply chain practices and to understand how those practices influence supply chain attributes and overall supply chain performance; more specifically their contribution to the sustainable business development of supply chains. In a first step, a theoretical framework with the influence of green and lean upstream supply chain practices on supply chain performance is derived from the literature review. Next, three research propositions are suggested and tested using a case study belonging to the Portuguese automotive supply chain. The case study data were collected to develop a deeper understanding on how green and lean upstream supply chain practices are implemented in the automotive industry. After that, the relationships between green and lean practices deployed and supply chain performance are identified. Finally some conclusions are draw.

**BACKGROUND**

There is no consensus about the definition of sustainable development in literature. The first accepted definition of sustainable development is the one made by the World Commission on Environmental and Development “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). Afterward Pearce and Turner (1990) consider that sustainable development is a set of activities that maximize the net benefits of economic development while maintaining the services and quality of natural