

Environmentally and socially sustainable supply chains: a focus on the automotive industry

Report of joint research

Prof. Ruth Carrasco-Gallego, Technical University of Madrid (UPM)

Prof. Lumbidi Kupanhy, Wakayama University

Foreword

This document reports on the joint research activities carried out in Japan by the authors from January 7th to February 8th, 2013. This research has been funded by the International Visiting Fellowship Award, 2012 and the authors would like to express their gratitude to the Wakayama University Faculty of Economics for making this research possible.

Background: Sustainable supply chains in the automotive industry

Over the past few years, some of the most influential and high-profile corporations have embraced sustainability not only as a glittering block of their marketing and communication policy but also as a core component of their supply chain strategy. The long-term value proposition of the Brundtland report (1987), which was later operationalised in the triple bottom line concept developed by Elkington (1997), has resulted in many firms disclosing information on their environmental and social performance, along with their economic outcomes. Firms conducting triple bottom line reporting are eligible for responsible investment indexes such as the Dow Jones Sustainability Index (DJSI) or the FTSE4Good. This differentiates such corporations from competitors not included in this type of stock exchange indexes. Within the automotive sector, we find out that automakers like Ford, Renault or Toyota and parts suppliers such as Lear, Bosch or Aisin are listed in the DJSI.

Even if the scope is narrowed down to one particular industry, sustainability is still a broad concept that needs refining and sharpening in order to deliver tangible research results. The research team worked on identifying specific and well-defined research lines where they could provide a distinct contribution to the current academic discussion on sustainability within the automotive industry, namely:

- The link between lean operations and environmental sustainability
- End-of-life vehicles (ELV) management: benchmarking of Japanese and European practices
- Parts remanufacturing in the automotive industry

Those three research lines are summarized below.

The link between lean operations and environmental sustainability

Lean management principles are driven by the idea of “doing more with less”. The Lean system seeks to identify and eliminate any *muda* (waste) related to production activities. To do, it uses tools such as 5S, Kanban, total productive maintenance (TPM), single minute exchange of dies (SMED), or value stream mapping (VSM). *Muda* is still present in the production system when there is a spending of resources that do not translate in direct value for the customer. The implementation of lean thinking and techniques often brings along more environmentally-friendly operations as a by-product, since fewer natural resources (in terms of energy or materials) are used for achieving the same results for the end-customer. Environmental agencies, e.g. EPA (2000), have been advocating in the last decade for “lean and green” operations.

However, when attending academic conferences, we have heard some criticism to the idea that lean operations result in more environmentally-sustainable operations. Critical scholars judge the low inventories of Just-in-Time (JIT) operations responsible for an increased need for transport and thus, for an increase in the greenhouse gas (GHG) emissions derived from this activity. Nevertheless, other scholars (for instance, Matthews and Hendrickson, 2003; Kohn and Huge Brodin, 2008) contend that when the environmental performance of a system is analyzed with a wider perspective, not just focused on CO₂ emissions, the benefits of working with lower inventories overcome the externalities of transport. In addition, lean firms can also work on reducing the GHG emissions linked to their transport activities through shifting to new vehicle technologies or to less fossil-fuel intensive transport modes. The **trade-off between increased transport and reduced inventories**, from a cost and environmental perspective, is one of the research lines opened during the joint research period described in this report.

Another research line opened within this field is related to the cost of capital for investing in green and lean implementations. We analyzed the **concept of “self-sustainability”** for investments geared towards solving environmental problems in manufacturing while economic and competitive advantages are also leveraged.

End-of-life vehicles management: benchmarking of Japanese and European practices

In the year 2000, the European Commission issued the so-called End-of-Life Vehicles (ELV) directive (Directive 2000/53/EC). This regulation aimed at: (1) reducing waste arising from end-of-life vehicles; (2) promoting reuse, recycling and recovery of waste vehicles and their components; and (3) encouraging producers to design and manufacture new vehicles including recyclability considerations. The directive introduced for the first time in the European legislation the concept of Extended Producer Responsibility (EPR) throughout the whole life-cycle of a product. The implementation of this norm resulted in the creation in each member state of one Producer Responsibility Organization (PRO), such as SIGRAUTO in Spain, ARN in the Netherlands or KFZ Gewerbe in Germany. These country-specific PRO were responsible for setting up an ELV recycling network made up of collection points, auto-dismantling business and shredders that would ensure the proper disposal and recycling of ELV. The directive set quantifiable targets for reuse, recycling and recovery of vehicles and their components.

In Japan, the Ministry of Economy, Trade and Industry (METI) also promulgated the “Law for the Recycling of End-of-Life Vehicles”, which was partially inspired by the European ELV directive. The law was enacted in January 2005 and, as a result, the Japan Automobile Manufacturers Association (JAMA) led to the creation of several organizations that make up the auto recycling network in Japan, including the Japan Automobile Recycling Promotion Center (JARC) and two recycling teams. JARC is responsible for collecting recycling fees from vehicle owners and for orchestrating the recycling system (including the tracking information system). Recycling is organized by two different teams. The TH-team, consisting of Toyota, Honda and six other companies entrusts their recycling operations to Toyotsu Recycle Corporation, a subsidiary of Toyota. The ART-team (Automobile shredder residue Recycle team) consists of Nissan, Isuzu and nine other companies.

In further developments of this research line we intend to develop a comparative study of both the European and Japanese ELV recycling system, including: characteristics of the reverse logistics networks, reuse and recycling targets, results obtained by each legislation and main challenges.

Parts remanufacturing in the automotive industry

European automotive firms such as Renault¹ and Volkswagen² have an active strategy for remanufacturing durable vehicle spare parts, such as gearboxes, engines or transmissions. Remanufacturing can be in some occasions a more environmentally-sound alternative than just steel recycling, but some factors, such as customer’s perception of remanufactured parts or legislative barriers can hinder its widespread adoption. We advanced during this research period in contrasting how extended parts remanufacturing was in the Japanese automotive industry compared to the European Industry.

The methodology used during the research period reported here is basically exploratory. The research team carried out desk research and two field visits to selected manufacturing facilities in Japan.

- Toyota Motomachi plant. February 1st, 2013
- Mitsubishi Air Conditioning & Refrigeration Systems plant. Wakayama. February 8th, 2013.

In addition, soon after the end of this research period, an industrial facility of Renault in Spain was visited to contrast the results related to parts remanufacturing obtained in Japan (visit to the Renault’s National Distribution Centre of Spare Parts. Torres de la Alameda, Madrid, visited on March 7th, 2013). On the other hand, an interview of two long hours was conducted with five production and logistics managers of Aisin at its headquarters in the form of workshop.

¹ http://www.renaultservicios.es/php/cambio_estandar.php

²

http://www.volkswagengroupamerica.com/newsroom/2012/10/16_Turning_old_into_new_65_years_of_Volkswagen_Genuine_Exchange_Parts.html

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