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Factors affecting sustainability-oriented innovation in the leather supply chain[1]

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A sustainability-oriented innovation in the leather making process, together with a highly collaborative approach and the use of non-mediated power, are key conditions for inducing a sustainable shift the leather supply chain, with a potential positive impact on environmental and economic performance dimensions.

Key points

Based on the experience of Fossil (leather accessories division) and its decision to implement a sustainability-oriented innovation in the leather making process, we could derive interesting insights for the whole leather supply chain. Key lessons learnt for those companies willing to initiate a sustainability transition in this industry, include: the need extend the sustainability-oriented innovation beyond the first-tier suppliers, involving also the second-tier supplier, and the need to foster a collaborative behavior leveraging the use of non-mediated rather than coercive power. This would potentially enable an improvement in economic and environmental performances.

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[1] Q56 - Environment and Development • Sustainability
L67- Industry studies - Other Consumer Nondurables: Clothing, textiles, Shoes, and Leather
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Abstract: Fashion is known as an industry which is highly vulnerable to sustainability disruptions and, at the same time, as a fertile ground for sustainability-oriented innovations (SOIs). As a result of increasing pressures from the market, several fashion brands have started to recognize the potential of SOIs to induce a positive transformation for the whole supply chain. The present paper discusses the case of a SOI in the leather industry; analysing the perception of different actors in the leather-accessories supply chain with three theoretical lenses: (1) relational theory, to understand the role that supply chain relationships have in the adoption of a sustainability-oriented innovation; (2) supply chain power and its role in sustainability transition; and (3) the (potential) impact on sustainability performance dimensions. Findings suggest that focal companies should pay attention on how to manage their business relationships with supply chain actors and leverage positive and collaborative relationships rather than using coercive methods with the aim to extend sustainability along the supply chain.

Keywords: fashion-luxury supply chain; leather production; sustainability-oriented innovation, sustainable development goals.

Introduction

The concept of supply chain management has been studied by a wide research community since some decades. Over the years, the interest of the researchers moved in some specific directions, including the one of sustainability, giving rise to the specific area of sustainable supply chain management (SSCM), i.e. managing the supply chain with a focus on "all three dimensions of sustainable development, i.e., economic, environmental and social." (Seuring and Muller, 2008). Being a relatively young yet promising research domain, several research streams were established with a very specific focus on SSCM with the aim of studying its application and implication in specific sectors/domains and analysing the phenomenon according to different theoretical lenses. Our research aims at studying the introduction of a sustainability-oriented innovation in the leather accessory supply chain, with three different theoretical lenses.

The decision to focus on the fashion-luxury industry and in particular the leather accessories supply chain, was driven by the swiftly increasing awareness of the importance of sustainability in this segment, with big brands held responsible for the actions taken by supply chain actors that are not directly controlled by focal firms. In this turbulent context, fashion firms are called at introducing sustainability practices to induce a shift toward SSCM but, to do so, there is the need to involve multiple actors in the supply chain. Considering this multi-actor perspective, the three theoretical lenses through which we analyse the leather accessories supply chain are (1) the relational theory, to understand the role that supply chain relationships have in the adoption of a sustainability-oriented innovation; (2) supply chain power and its role in sustainability transition; and (3) the (potential) impact on sustainability performance dimensions. The remainder of the paper is organized as follows: Section 2 summarizes extant literature in the areas of SSCM and analyses in depth the challenges of the fashion industry and of the leather goods segment in particular; Section 3 discusses the research methodology and introduces the case study, Section 4 reports the results of the empirical investigation according to the three perspectives – relational, supply chain power and performance dimension– while Section 5 is a critical analysis of the findings, discussing whether they do support or contrast with previous literature. Section 6 concludes the paper summarizing the managerial and theoretical implications, underlining the limitations of the paper, and the related future research avenues.

Literature Background

The literature review section is divided into three sub-sections: the first deals with sustainability in supply chain management (SSCM), while the second focuses specifically on the fashion-luxury sector, in order to get a better understanding of practices and issues in this industry; the third sub-section introduces the three main theoretical lenses employed to analyse the findings of the case study.

A literature review on Supply Chains (SC) and Supply Chain Management (SCM) is purposefully not reported extensively; the readers interested in knowing more about the general topic may refer to the complete literature reviews carried out by Lummus and Vokurka (1999), Shukla et al. (2011), and LeMay et al. (2017).

2.1. Sustainable supply chain management (SSCM) and sustainability oriented innovaton (SOI)

A summary definition of supply chain has been proposed by Lummus and Vokurka, who stated that supply chain can be considered as "all the activities involved in delivering a product from raw material through to the customer including sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, delivery to the customer, and the information systems necessary to monitor all of these activities" (Lummus and Vokurka, 1999).

The existence of a supply chain does not imply that there is an actual organizational effort targeted at properly managing the relationships associated with this network of firms. Such organizational effort is identified in literature with supply chain management (SCM) process, which is referred to as the management of the flow of goods, services, information and monetary resources across all the stages necessary to fulfil a customer order, starting from raw materials sourcing, passing by several work-in-process stages, and finally ending up in the manufacturing and distribution of finished goods. For a company to be competitive within the modern global economy it has been increasingly important to count on effective supply chain, rather than limiting its scope to the optimisation of internal processes: “there is a growing recognition that individual businesses no longer compete as stand-alone entities but rather as supply chains” (Christopher, 2005, pg. 122).

Sustainability requires to broaden the perspective to a supply-chain wide level: in order to achieve positive outcomes in the transition toward sustainability, acting at a single company or even focal company level is not enough; there is the need for the whole supply chain to shift toward sustainability, as highlighted by the concept of “boundaryless responsibility” (Ameshi et al., 2008).

The forces which are driving companies in the adoption of sustainable practices are different and can be divided into the three following categories (Caniato et al., 2012): i) internal factors, generally related to an enhancement of company efficiency, in accordance with the pollution prevention approach of the Natural Resource Based View (NRBV), and the commitment of top management and business owners toward sustainable values and corporate responsibility; ii) Market drivers, associated with the customers requesting sustainability features of products and processes; iii) Law and policies drivers, with governments and NGOs scrutinizing businesses and promoting more stringent regulations in order to force businesses to become more responsible towards environmental and social themes;

It is not unusual that when a company faces pressure, these pressures are cascaded upstream the supply chain, in an attempt to share the burden with business partners. This fact can spur an additional cascading effect, with first tier suppliers fostering the adoption of sustainable practices to sub-suppliers and in turn spreading the sustainability along the whole chain (Wilhelm et al., 2016; Koberg and Longoni. 2019). From this perspective, it is clear that suppliers have a major impact on performances and reputation of the focal companies which are held responsible for the actions of their supply chain: it is then crucial to drive suppliers efforts and commitments towards sustainability (Caniato et al., 2012; Scherer et al., 2002).

Green supply chain management (GSCM) is considered an antecedent of sustainable supply chain management (SSCM), with an emphasis on environmental concerns and the NRBV principles in supply chain management, encompassing all the stages, ranging from product design to sourcing, production, delivery and disposal (Srivastava, 2007; Golicic and Smith, 2013). Yet, GSCM addresses in an unbalanced way the triple bottom line dimensions, giving great attention to the environmental aspect and, to a lower extent, to the economic outcome while mostly overlooking the social dimension (Ahi and Searcy, 2013).

SSCM is an extension of the GSCM concept, and it is based on the adoption of a broader triple bottom line perspective through the addition of the Corporate Social Responsibility (CSR) dimension, eventually introducing the social aspect (Koberg and Longoni, 2019; Castka and Balzarova, 2008).

SSCM can be defined as "the management of material, information and capital flows as cooperation among companies along the supply chain while taking into account goals from all three dimensions of sustainable development, i.e., economic, environmental and social, which are derived from customer and stakeholder requirements." (Seuring and Müller, 2008).

SSCM has developed around the study of sustainable supply chain practices, which represent intentional changes or actions within the scope of supply chain management processes to improve sustainability performance (e.g., Pagell and Wu, 2009, Wu and Pagell, 2011; Marshall et al., 2015). SSCM practices are associated with incremental changes in supply chain management processes, but also products and organizational structure. Truly sustainable supply chain though, requires more radical changes in the organizational structure of a company or a supply chain, values and purpose of an organization as well as business models (Pagell and Shevchenko, 2014).

Both incremental and radical intentional changes of these type are also called sustainability- oriented innovations (SOIs). SOIs include changes internal to a single company (i.e. operational optimization), but also organizational transformation, through buyer-supplier collaborations, as well as more extensive collaboration with not proximate stakeholders for building new systems (i.e., changing an industry from inside) (Adams et al., 2016).

2.2. Sustainability in the fashion and leather accessory industry

"Fashion is everywhere. It is one of the main ways in which we present ourselves to others, signaling what we want to communicate about our sexuality, wealth, professionalism, subcultural and political allegiances, social status, even our mood. It is also a global industry with huge economic, political and cultural impact on the lives of all of us who make, sell, wear or even just watch fashion" (Craik, 2009). This description perfectly explains what fashion stands for and the impact it has in everyday life of a great part of the World's population, as well as on our global industrial system. The fashion industry is highly variegated, with companies being active in different value chains, such as the production and distribution of textiles, leather accessories and footwear and the related tanning of hides and skins (Resta et al., 2014).

The establishment of the "fast fashion" movement has great responsibility for the sustainability concerns linked to the industry. Fast fashion is a concept associated to business practices adopted by several brands with the aim to increase revenue by encouraging a higher apparel consumption; this was achieved with the adoption of both lower prices and general quality coupled with faster trend cycles and planned obsolescence. The concept to replace prematurely a product following the idea of a continuous consumption of new garments discarding the old ones is generating an incredibly negative environmental and social footprint, with garments being sent prematurely to the landfill and thus causing both high resource consumption and an incredible amount of waste (Fletcher, 2008; Kozlowski et al., 2012).

The fashion industry is considered the second most polluting industry just after the oil sector, with major criticalities associated to the amount of energy required for apparel production and the high-water consumption required by the manufacturing process (MarketWatch, 2019). The industry in fact is responsible for a yearly global consumption of 93 billions m^3 of water; in addition, more than 8,000 chemicals are used to treat raw materials and make them ready for the production process, in turn resulting in high wastewater emissions (Aiama et al., 2016; Karaosman et al., 2017).

The industry is one of the most labour-intensive, employing more than 60 million workers (Karaosman et al., 2017; Ditty, 2015) and highly relying on subcontractors in low-cost countries. For this reason, the industry has been receiving great attention by media and public opinion due to misconducts in the practices implemented in emerging countries which have less strict regulations on worker rights, “sweatshop” and child-labour. In these regards, the 2013 Rana Plaza disaster in Bangladesh represented a major wake-up call for the whole industry (Lueg et al., 2015). This severe disruption directly harmed the focal companies (i.e fashion brands), thus revealing their blind-spots, i.e., suppliers’ operations over which they have no direct control, even if they are held responsible for both the environmental and social performance of their supply chains. The accident has also spurred the creation of different organizations, for example the Sustainable Apparel Coalition (SAC). By partnering in this conglomerate, fashion companies have started to report their actions with respect to sustainability dimensions and have started to cooperate to make the overall industry more sustainable (Kozlowski et al., 2012; Karaosman et al., 2017) . Moreover, Fashion Revolution and Ethical Consumer, are other organizations who joined forces in 2017 to develop, among others, the Fashion Transparency Index (FTI), thus contributing to the sustainability improvements of industry. Transparency has indeed become a prerequisite to establish corporate reporting and, at the supply chain level, can be defined as “the minimum degree of disclosure to which supply chain policies, practices, agreements and procedures are open for public verification” (Mol et al., 2015; Jestratijevic et al., 2018). As the name suggests, the FTI ranks companies based on their information transparency about their business policies and corporate governance giving an overall score which summarizes the sustainability attitude of a fashion firm (Jestratijevic et al., 2018).

Even though “sustainable fashion” has been considered an oxymoron, fashion operations and sustainability management should not be perceived as mutually exclusive (Karaosman et al., 2017; Karaosman et al., 2015). Despite the lack of an industry standard regarding the use of ethical, green or eco terminology, their industry-wide adoption suggests that a growing number of brands are trying to capture the mainstream market with sustainable fashion apparel. Some mass-market retailers have enriched their offerings by introducing sustainable products based on the use of environmentally friendly materials, such as organic cotton (Kozlowski et al., 2012; Joergens, 2006). These are just some examples of a major trend that is ongoing. In recent years, fashion firms have been focused on the reduction of the whole product lifecycle impact through the implementation of Sustainable Oriented Innovations (SOIs), aiming at becoming more sustainable both at product and process level.

One segment within the fashion industry that is generally considered particularly polluting is that of leather goods segment. Leather is a very peculiar product, as it takes many steps from the raw hide to be transformed into a finished good, which in turn has applications in many industries such as fashion, automotive and furniture (a synopsis of the leather production process is provided in Appendix A). The leather supply chain is generally global, with global sourcing and distribution. Moreover, the leather supply chain has a clear dependence on the meat supply chain, as tanneries receive the raw hides which are a by-product of the slaughterhouses and meatpackers processes; therefore leather production depends on the dynamics of the beef chain (Brack et al., 2016). The tanning industry is widely perceived as a polluting sector. Tanning process uses chemicals and high amount of water, resulting in the production of both liquid and solid wastes (Swartz et al., 2017).

Lately, leather companies showed an increasing commitment towards material assessment and reduction of chemicals (Karaosman et al., 2020). In particular, they adopt a number of practices: product and process certifications, followed by the design and development of eco-friendly products, recyclable and recycled materials, reduction of toxic chemicals and wastewater treatment (Resta et al., 2014). Notwithstanding the strong pressures from the market and the brands, research shows that tanneries have a poor commitment in embracing these sustainability driven changes, for different reasons: tanneries either lack the financial resources to invest, or they are just not interested in these improvements, thus showing reluctance to change, as a confirmation of the conservative nature of this industrial segment, which is quite adverse to innovations. It’s interesting to point out that leather companies tend to implement sustainable practices when there is a clear economic benefit attached to it, stressing the impact of the economic dimension as an important part of the decision-making process related to sustainability issues (Karaosman et al., 2020).

Research Design and Methodology

As just introduced, fashion industry is exposed to different areas of vulnerability connected to sustainability. This is even more true in the leather goods segment, which is considered highly unsustainable, but which, at the same time, offers a fertile ground for innovative more sustainable production process and products to overcome the resistances of different companies in the industry. On these premises, our focus is on SOI and its impacts on different stages of a specific supply chain of the leather goods segment. In particular, our study aims at:

- understanding the role that supply chain relationships have in the adoption of a SOI;
- investigating the role that supply chain power has in carrying out a sustainability transition;
- highlighting the potential impact that SSCM, enabled by the SOI has on sustainability performance.

The abovementioned objectives have been investigated through the following theoretical lenses, leading to the formulation of three main research questions.

Relational Theory – research question 1 (RQ1)

Relational theory claims that, to achieve positive business performances, the management of resources and capabilities should be coupled with an effort focused on relationship management of the actors belonging to the supply chain. What fosters the relationships and thus enhances the competitive advantage of a firm is linked to four main enabling factors (Dyer et al., 1998): i) *relation-specific assets investments*: joint investments carried out by partners; ii) *knowledge sharing*: the commitment to continuous exchange of information and ideas between supply chain actors; iii) *the combination of different and complementary resources*: the aim is to exploit synergies for the creation of new products or processes as well as the introduction of new technologies; iv) *governance mechanisms*: both formal (Giulati and Singh, 1998) and informal (Alvarez et al. 2010) : the former is linked to standard procedures and communication systems between parties while the latter is more related to soft aspects like mutual respect, trust, commitment, and joint projects.

As supply chains become more complex and geographically widespread, there is the need to establish positive and collaborative relationships with all the actors of the chain, thus providing a solid foundation to support the introduction of sustainability into the network and granting its spreading thanks to the commitment of the players involved. The role of supply chain relationships is fundamental in the business context, especially when talking about sustainability, since a single actor alone cannot reduce the supply chain footprint by its own, unless it could leverage on the support and collaboration of its downstream and upstream partners (Touboulic et al., 2014; Dyer et al., 2018).

Hence, we formulate the first research question (RQ1):

RQ1: Do the relationships in a supply chain affect the adoption of SSCM practices in the leather supply chain? If so, how?

Power theory – research question 2 (RQ2)

Power is the ability of a firm to influence and thus control the decisions, actions and behaviors of other individuals or organizations in the supply chain (Marshall et al., 2019; Gaski, 1984). This means also being able to force another actor to do something that otherwise he would not have done (Meqdadi et al., 2017). In the context of supply chain management, the control power is related to those supply chain members which dominate the supply chain decisions, with direct effect on the economic performance of the whole supply chain (Liu et al., 2015). As fashion brands face increasing pressure to take a more sustainable stance, focal companies directly pass it to their suppliers asking them to comply with newer and stricter rules about carbon emissions and waste reduction. In this case, a form of mediated power is exerted. Mediated power is the active influence of one party on the other, typically associated with a negative use of coercive power (i.e., adopted when punishing for performance under expectations) and legitimate power (i.e., exerted by a legal authority) (Meqdadi et al., 2017).

This reliance on mediated power is due to the dominant role focal companies have in their supply chains, with small suppliers usually obliged to comply with these requests. This approach to sustainability may help in introducing basic sustainable practices but harms the relationship between supply chain partners, increasing the tension and reducing their commitment in the long term. For this reason, *non-mediated power* is regarded to be the best way to spur the sustainability transition within a supply chain and in turn this approach results in an enhanced relationship which enables the whole chain to achieve better performance (Touboulic et al., 2014; Marshall et al., 2019).

On these premises, given the relevance of the matter for any sustainable innovations that is proposed to supply chain actors which already have relationship established based on a form of power balance, we formulate the following research question:

RQ2: Does the supply chain *power* affect the implementation of SSCM practices in the leather supply chain? If so, how?

Sustainability performances – research question 3 (RQ3)

The adoption of Sustainable Supply Chain Management practices connected to a sustainable innovation, is linked with an impact on performance dimension. Despite a growing awareness of share value approaches (Kramer and Porter, 2011), which assign equal relevance to the creation of economic, social and environmental value, there is still a widespread trend by companies to consider environmental and social impact just when instrumental for a positive economic impact. This anthropocentric view is wrong in its foundations, but starting to take sustainable actions is part of the transitional strategy and is a step in the right direction, embracing the sustainable development strategy and reducing their impact on the environment (Golicic and Smith, 2013; Kataike et al., 2019). In this paper we focus on market-based (e.g., market share, customer loyalty, brand equity) and operational based (e.g., costs, quality, flexibility, speed) performance, excluding the focus on accounting-based performance, which include profitability and financial indicators, being second level outcomes of the previously cited performance. Finally, environmental performances refer to the framework of the Agenda 2030 of the United Nations with the 17 Sustainable Development Goals (SDGs)[2]. This work is not focused on all possible SDGs, given a specific focus of this study on a sustainability innovation which addresses the environmental impact of the leather supply chain.

Hence, we formulate the third and last research question (RQ3):

Which are the sustainable performances potentially impacted by the implementation of SSCM practices – enabled by a SOI in the leather supply chain?

Research Methodology

Due to its exploratory nature, this research adopts a qualitative case study method. Qualitative case studies have been used in similar contexts and are considered adequate for research seeking to address real-life issues in a meaningful way (e.g., Carrigan et al., 2017; Pagell and Wu, 2009; Perry and Towers, 2013). The case study process followed the guidelines by Yin (2009), in alignment with the principles addressed by prior qualitative research in sustainable supply chain management literature (Caniato et al., 2012; Karaosman et al., 2020).

A single case study was conducted to explore how to form collaborative approaches for supply chain sustainability by encompassing multiple actors of the same chain. The innovative process that justifies the interest and the novelty for SSCM is LiteHide Ltd, which is the name of the provider of a sustainable innovation for the leather industry (hereinafter

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[2] https://sdgs.un.org/2030agenda

also called process provider or sustainability innovation provider). LiteHide™ is indeed a patented leather making process eliminating the use of salt in the hide preservation. Not only it avoids the use of a significant amount of water and land pollutants, but this innovation also reduces shipping, water and energy costs. The identified process has all the elements for being regarded as interesting: it is innovative, yet its application is still limited, it has an impact over a number of sustainability parameters (waste, CO2 footprint, land and waterways pollution), and requires the collaboration of multiple actors along the supply chain.

As for the focal company, Fossil Group is an American fashion brand operating in the fashion industry, which has a strong leather supply chain to provide components required for watches and accessories. This choice was driven by the fact that this company is introducing the LiteHide™ leather making process. Figure 1 depicts the boundaries of the study.

-- INSERT FIGURE 1 AROUND HERE--

Data collection

Data about the Fossil supply chain and processes were collected through two main information streams: general information were obtained from the company's official reports while specific data were obtained with semi structured and in-depth interviews via phone calls, through which we were able to contact the actors of the supply chain under investigation. In particular, the interview protocol was based on a set of open-ended questions to be asked to each interviewee. Then, giving the flexibility of the semi-structured interview, this base framework was enriched with context-specific questions that emerged during the conversation, creating a dynamic flow of thoughts and topics that in turn has given the possibility to capture more and diverse information, while still remaining within the research boundaries. As Table 1 summarizes, for two stages of the supply chain (i.e., the tannery and the brand owner - the leather manufacturer) information were collected through direct in-depth interviews, conducted between April 2019 and August 2019, whereas the meatpacker is the only stage in this supply chain in which only secondary sources (i.e., corporate website and company internal presentations) were used. In addition to these actors of the leather supply chain, also for the sustainable innovation provider (i.e., LiteHide Ltd) primary sources of information (i.e., multiple interviews) were adopted. By covering multiple actors operating in the same chain, the research becomes one of the few contributions investigating the adaption and outcomes of a sustainable oriented innovation on the entire chain. Subsequently data have been thoroughly analysed and were subsequently coded into the three theoretical lenses upon which this research is built: relational, power and performance.

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Results

The objective of this section is to present the results of the data analysis process involving the actors of the Fossil leather supply chain in terms of tightly correlated relational, power and performance views. Findings of the above analysis are illustrated in the following subsections. A more detailed synopsis of main findings is presented in Appendix B.

As a general premise, the case under investigation, Fossil leather supply chain, reflects a general trend in the personal luxury goods market, in which customers are increasingly demanding more sustainable products. Fossil represents an interesting case of a company reacting promptly to this change, introducing a SOI in multiple stages of its leather supply chain, with a coordinated effort that offer interesting insights and implications for companies that are walking on the same path.

Relational view

Findings in the analysed leather supply chain, showcase that relationship management in a supply chain is a critical factor in driving the adoption of SSCM practices. More in detail, a positive relationship management between actors of the supply chain favors the implementation of sustainable and eco-friendly practices. This happens because proper relationship management favors information exchange and creates the right dialogue resulting in mutual understanding, enhanced trust, and – in turn – collaborative attitude and shared long-term goals.

In the case of Fossil leather supply chain, one core building block – probably the main one – to a successful transition toward SSCM was represented by the tanneries. The tanning industry is old fashioned and characterized by very low margins; these two key aspects, combined with the fact that many tanneries within Fossil leather supply chain are family businesses, explain the skepticism that tanneries have about sustainable transition and any kind of process innovation in general. This resistance was confirmed by the interview with the manager of a tannery. This situation deeply impacts the adoption of the process provided by LiteHide™ and requires demonstration of the benefits associated with the ultimate objective of carrying out the transition in the best way.

To this extent, the role of LiteHide™ has proven to be fundamental in the whole supply chain shift. LiteHide, has fostered the collaboration between the players involved, by bringing everyone together in the same room to successfully spread the sustainability agenda. This because every actor feels to be part of something bigger and want to collaborate with the other tiers to successfully introduce the SOI.

The process provider has given the possibility to Fossil to get in contact with a meatpacker that pays great attention to innovative solutions and environment protection and the brand was able to influence its decision to embrace this sustainability challenge. Subsequently, LiteHide™ has organized several joint meetings in which, for the first time, all the supply chain actors sit together, enabling each actor to understand problems and the perspectives of their supply chain counterparts tackling them in a comprehensive way, spurring a constructive talk and leading toward true collaboration and positive business relationships. The importance of these meetings is also highlighted by the operational collaboration shown by the supply chain players. In fact, firms' representatives learned rapidly to take the chance of meeting as an opportunity to share information among each other, with the brand providing data about volume forecasts and the meatpacker disclosing prediction about future rawhide prices and availability.

The interview with LiteHide™ managers clearly highlighted that they were aware of their critical role in convincing tanneries to embrace the an innovative process: they describe the approach they follow as "holding the hands of the business partners", referring to a continuous support offered to 1st tier suppliers, with training and knowledge dissemination activities aimed at improving tanneries capabilities and the understanding of the process, thus increasing the changes of a successful implementation. In the LiteHide™ case, relationship management were the key to putting the supply chain sustainability issue at the top of the management agendas of actors in each tier.

The importance of relationship management in the adoption of the LiteHide™ process is also highlighted by the following two different perspectives: on the one hand, there is the brand point of view, with Fossil aiming to make its supply chain more efficient and its products more sustainable; to do so, the company pressures upstream players in order to have a secure supply of sustainable leather; on the other hand, meatpackers and tanneries need to be reassured that LiteHide™ would be paid back the effort carried out, only if there is demand for this economy from band-owner companies.

Supply chain power perspective

As for the role of supply chain power, findings from the leather supply chain under investigation revealed that a positive and non-mediated power use, based on trust and collaboration, facilitates the introduction and subsequent implementation of SSCM practices. This is true since the other tiers of the chain do not perceive a strong actor which dictates rules and runs single-handedly the supply chain; rather, they feel that everyone has an important role to play.

Nevertheless, in the supply chain under study there is an unbalanced power situation, with the brand-owner company and the meatpacker both enjoying roles of supply chain dominance. In such a situation, the tannery perceives itself as trapped between two major players which might shrink its margins.

This is the common situation in leather supply chains. The brand also reported the use of coercive power in the relationships with captive suppliers (i.e. those tanneries where Fossil accounts for the vast majority – say 60-80% - of the production volumes): in these situations, tanneries had to be compliant with the requests of the focal company due to the great business dependence of the downstream actor. Yet surprisingly, the two dominant players' attitudes changed thanks to the highly collaborative approach promoted by LiteHide™. The process provider has encouraged the brand and the meatpacker to establish a more collaborative relationship, based on non-mediated power rather than the coercive one previously used. Thanks to this shift, the tannery perception about the business relationship changed, empowering and motivating the actor to perform better and to successfully carry out the sustainability driven transition.

The power construct can be associated also to the process provider. We are referring to expert and referent power types, which are non-mediated power types. In this case, LiteHide™ is willing to share its knowledge with all the other actors of the supply chain in order to foster the correct implementation of its process and to enhance the performances of all the involved players.

Performance view

For what concerns the impact on sustainability performance, in the analysed case study, while the environmental performances of the leather supply chain have potentials to be enhanced and improved, being the main value proposition of LiteHide™, the effect on the economic dimension is present but without a univocal consensus from all the actors of the leather the supply chain.

As a whole, the process innovation provided by LiteHide™ can potentially enable the whole leather supply chain to achieve higher levels of efficiency in the use of resources thanks to the elimination of salt in the preservation stage of the hide and the subsequent reduction of water in the following steps of the tanning process. This newly introduced process is characterised by a preservation stage which does not require the meatpacker to use the ordinary high amount of salt employed to preserve the hide from degradation. In addition, thanks to the LiteHide™ innovation, the meatpacker process associated with leather making is shortened and made easier, thus resulting in a more efficient production system.

The innovation provided by LiteHide™ technology has potentially several direct consequences related to a set of SDGs, as explained in Table 2.

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An additional consideration about the performance dimension provided by the LiteHide™ process is related to the implementation cost. To this extent, the actors seemed to have different perceptions, which have not been effectively measured yet. The manufacturer claims that the sustainable innovation does not imply an increase in cost; LiteHide™ interviewee claim instead that the technology can enables further benefits, lowering cost thanks to the water consumption savings. While carrying out this sustainability shift, Fossil sees the adoption of this new production process as a possibility to achieve sustainability and *at the same time* reducing cost. In fact, the brand acknowledges that it is willing to shift toward a more sustainable supply chain if the costs associated with it are not increasing, thus showcasing an instrumental approach connected to sustainability performance dimensions.

Discussion

From the case study, we have derived some compelling aspects to consider when transitioning toward a more sustainable supply chain. Although the case study methodology may result in industry-specific findings, in the present section we will link our findings to the theoretical background, and underline those aspects that can be extended to other industrial contexts.

With the objective to shift to a more sustainable supply chain, findings from the case study suggest the importance of managing the relationships with supply chain actors, in a collaborative rather than coercive approach with the aim to spread the adoption of a sustainable innovative practice. More specifically, thanks to the specific experience of the leather supply chain under investigation and the LiteHide™ experience, we can define three possible steps summarizing a set of possible guidelines for companies: (1) start beyond the 1st tier suppliers; (2) organize joint meetings to overcome inertia and foster collaboration; (3) be aware of SOI impact on sustainability performances.

Start beyond the first tier

The pressure faced by focal companies pushes them not just to work on sustainable projects by themselves but also require them to engage with their supply chains in a comprehensive way. “Awakening” the whole supply chain becomes fundamental to achieve a comprehensive SSCM shift. To this regard, the presence of sustainability issues in the top management agendas is fundamental to propel this change, as addressed in León-Bravo et al. (2017). In this regard, the Fossil-LiteHide™ case study is a great example of this practice, with the fashion brand which relies on vertical collaboration, as reported in Neutzling et al. (2018), to properly address the sustainability issues related to the leather making process. In this way, the fashion brand was able to engage both 1st and 2nd tier suppliers in order to achieve a proper supply chain transition.

Our findings underline that the closed configuration that is achieved thanks to the intervention of LiteHide™ is effective to reach sustainability objectives. A closed configuration consists indeed in a buying company establishing a direct formal link with both first and second tier suppliers, enabling a direct relationship with all the business actors involved (Koberg and Longoni, 2019).

In the case of Fossil, the 2nd tier supplier, which here is represented by the meatpacker, has a fundamental role in enabling this sustainability shift by implementing the LiteHide™ process in its operations. The engagement of the 2nd tier supplier gives the possibility to the 1st tier to enjoy both economic and environmental benefits.

Organize joint meetings to overcome inertia and foster collaboration

A second important finding is that joint meetings can foster the implementation of sustainable practices in the supply chain, as they enhance cooperation and strengthen the relationship between actors in the supply network. LiteHide™ acted as a third party in charge of gathering the members of the whole supply chain around the same table. This, to the best of our knowledge, is an innovative behavior within an highly competitive industrial segment where conflict of interests and profit oriented attitudes may hinder possible collaborative sustainable practices. In joint meetings, different actors shared their points of view, problems and possible solutions that may arise in the leather making supply chain: this supports the previous finding that collaboration and positive supply chain relationships facilitates the implementation of sustainable practices (Youn et al., 2011).

Collaboration and non-mediated power in general are the two main relational tools which can ensure the proper adoption of SSCM practices (Koberg and Longoni, 2019; Lee, 2010; Albino et al., 2012). Collaboration requires to develop a proper sense of belonging, with every single actor understanding its role in the sustainable transformation of the whole chain (Neutzling et al., 2018). Every tier has its own environmental impact that is increasingly amplified when moving downstream: joint (and aligned) group decision and consequent action of every single player will lead to the expected improvements, as indicated in (Meqdadi et al., 2017).

More specifically, joint meetings represent the foundation to build three types of collaboration: operational communication (Terpend et al., 2008), operational planning and control (van Donk and van der Vaart, 2004), and new product development (Koufteros et al., 2005). The first two collaboration types are related to supply chain actors that, thanks to the intervention of LiteHide™, have started to exchange information about forecast, production capacity and availability of materials which in turn enables companies to enhance their operational planning. The third type of collaboration is related to the ability of Fossil to market a sustainable product which would not be possible without the direct involvement and support of 1st and 2nd tier suppliers, thus making the development of this sustainable products a collaborative one.

Moreover, the adoption of mediated power with smaller or dependent players may reduce the involvement of the weaker player and harm the relationship, with the risk of supply chain clashes, confirming what stated by Meqdadi et al. (2017). In the analysed case, this problem was avoided thanks to LiteHide™ that managed to influence all actors of the leather supply chain with a "holding the hands" approach, which proved to be the most effective way to ensure the correct introduction of a SOI in this leather supply chain.

Be aware of the potential impact of sustainability-oriented innovation on performances

The LiteHide™ innovation provides companies operating in the leather supply chain with an effective production process which helps them in making their operations more sustainable. Specific SDGs which can be addressed through LiteHide™ are SDG 6 and 12, as these two goals are related to the improved efficiency and responsible management of water resources. SDG 12 is also addressed thanks to the possibility, enabled by LiteHide Ltd for every tannery and brand to know exactly where the raw hides come from, thus increasing possibilities to implement reporting on sustainability performance (SDG 12.6). Then the reduced CO2 emissions linked to leather transportation will positively impact the climate change fight (SDG 13). The geographical location of the tannery studied in India brings another advantage, as LiteHide™ process would tackle those issues presented in the report developed by Change Your Shoes (Chellapilla et al., 2017), that are related to polluted rivers and wrong wastewater management in those Indian regions where tanneries are present.

Moreover, LiteHide™ gives the possibility to tanneries to be compliant with the ZDHC certification: the production of chrome-free leather will tackle the further pressing issue related to high chrome levels in Indian tanneries wastewaters, which then results in the contamination of the neighbouring agricultural areas, having eventually a major negative effect on the whole food supply chain of those areas.

Looking at market-based performance (Golicich and Smith, 2013; Gunasekaran and Kobu, 2007), this SOI gives the possibility to a company like Fossil to market their leather products as sustainable, helping the fashion brand to reach those customers who are particularly sensitive to the sustainability issues while increasing their satisfaction and possibly their brand loyalty. Interestingly, albeit still instrumental for market-based performance, this view is coherent with the idea of sustainability possibly being a source of competitive advantage in Fossil's supply chain strategy. A niche of customers indeed chooses a product thanks to the product sustainability features and thanks to a consistent set of sustainability supply chain practices behind (i.e., sustainability is the main order winner for these customers). Therefore, is of paramount importance that the company's operations and the supply chain strategy are deployed coherently, aligning the strategy with the idea that sustainability is the main driver to win orders in the market (Ciccullo et al., 2020).

Regarding operations-based performance (Golicich and Smith, 2013; Hult et al., 2008) we have already underlined the positive impact on process efficiency, achieved not only in the tanneries process specifically but also at the supply chain level, with the possibility for the 1st tier supplier to enjoy an increase of its margins and a reduction of waste caused by obsolescent stored hides. Additionally, the enhanced flexibility that this new leather making process grants is aligned with the responsive supply chain strategy that is adopted in the fashion industry, allowing Fossil to promptly react to market changes. Under this light, sustainability can be considered as a key market qualifier. Practices associated to sustainability innovations are important antecedents to achieve an increase in operational performance that are consistent with the responsive supply chain strategy (Lee, 2010). Being a market qualifier though, means that despite the role of sustainability is crucial to qualify the company to the achievement of operational outcomes, cost, quality or service related aspects allows to win orders (Ciccullo et al., 2020).

We can argue that SOI enables a supply chain to enhance its sustainability performances, while even providing several operational and business-related benefits.

An important takeaway, stressed by all interviewees, is the relevance that the economic dimension plays in the adoption of process innovation. This is still a prevailing strategy adopted by many companies, which are embracing the "business case for sustainability" perspective, i.e. with an instrumental attitude. These attempts were classified as transitional strategy (Montabon et al., 2016), approaches which are still influenced by the anthropocentric view, even though resources are considered limited and constrained. This aspect positively affects the business strategy, which focuses on efficient resource consumption, in turn resulting in reduced waste and pollution and in a more efficient production process, obtain the same output with lower input. For this reason, we argue that the LiteHide™ implementation represents a good starting point, but which requires future strategic actions taken by the top management, which can rely on the enhanced relationship with supply chain partners in order to introduce more SSCM practices focused on other sustainability issues. In the same way we can state that, thanks to the implementation of LiteHide™, the company will be able to save economic resources that could be invested in sustainability driven activities, creating a positive feedback loop.

Conclusions

Managerial and theoretical implications

The findings of this work may help both practitioners and academics. Practitioners might find interesting insights on the effect that a proper relationship management has on the implementation of SSCM practices. Indeed, the creation trust and collaboration in supply chain relationships is required to overcome the inertia and start the journey towards sustainability.

We also offer interesting insights for academics and future research avenues by adopting the theoretical lens of relational theory to study sustainability-oriented innovations in supply chains. Furthermore, we offer a new possible approach to nurture collaborative practices and enhance the relationship between partners, based on the joint meetings organized by a newcomer actor in the supply chain. Finally, we extend the theory related to the power construct by confirming and demonstrating that non coercive power is more effective when there is the necessity to spread successfully sustainable practices along the supply chain, since this power type fosters trust between players, thus enhancing their commitment and in the end making possible to effectively carry out a vertical collaborative initiative.

Limitations and future research avenues

The present paper presents some limitations, mainly related with the methodology (single case study). Overcoming such limitations may constitute interesting future research avenues.

First, the single case study methodology does not assure generalizability and thus the findings are related per se to the business case. Secondly, generalizability is limited to the sector under discussion since this work is based on the leather supply chain. The same study in a different sector could have resulted in different findings as SSCM practices implementation is affected by industry specificities. Therefore, we suggest extending our methodology to a larger number of cases studies, in particular belonging to other sectors.

In terms of supply chain actors investigated, one limitation regards the lack of direct (primary) source of information for the study of the 2nd tier supplier (the meatpacker); yet we relied on extensive set of secondary information, and on indirect source of information coming from the other supply chain players to map the possible behaviour and reaction of this actor. Moreover, since this work is based on the vertical collaboration within the supply chain, we suggest future research to include in the investigation the horizontal collaboration related to sustainability, understanding the role played by NGOs and governments in facilitating the shift toward truly sustainable supply chains.

Since this work is mainly based on qualitative responses and thus it may be more difficult to validate, we suggest that future research in the field should integrate our qualitative perspective with a quantitative one, by adding reliable data that can capture the impact of a sustainable innovation on collaborations and on different sustainability performance dimensions. Our study, indeed, analyses only potential impact according to the perception of the interviewees, instead further investigation of actual achievements of sustainability performances would benefit from a validation in practice. Moreover, for the specific nature of the innovative process under investigation, our work focuses on environmental and economic performance, thus leaving aside the social dimension of sustainability, which remains substantially overlooked.

Appendix A

Overview of the leather production process: leather products are produced throughout a journey covering four transformative steps, namely Animal husbandry/Agriculture, Slaughterhouse Operations, Leather Processing, Product Manufacturing and Packaging & Transport. The tanning process encompasses three major stages, including Beamhouse operations, Tanning, Re-tanning & Dyeing and Finishing.

Beamhouse operations aim at preparing the hides for the tanning process after being received from the slaughterhouse. In soaking, the raw hides are soaked in clean water so as to remove salt, manure, blood and some organic substances. Soaking rehydrates and brings the hides back to their initial condition. Subsequently, liming takes place to soak the hides in special drums utilising sodium sulphite and enzymes to loosen the structure of the hide. After removing hairs, cells and other substances, the hides are washed. Fleshing, subsequently, eliminates collagen, fat and proteins. The hides are, successively, delimed by using chemical agents (ammonium chloride or ammonium sulphate) and enzymes to enhance the grain quality before the hide is rewashed. Lastly, the hides are split into two layers namely grain split pelt, the most valuable part, and flesh split pelt, less durable used for suede products.

Tanning is a process where the hide is transformed into leather. In order to increase the quality and resistance chemicals are used during the tanning process. Degreasing and pickling are two fundamental activities for the entire process. Degreasing eliminates the natural fat for which non-ionic surfactants and/or solvents are used and then hides are washed in an excessive amount of water. Pickling, on the other hand, lowers the pH, sterilising the skin and making the fibres more responsive to the tanning agents. As for the main tanning stage, hides are soaked with tanning agents. After tanning, the leather is drained and horsed up to enable further fixation of the tan. Successively, the leather goes through several mechanical processes to reduce the humidity to make sure it can be split and shaved to obtain the preferred thickness. The end result, can be, wet blue grain leather, if coming from grain split pelt, or wet blue split, if coming from flesh split pelt. Finally, leather goes through re-tanning, dyeing and finishing stages to close the circle of the leather production.

Re-tanning, dyeing and finishing is the last phase of the leather making during which the leather obtains new characteristics such as water resistance, gas permeability, abrasion and anti-electrostatics. Throughout this stage several actions are undertaken, including neutralisation, bleaching, retanning, dyeing, fat liquoring, drying, surface coating and finishing. The leather becomes ready to be used to create fashion products.

-- INSERT FIGURE A1 HERE—

-- INSERT FIGURE A2 HERE—

Appendix B

-- INSERT TABLE B2 AROUND HERE—

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