Adopting a Circular Business Model: Opportunities and Challenges for the Supply Chain Management

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Abstract
Circular economy implies profound changes in companies’ business model to gain competitive advantage and mostly in the value network dimension. Notwithstanding, the supply chain management field has poorly focused on the role played by the value network to allow companies’ shift towards sustainable supply chains. This deserves particular attention nowadays, when circular economy calls companies to become sustainable through establishing closed-loop supply chains, which find in collaborative relationships a way to reduce environmental impacts and gain competitive advantage. We tackle this issue, leveraging on an exploratory single case study analysis of a manufacturing company conducting a transition towards circular economy.

Keywords: circular economy, supply chain management, value network

Introduction
Circular economy is the new industrial paradigm that aims at overcoming the linear take, make, disposal model, which “relies on large quantities of easily accessible resources and energy, and as such is increasingly unfit to the reality in which it operates”, because resources are neither so abundant nor so accessible (Ellen MacArthur Foundation, 2015a). In this respect, circular economy encourages people towards more sustainable behaviors and policymakers to establish regulations that address principles of sustainability (Andersen, 2007; Besio & Pronzini, 2014; Miliute-Plepiene & Plepys, 2015; Schneider, 2015; Haas et al., 2015). In addition, circular economy implies profound changes in managerial and organisational practices of companies in a way they use more efficiently energy, materials and resources, and reduce the environmental waste contextually. In this case, companies are called to develope, manufacture, distribute and retrieve products (McDonough & Braungart, 2002; Ellen MacArthur Foundation, 2013a, 2013b, 2014, 2015a, 2015b, 2015c; UNEP, 2006; Geng et al., 2013; Murray et al., 2015). Put it
differently, companies are expected to maintain mostly the properties of products, as well as of their components, while customers to become their users (Mont, 2002; Tukker, 2004, 2013; Tukker & Tischner, 2006).

To a certain extent, the above streams of research focus on circular economy as a new industrial paradigm adopting micro (i.e. people), macro (i.e. policy makers) and meso (i.e. companies) approaches.

However, whereas micro and macro approaches are widely described in literature, a meso approach that takes into account the company as a unit of analysis still requires more theoretical and empirical effort. Indeed, very few contributions have studied circular economy according to a business model perspective (Chiaroni & Urbinati, 2016; Linder & Williander, 2015; Vermeulen, 2015; Crainer, 2013), although they do not seem to analyse in depth how companies adopt in practice circular economy and adapt or change their business model. However, these studies have highlighted two main dimensions of the business model on which companies can leverage to implement circular economy as a new industrial paradigm. On one hand, the customer value proposition and interface, which concerns the management of relationships with clients, such as demonstrated by the increasing appeal of pay-as-a-service mechanisms (Tukker, 2013; Williams, 2007). On the other hand, the value network, which mainly concerns the management of the supply chain and the role in the value creation along the entire supply chain of suppliers, manufacturers and retailers (Vermeulen, 2015; Goldsworthy, 2014; Parkinson & Thompson, 2003; Matsumoto et al., 2016).

In this paper, we focus on the value network, therefore on the management of the supply chain and of its main actors, with the aim to fill a gap that existing literature on supply chain management still neglects if analysed under the lens of the new industrial paradigm of circular economy.

On one hand, the sustainability issue has allowed significant advances in the field of supply chain management, such as demonstrated by the fact that existing literature has recently highlighted the concept of sustainable supply chains (Seuring & Müller, 2008). In sustainable supply chains, the issues of environment, safety and human rights are addressed simultaneously through the implementation of new sustainable managerial and organizational practices (Wheeler et al., 2002). The focus in this field of research is still on the adoption of managerial and organizational practices (Carter & Jennings, 2002).

On the other hand, the new industrial paradigm of circular economy has called companies to become sustainable through the establishment of closed-loop supply chains, which find in collaborative relationships with external partners a complementary activity to sustainable managerial and organizational practices. In particular, they allow companies to reduce environmental impacts, minimize resources consumption from economic activities and support the life system, and gain long-term competitive advantage (Yuan et al., 2006; Winkler, 2011).

In the field of supply chain management there are few and more recent studies exploring the role that the value network can play for companies in the shift towards sustainable supply chains (Attaran & Attaran, 2007; Chandra & Kumar, 2000). In this respect, there is
a need for investigating how collaborative relationships with external partners allow the establishment of sustainable closed-loop supply chains.

From a methodological point of view, the paper relies on an exploratory single case study analysis of a manufacturing company that has conducted a transition towards circular economy in the last years. We aim to describe its undertaken journey towards the new industrial paradigm, looking at how it has leveraged on the establishment of its value network. We compare our findings with those barriers and practices already described in scientific literature dealing with the specific themes of sustainable supply chains and sustainable operations, i.e. reverse supply chains, reverse logistics, recycling, remanufacturing, redistribution and reuse (Parkinson & Thompson, 2003; Matsumoto et al., 2016; Dagman & Söderberg, 2012; Go et al., 2011).

By doing so, our work allows the progress in the field of supply chain management, arguing that circular economy as a new industrial paradigm, although based on already known and studied solutions, offers new stimuli and avenues for further research. As for example, indeed, leveraging on the establishment of the value network, it allows creating unique and new interactions with the actors of the supply chain, as well as it requires companies to implement and nurture new sustainable managerial and organisational practices.

The paper is structured as follows. In the “State-of-the-art” section, we present a review of the extant literature on circular economy and on the supply chain management, tackling the topic of the value network dimension. Then, in the “Methodology” section, we highlight the rational used for our empirical analysis and show in the following section, i.e. “Results and discussion”, the results of our research. Finally, in the “Conclusion” section, we point out the main implications of our study and argue about the main limitations of the paper and avenues for further research in the field of circular economy and supply chain management.

State-of-the-art
In this section, we propose a review of the extant literature on sustainable supply chains and closed-loop supply chains. Therefore, we highlight the role that sustainable operations and collaborative relationships with external partners have in the fields of supply chain management and circular economy. By doing so, we attempt to identify the existing gaps in these fields of research.

Circular economy and supply chain management
Sustainable operations have represented for long time the unit of analysis of the sustainable supply chains, which mean the implementation of a set of sustainable activities in the production processes of the supply chains (Kleindorfer et al., 2005; Maloni & Brown, 2006). This set of sustainable activities, among which design, manufacturing, distribution and recycling (O’Brien, 1999), allows companies to structure production processes in a way to rich sustainable performances, such as sustainable product design, lean and green operations, corporate image and sustainability, regulatory compliance, employee health and safety (Kleindorfer et al., 2005). This issue is even more relevant nowadays, when supply chains in which companies operate are called to be more socially responsible and
greener (Gimenez et al., 2012). In addition, several scientific contributions insist to highlight how companies implementing the above sustainable techniques in the production processes of their supply chain gain a competitive advantage over their competitors thanks to reduction of costs and improved quality (de Ron, 1998). This line of argumentation was especially due to the sustainability issue, which tackles social, environmental and economic responsibilities simultaneously (Kleindorfer et al., 2005), and has allowed the shift in the field of supply chain management towards the concept of sustainable supply chain (Seuring & Müller, 2008). Indeed, sustainable supply chains address the issues of environment, safety and human rights through the implementation of new sustainable managerial and organizational practices (Wheeler et al., 2002).

The new industrial paradigm of circular economy tackles all the dimensions of sustainability addressing people behaviors, policymakers and companies (Andersen, 2007; Besio & Pronzini, 2014; Mileute-Plepiene & Plepys, 2015; Schneider, 2015; Haas et al., 2015; McDonough & Braungart, 2002; Ellen MacArthur Foundation, 2013a, 2013b, 2014, 2015a, 2015b, 2015c; UNEP, 2006; Geng et al., 2013; Murray et al., 2015). However, differently from the field of supply chain management, circular economy calls companies to become sustainable through the establishment of closed-loop supply chains, which find in collaborative relationships with external partners a complementary activity to sustainable managerial and organizational practices. In particular, they allow companies to reduce environmental impacts, minimize resources consumption and support the life system, allowing same companies to gain long-term competitive advantage (Yuan et al., 2006; Winkler, 2011).

This issue deserves particular attention when there are few and more recent studies in the field of supply chain management exploring the role that the value network can play for companies to shift towards sustainable supply chains (Attaran & Attaran, 2007; Chandra & Kumar, 2000).

Closed-loop supply chains are about sufficiency and efficiency of materials and resources (Ellen MacArthur Foundation, 2015a). Resources and materials sufficiency concerns the re-use and the product-life extension of manufactured and distributed capital, and resources and materials efficiency concerns the recycle of resources and materials themselves. Accordingly, sufficiency claims for a product-specific strategy, that entails modular design systems, components standardization and eco-design approaches, whereas efficiency implies a material-specific strategy, i.e. the usage of physical and chemical processes of recycling, often deriving from existing or new manufactured processes. However, each of the above strategies create dedicated loops, which are summarized below (Chiaroni & Urbinati, 2016; Source: “Explore circular economy approaches”):

1. Product-life extension means, “products are designed to be durable and to have a long lifetime, thus reducing consumption. Such products are by definition high quality, so businesses often need to change their business model in order to offset the increase product cost, for example by leasing instead of selling products or generating revenue by selling additional services”;}
2. Redistribution & reuse means, “the most sustainable product is often one we already own. Reusing a product preserves all of the added-value within that product”;

3. Remanufacturing means, “a series of manufacturing steps acting on an end-of-life part or product in order to return it to like-new or better performance, with warranty to match”;

4. Recycling means, “the most common circular economy approach”. It is still the most widespread strategy employed to achieve a circular economy paradigm. In the perspective of “circularity” (rather than of “linearity”), the recycling means that a product is initially thought and designed in such way that at the end of its life allows creating a new one that maintains its same qualities. The new product is obtained thanks to dedicated processes that do not need a high-energy consumption (Ellen MacArthur Foundation, 2013a).

Accordingly, the circular pattern tries to use resources as efficiently as possible and turning them as long as possible into the economy through reuse, remanufacturing and recycling. In this case, the new industrial paradigm of circular economy aims to maintain the high value-added of products for as long as possible and minimize the production of waste. To each implemented loop corresponds a specific degree of value that can be obtained, i.e. every loop increases its value as much as is short the loop itself, due to the fact that a product is replaced in the economy with more frequency and speed.

The role of the value network dimension in closed-loop supply chains is fundamental to create value in each loop and it is mostly explained by the building blocks that we summarize below according to recent contributions addressing this issue (Lieder & Rashid, 2016; Spring & Araujo, 2016; Ghisellini et al., 2016; Bezama, 2016; Moreno et al., 2016; Antikainen & Valkokari, 2016):

1. **Circular collaborative business model**, i.e. rethinking of the partnerships in order to allow new collaborative business models. Collaboration and synergies need to be emphasized and enabled through geographic proximity, such as industrial symbiosis and development of eco-industrial parks, with the aim of reaching competitive advantage as a collective approach;

2. **Circular communication**, i.e. establishing effective communication with suppliers, retailers and end-of-life materials managers, such as the waste industry, as well as with all the actors involved in the supply chain;

3. **Circular awareness**, i.e. helping all partners to develop awareness and new skills, hence rendering the business model more viable, i.e. circular, for all the actors involved in the supply chain.

Starting from these premises, we argue how there is a need to investigate whether and how collaborative relationships with external partners allow the establishment of sustainable closed-loop supply chains.
Moreover, the role of the value network in enabling companies’ changes is not new in existing literature. Several studies, among which the literature on the change management, have underlined how the establishment of collaborative relationships is fundamental to allow the companies’ transition towards new industrial paradigms (Paton & McCalman, 2008; Jiao et al., 2006).

Accordingly, we argue how companies have to focus on sustainable operations, but work consistently on the building blocks of the value network dimension of their business model in order to enable their change in the shift towards the new industrial paradigm of circular economy and sustainable closed-loop supply chains.

Following these streams of research, we propose the following research questions: “Whether and how do companies establish their value network, i.e. circular collaborative business model, circular communication and circular awareness, in the shift towards the new industrial paradigm of circular economy and sustainable closed-loop supply chains?”

**Methodology**

The paper builds on an exploratory single case study analysis of a manufacturing company that has conducted a transition towards the new industrial paradigm of circular economy in the last decades. Single case studies are particularly suited to answer to “whether” and “how” questions, as in our case, and to investigate a phenomenon in its whole complexity (Eisenhardt, 1989; Yin, 1989). We decided to focus on the manufacturing sector because it is the sector that historically has been most conformed to the adoption of circular economy as a new industrial paradigm (Ellen MacArthur Foundation, 2013a; Lieder & Rashid, 2016).

In order to find a reliable case, even if based on secondary sources, we decided in a first step, to consider all the case studies listed and recorded on the Ellen MacArthur Foundation website. An initial list of 24 firms, which have adopted the principles of circular economy, was present in the website. The list of the 24 firms on the Ellen MacArthur Foundation website was accessed at the latest the April 17, 2016.

In a second step, we have considered the list of “Circular Economy 100 members”, i.e. “a pre-competitive innovation programme established to enable organisations to develop new opportunities and realise their circular economy ambitions faster. It brings together corporates, governments and cities, academic institutions, emerging innovators and affiliates in a unique multi-stakeholder platform. Specially developed programme elements help members learn, build capacity, network, and collaborate with key organisations around the circular economy.” We did so in order to strengthen our empirical base of firms to start our search. The list of the “Circular Economy 100 members” was accessed at the latest the April 17, 2016.

By doing so, we obtained an initial sample of 124 firms operating in different sectors of activity, which have adopted in different extent the principles of circular economy. Therefore, we have considered in this sample just firms operating in the manufacturing sector in order to restrict and focus our analysis. In a first case, we were able to restrict the
sample from 124 to 14 companies, whereas, in a second case, this number was reduced to 8, looking at the degree of maturity of the dimension of value network for each of the 14 firms. We did so coherently with the purpose of our paper, synthesized in the research question we attempt to answer, and highlighted in the “State-of-the-art” section.

Therefore, we provide in Table 1 the list of firms operating in the manufacturing sector, by distinguishing and selecting each of them according to the degree of maturity of the value network dimension.

**Table 1 – Final sample of manufacturing companies according to the degree of maturity of the value network dimension.**

<table>
<thead>
<tr>
<th>Company</th>
<th>Brief profile description</th>
<th>Industry</th>
<th>Value Network</th>
<th>Why not</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ikea</td>
<td>Swedish multinational group of companies that designs and sells ready-to-assemble furniture (such as beds, chairs and desks), appliances and home accessories</td>
<td>Furniture, Textile and Flooring, Retail</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Mera</td>
<td>Mera is an association of remanufacturers, suppliers, universities and professional services firms that promote the economic and environmental benefits of remanufacturing. A division of Memra, Mera has its roots in the transportation industry, particularly the automotive and heavy-duty, off-road sectors</td>
<td>Automotive and Transport Manufacturing</td>
<td>NO</td>
<td>Mera is just an enabler of the circular economy. Mera has grown to become internationally recognized as a network of 120 member companies</td>
</tr>
<tr>
<td>Michelin</td>
<td>Michelin is a French tire manufacturer based in Clermont-Ferrand in the Auvergne region of France</td>
<td>Automotive and Transport Manufacturing</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Midal Cables</td>
<td>Significant player in the aluminum and electrical transmission industry in Kingdom of Bahrain</td>
<td>Industrial machinery and equipment</td>
<td>NO</td>
<td>No information on Supplier Relationship Management</td>
</tr>
<tr>
<td>Noble Environmental Technologies</td>
<td>Founded in 2005, Noble develops high-value waste conversion technologies, advanced green building materials and provides closed-loop enterprise solutions. Noble is the founder of</td>
<td>Built Environment, Manufacturing, Materials</td>
<td>NO</td>
<td>Ecor is just an enabler of the circular economy. The company itself, Noble, covers a very small portion of the</td>
</tr>
<tr>
<td>Company</td>
<td>Description</td>
<td>Sector</td>
<td>Circular?</td>
<td>Notes</td>
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<td>------------</td>
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</tr>
<tr>
<td>Ecor</td>
<td>Global leader in aluminum rolled products and the world’s largest recycler of aluminum</td>
<td>Materials</td>
<td>YES</td>
<td>Value chain and is not therefore representative of the circular business model. Moreover, there is no information available on the company’s supply chain network.</td>
</tr>
<tr>
<td>Renault France</td>
<td>Group Renault is a French multinational automobile manufacturer established in 1899</td>
<td>Automotive and transport manufacturing</td>
<td>YES</td>
<td>Rather than being a company that applies circular principles, Replenish sells equipment that allows other companies to apply circularity. Moreover, being newborn, the company still seems to have an underdeveloped supply chain network.</td>
</tr>
<tr>
<td>Replenish</td>
<td>Founded in 2009, Replenish is an emerging innovator of refill systems, wanting to disrupt the old paradigm of plastic bottles with a reusable bottle and concentrate refill system that makes it easy for consumers to add water at home and not at a factory. The result is a reusable bottle that attaches directly to a concentrate refill pod</td>
<td>FMCG &amp; Packaging</td>
<td>NO</td>
<td>Rather than being a company that applies circular principles, Selfrag sells equipment that allows other companies to apply circularity, because the tools offered are able to disaggregate composite materials of all sorts to facilitate sorting and to</td>
</tr>
<tr>
<td>Selfrag</td>
<td>Founded in 2007, the company SELFRAG AG specializes in the development, engineering and marketing of high voltage pulse power products, plants and systems for selective fragmentation of various solids</td>
<td>Industrial machinery and equipment</td>
<td>NO</td>
<td>Rather than being a company that applies circular principles, Selfrag sells equipment that allows other companies to apply circularity, because the tools offered are able to disaggregate composite materials of all sorts to facilitate sorting and to</td>
</tr>
<tr>
<td>Company</td>
<td>Description</td>
<td>Sector</td>
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<tr>
<td>Steelcase</td>
<td>Founded in 1912 as the Metal Office Furniture Company in Grand Rapids, Michigan, Steelcase is over 100 years old. Today, Steelcase’s portfolio of solutions addresses the three core elements of an office environment: interior architecture, furniture and technology</td>
<td>Furniture, Textile and Flooring</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Tarkett GDL</td>
<td>With net sales of 2.7 billion euros in 2015, Tarkett is a global leader in innovative and sustainable solutions for flooring and sports surfaces. Offering a wide range of products including vinyl, linoleum, carpet, rubber, wood &amp; laminate, synthetic turf and athletic tracks, the Group serves customers in more than 100 countries worldwide</td>
<td>Furniture, Textile and Flooring</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Tetra Pak</td>
<td>Tetra Pak is a world leading food processing and packaging solutions company</td>
<td>FMCG &amp; Packaging</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Unilever</td>
<td>Unilever is an Anglo-Dutch multinational consumer goods company. Its product portfolio includes food, beverages, cleaning agents and personal care products</td>
<td>FMCG &amp; Packaging</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>
Founded in 2015, Vigga offers high quality children’s clothing produced under proper conditions, at a very attractive price point. This is possible because several children share the same piece of clothing.

Furniture, Textile and Flooring

NO

Now Vigga is working with Design School Kolding to create design solutions to extend the life of the clothes. Vigga has also teamed up with a large Danish company that will recycle the clothes when they are too worn out to circulate again. However, the effort seems to be focused downstream, towards making clothing a shared service. Very little available information on supply chain network due to the novelty of the project (2015).

Therefore, we obtained a final sample of 8 cases, among which Ikea, Michelin, Novelis, Renault France, Steelcase, Tarkett GDL, Tetra Pak, and Unilever.

However, we finally decided to focus our analysis on the case of Steelcase, the largest offices environment furniture manufacturer in the world, due to the incredible new interactions and new sustainable actions that the company has implemented in the last decades to shift towards the new industrial paradigm of circular economy (Source: “Steelcase”; “Ellen MacArthur Foundation”). The criteria with which the case study has been selected follow the logic of theoretical and convenience sampling (Siggelkow, 2007). Accordingly, our aim is to investigate and highlight the role that the value network dimension can play for a manufacturing company in the transition towards circular economy and sustainable closed-loop supply chains, without the will to generalize to any population of companies operating in the manufacturing sector.

In order to enlarge data and information of this case – due to the fact that information on the Ellen MacArthur Foundation website often was not enough clear and plentiful to understand the relevance of the value network dimension of the company – we analysed as primary sources journals, websites, magazines and reports that have described this company from a circular perspective. The most helpful and frequently referenced sources of information were Bloomberg, The Financial Times and the European Commission website. We have supported our research with professional full-text journal databases such as InfoTrac and LexisNexis. In addition, the choice to take additional data and information
from secondary sources aimed at facilitating comparisons and triangulation of information. In this respect, a content analysis (Weber, 1990) was performed on the collected material, in order to cluster the information contained in the documents above.

Results and discussion
In the present section, we describe the undertaken journey of Steelcase towards the new industrial paradigm of circular economy, the main barriers the company has faced and the new sustainable managerial and organisational solutions it has adopted. We do so providing a brief overview of the company, its relationship with the paradigm of circular economy and finally, exploring at the main building blocks explaining the value network dimension as a key enabler of the company to shift towards circular economy as a new industrial paradigm, i.e. circular collaborative business model, circular communication and circular awareness.

Background of the company
“Steelcase was founded in 1912 by a few people with a strong commitment to integrity and doing the right thing for their customers, employees, business partners, associates and neighbors” (Source: “Ellen MacArthur Foundation”).

Steelcase is a US-based metal office furniture company, which headquarter is located in Grand Rapids, Michigan. The company is over 100 years old in the production of furniture settings, interior architectural products and user-centered technologies for office environments, which represent the three core elements of the company’s portfolio. In particular, as far as furniture settings are concerned, they include panel-based and freestanding furniture systems and complementary products, such as storage, tables and ergonomic work tools. Its seating products include task chairs, which are ergonomic seating that can be used in collaborative or casual settings and specialty seating for specific vertical markets, such as healthcare and education. As far as user-centered technologies are concerned, they support group collaboration by integrating furniture and technology. As far as interior architectural products are concerned, they include full and partial height walls and doors. Complementary activities of the company include workplace strategy consulting, lease origination services, furniture and asset management and hosted spaces.

The main brands of the company are Steelcase, Coalesse and Turnstone, whereas its subsidiaries include Designtex, acquired in 1988 to offer interior textiles and upholstery, PolyVision, acquired in 2001 to make lightweight ceramic steel surfaces and, Steelcase Health and Education, borns in 2014 to create products for the health care industry.

In 2016 Steelcase reached revenues of $ 3.01 billion, a net income of $ 172.90 million and a market capitalization of $ 1.92 billion. In addition, the company has a number of over 10,000 employees working worldwide in its 80 locations, among which showrooms and manufacturing facilities, spread in United States, Europe, Asia, Middle Est, Australia and Africa. Moreover, the company distributed its products through a network of over 750 independent retailers around the world.

The figures above have allowed the company to become today the largest manufacturer for offices environment furniture in the world.
Steelcase and the paradigm of circular economy
The relationship between Steelcase and the paradigm of circular economy took place since the sustainability issue has founded its application in worldwide supply chains in order to address the issues of environment, safety and human rights. The company already had a strong legacy with environmental and social issues, as well as the philosophy of cradle-to-cradle and its methodologies, such as maintenance, reuse, remanufacture, redistribution, refurbishment, and recycle, became a powerful and clarifying lens for embracing circular economy and innovating, changing the way company designs and manufacturers its products.

Examples of the transition towards sustainability, cradle-to-cradle philosophy and circular economy are evident in the company’s Think® chair, launched in 2004 as the first product to earn Cradle to Cradle CertifiedTM from the Cradle to Cradle Innovations Institute and designed for the circular economy. In particular, this certification includes stringent materials chemistry criteria, which covers human and environmental health factors, such as material health, material reutilization, renewable energy and carbon management, water stewardship, and social fairness. Starting from 2004, 59 other products of Steelcase have received the Cradle to Cradle certification and many others furniture settings, interior architectural products and user-centered technologies are under evaluation to be certified.

Some of Steelcase’s products however have BIFMA level®, NF Environment, Blue Angel, SCS Indoor AdvantageTM certifications, which take into account the company’s social actions, energy usage, material selection for its products, human and ecosystem health impacts. In this case, it is important to point out how Steelcase leverages on materials chemistry, life cycle thinking and closed-loop design thinking to minimize impact on human and environmental health. The company has screened well over 1,500 materials across more than 600 categories and multiple product lines.

In 2015, the company was asked to participate as one of 100 sustainability leaders in the above-mentioned “Circular Economy 100 members”, an international multi-industry group established by The Ellen MacArthur Foundation to explore the industrial paradigm of circular economy.

Steelcase and the value network dimension

Circular collaborative business model
We have depicted a circular collaborative business model as the first fundamental building block of the value network dimension, which expects companies to rethink the relationships established with external partners in order to allow a new collaborative business model with them. New collaborative business models emphasize and enable synergies among partners in order to gain competitive advantage as a collective approach.

The circular collaborative business model of Steelcase is based on long-term relationships with three particular partners, which are (i) suppliers (ii) independent retailers and (iii) other manufacturer companies.

As far as suppliers are concerned, the interesting aspect is related to the simultaneous development and adoption of life cycle assessment techniques, which represent the bridge
between the company and the suppliers’ business model. Life cycle assessment techniques – as underlined by Winkler (2011) in its work on closed-loop production systems – have the emphasis on a holistic production system that extends beyond an organization’s own boundaries. This is also the case of Steelcase, which gains improvements on environmental performance of its products when the entire network of suppliers conducts complementary activities of the company related to the flow of materials and products, to the use of environmentally and friendly materials, and to the transformation materials and information into sustainable products. At some extent, the development and adoption of life cycle analysis techniques by the company has induced Steelcase’s suppliers to find a way to measure sustainability on their business activities continuously over time, creating and providing raw materials and resources that have an already reduced environmental impact even before they arrive within Steelcase manufacturing facilities for the production phase. Life cycle analysis techniques have been made on over 35 products of Steelcase starting from 2003, and have allowed the company to use more environmentally and friendly materials in most of the products it currently proposes. As for example, Steelcase for the last two years has used a more sustainable catalyst in the polyester fabric manufacturing process, replacing antimony, which is a metal that can bio-accumulate. In addition, in Europe, the company has switched from hexavalent chromium to trivalent chromium, a preferable alternative for chair and desk legs. Furthermore, Steelcase’s designers and engineers work closely with the outside suppliers to co-develop products and processes that lead to more efficient manufacturing without compromising key user benefits.

As far as independent retailers are concerned, the interesting aspect that explains the business model of the company and these partners as a collaborative one is represented by the fact that each independent retailer, although having its own sales force, is supported by the sales representatives of Steelcase. This means that Steelcase’s sales representatives work closely with the entire network of independent retailers in the downstream phases of the supply chain throughout the sales process.

As far as other manufacturer companies are concerned, we have to underline how Steelcase, in 2011, established a partnership with three textile manufacturer companies, which are Designtex, Victor and Unifi, with the aim to set up a closed-loop system to produce advancements in driving sustainable innovation in the textile industry. “This unique initiative represents more than just an innovative recycling program for our industry’s waste. It shows how collaboration at multiple levels of the supply chain can enable us to develop better business models for the future”, said Alain Duval, President and CEO of Victor. Whereas Victor work for the sustainability issue, focusing on recycled polyester or Eco Intelligence® Polyester, adding no extras during production, Designtex can leverage on the digital printing technology. Because the polyester can be re-recycled, Steelcase goes to use this material in the production of furniture. Finally, Unifi closes the loop, by collecting Steelcase’s recyclables and processing the polyester and nylon into yarns.

**Circular communication**

We have depicted a circular communication as the second fundamental building block of the value network dimension, which expects companies to establish effective
communication with its external partners, such as suppliers, manufacturers, retailers and end-of-life materials managers.

In Steelcase, the effective communication with partners was initially due to the development and adoption of life cycle analysis techniques, we mentioned above, which have been useful for the company to identify initially its main partners with which establish long-term relationships. Then for designing and producing products, which environmental impacts are evaluated and discussed together before being launched into the market.

However, a particular attention deserves the communication of Steelcase with its suppliers. Indeed, the company leverages on SupplySync, a private and Internet-based social platform, for being connected with its supply network. The exchange of information provides a wide range of business services for both indirect and direct material suppliers. Steelcase’s suppliers are called (i) to provide all the materials and services required for the company’s business at right time and places, in the right quantity and quality, and at the lowest total cost, (ii) they have to ensure a social and environmental responsibility within Steelcase’s supply base, (iii) bring leading-edge practices to procurement, and (iv) cultivate an environment that attracts and retains talented, high-performing people.

However, the SupplySync project of Steelcase enhances communication and information sharing by linking the supply base of the company through the Internet so that the entire supply chain network can act as one integrated unit.

Circular awareness
We have depicted a circular awareness as the third fundamental building block of the value network dimension, which expects companies to help its external partners in developing awareness and new skills, hence rendering the business model more viable, i.e. circular, for all players of the supply chain.

This particular aspect is emphasized in Steelcase by a comprehensive end of use and reuse programmes established with external partners to develop and nurture awareness on new sustainable practices to keep products out of the landfill. More specifically, Steelcase and its network of suppliers share knowledge and insights, discuss opportunities and initiatives. The company involves its suppliers much earlier in the product development process so that the company can more closely collaborate and leverage their expertise and knowledge about innovative materials and applications. In addition, Steelcase engages in conversations and shares insights from the work on diversifying its own renewable energy portfolio with all of its partners.

The above comprehensive programmes are strategic initiatives, which focus on re-evaluating suppliers and retailers capabilities and costs, and when necessary, on restructuring and developing new capabilities along the entire the supply chain.

Finally, we summarize with a synoptic table (Table 2) the material collected and mapped onto the building blocks of the value network dimension, i.e. circular collaborative business model, circular communication, and circular awareness.

Table 2 – The value network dimension of Steelcase.
| **Circular collaborative business model** | • Simultaneous development and adoption of life cycle assessment techniques between Steelcase and its suppliers allows conducting complementary business activities based on sustainability measures  
• Support of internal employees to external partners, as in the case of Steelcase’s sales representatives to the entire network of independent retailers in the downstream phases of the supply chain throughout the sales process  
• Collaborations at multiple levels of the supply chain with similar companies, such as the textile manufacturers Designtex, Victor and Unifi, to enable the development of sustainable closed-loops |
| **Circular communication** | • Simultaneous development and adoption of life cycle assessment techniques allows identifying the main partners with which designing and producing products, which environmental impacts are evaluated and discussed together before being launched into the market  
• Implementation of web-based social platforms, as in the case of SupplySync, a private and Internet-based social platform that enhances communication and information sharing by linking the supply base of Steelcase through the Internet |
| **Circular awareness** | • Comprehensive end of use and reuse programmes established with external partners to develop and nurture awareness on new sustainable practices to keep products out of the landfill and re-evaluate suppliers and retailers capabilities and costs, by restructuring and developing new capabilities along the entire the supply chain |

**Conclusion**
The paper explores the role that the establishment of the value network dimension can play for companies in the shift towards the new industrial paradigm of circular economy and sustainable closed-loop supply chains.

In this respect, we have investigated how collaborative relationships with external partners allow the establishment of sustainable closed-loop supply chains when companies particularly leverage on three main building blocks of their value network dimension of their business model, which are (i) circular collaborative business model, (ii) circular communication, and (iii) circular awareness.
To address this issue we based our research on an exploratory single case study analysis of a manufacturing company, Steelcase, which represents the largest offices environment furniture manufacturer in the world and has established in the last decades incredible new interactions and new sustainable actions to shift towards the new industrial paradigm of circular economy and sustainable closed-loop supply chains. In addition, the criteria with which the case study has been selected follow the logic of theoretical and convenience sampling (Siggelkow, 2007). This implies investigating and highlighting the role that the value network dimension can play for a manufacturing company in the transition towards circular economy and sustainable closed-loop supply chains, without the will to generalize to any population of companies operating in the manufacturing sector.

As far as the building block of circular collaborative business model is concerned, we highlight the important role played by the simultaneous development and adoption of life cycle analysis techniques, such as in the case of Steelcase and its suppliers. Indeed, they induce suppliers to implement sustainability measures on their business activities over time to create and provide materials and resources with an already reduced environmental impact even before they arrive within the manufacturer company. In addition, we point out the collaborative support of internal employees to external partners, such as the support to each independent retailer by the sales representatives of Steelcase in the downstream phases of the supply chain throughout the sales process. Furthermore, we emphasize how collaborations at multiple levels of the supply chain can enable the development of sustainable closed-loops for the future, as in the case of the partnership between Steelcase and the textile manufacturer companies Designtex, Victor and Unifi.

As far as the building block of circular communication is concerned, we highlight again the important role that life cycle analysis techniques play in the identification of partners and in the establishment of long-term relationships with them. Moreover, we point out the relevance of using web-based social platforms, such as SupplySync in the case of Steelcase, in order to enable and nurture a circular communication with external partners, in a way to meet and reach global standards, improve efficiencies and effectiveness and intelligently manage resources and costs.

As far as the building block of circular awareness is concerned, an important matter is addressed to the establishment of comprehensive programmes with external partners to develop and nurture new sustainable practices that keep products out of the landfill and re-evaluate and restructure the management of the entire value network.

Moreover, it appears that the building blocks of the value network dimension have to be managed simultaneously, inducing partners to shape their business model, which adapt and changes according to the business model of the other partners in the supply chain. This is an important matter to address in order to enable a circular communication and awareness on new sustainable practices, sustainability measures, as well as materials and information flows, which have to be considered as a collective approach, or under a more holistic view, which takes into account both sustainable operations and collaborative relationships to establish sustainable closed-loop supply chains.

Although these interesting findings, the fact that we have leveraged on a single case study for our empirical analysis is not sufficiently to clarify more deeply how sustainable
operations and collaborative relationships influence the extent to which a closed-loop supply chain is more or less sustainable. This deserves more empirical effort in order to understand how they can be managed simultaneously to allow companies’ transition towards the new industrial paradigm of circular economy and sustainable closed-loop supply chains. Therefore, we reckon this is a good point to start new research in the field of supply chain management and circular economy.

In addition, the empirical evidence used in the paper is only explorative in nature and therefore in this respect further effort is needed, by involving directly production and procurement managers of the company. However, we believe that our contribution to the existing debate provides scholars and practitioners operating in the field of supply chain management and circular economy with a valuable framework explaining the relevance of the building blocks of the value network dimension and their relevance for companies in the shift towards the new industrial paradigm of circular economy.
References


