Integrated Sustainable Fashion Supply Chains and the Impact on Operational Performance: Assessing Annual Sustainability Reports

Hakan Karaosman (*hakan.karaosman@polimi.it*)
Management, Economics, and Industrial Engineering, Politecnico di Milano (POLIMI), Milano, Italy

Alessandro Brun
Management, Economics, and Industrial Engineering, Politecnico di Milano (POLIMI), Milano, Italy

Gustavo Morales-Alonso
Department of Industrial Management, Business Administration and Statistics; Universidad Politécnica de Madrid (UPM), Madrid, Spain

Abstract

The luxury fashion industry shows a healthy growth of 7% by exceeding €225 billion in 2014. Nonetheless, the luxury fashion industry has a significant environmental footprint. Sustainability reporting receives a prominence. Nevertheless, despite the proliferation of these reports, there is a lack of consensus because of unsuitable definition of performance indicators, and lack of transparency in communication. Therefore, this study makes an original contribution by assessing the comprehensiveness of sustainability reports, and categorizing 'NOT addressed' indicators in terms of aspects. Linkage among practices, environmental impact, and carbon intensity of the industry allows this study to propose suggestions to enhance sustainability.

Keywords: Sustainability reporting, Luxury fashion industry, Carbon intensity

Introduction

Lately, in many consumer goods industries, sustainability has become an essential managerial issue, and both researchers and practitioners paid a significant attention to sustainability in connection to supply chain management (SCM). As shown in public eye, the fashion industry emerged as one of the most noteworthy industries with a significant environmental footprint (Caniato, Caridi, Crippa, & Moretto, 2012). Big fashion companies are often held responsible for their SCs (Perry, Fernie, & Wood, 2014). The worldwide fashion market has been experiencing a period of exceptional growth in recent years. Bain & Company (2014) indeed showed that the market for luxury fashion goods exceeded €225 billion in 2014, showing a healthy growth of 7% overall (Arpizio, Levato, & Zito, 2014). Nonetheless, the luxury fashion industry encounters sustainability related problems. Sustainability reporting, on the other hand, is receiving a prominence among global fashion companies.

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Providing accurate and fully transparent information on topics such as governance, intangible assets, non-financial issues, and sustainability performance is vital, since this information is publicly available. Nevertheless, despite the proliferation of these sustainability reports, a general consensus could not be reached on what these reports should encompass, what aspects should be covered, and how they should be structured (Roca & Searcy, 2012). Academic debate on sustainability reporting is growing while concerns and doubts exist regarding the accuracy and accountability of these reports (Roca & Searcy, 2012). Despite the acknowledgement of such relevance (Ageron et al., 2012; Azevedo, Carvalho, Duarte, & Cruz-Machado, 2012; Bray, Johns, & Kilburn, 2010; Caniato et al., 2012), very few contributions dealing with the luxury fashion industry (Achabou & Dekhili, 2013; Caniato, Caridi, Castelli, & Golini, 2011; Joy et al., 2012; Nagurney & Yu, 2012) touched the issues of key performance indicators (KPIs) to convey quantitative information, and further explain companies' actual environmental impact. An accurate knowledge is still missing to understand the level of commitment, disclosure, and sustainability performance of companies (Skouloudis, Evangelinos, & Kourmousis, 2010). Therefore, this study aims at making an original contribution to the industry-level analyses of sustainability reporting and environmental footprint by assessing the comprehensiveness of sustainability reports published by fashion companies operating in the luxury fashion industry. Linkage between practices and companies' actual environmental impact led this study to propose further suggestions to enhance sustainability. Particularly, this study considers the concept of environmental sustainability and defines the carbon intensity of luxury fashion companies. The paper is organised as follows: A literature review is presented in Section 2, Section 3 introduces the research framework, objectives, and methodology model while Section 4 addresses the findings the research methodology. In Section 5, conclusion is delivered.

Theoretical Background

Sustainability
The importance of sustainability has surged due to the increasing pressure on companies from regulators, customers and investors. Transparency is driving a multitude of stakeholders that require a disclosure of positive or negative environmental and social impacts of companies (Martínez-Ferrero & Frías-Aceituno, 2013). The principle of sustainability relies on a connection among economical, social, and environmental dynamics (Caniëls, Gehrsitz, & Semeijn, 2013; Schoenherr, 2012). Given these strong links, environmental, social and governance factors are becoming central to companies' ability to license to operate successfully (Karaosman, Mermod, & Yuksel, 2015). Therefore, integration between short and long term business goals and sustainability is required. Nevertheless, there are many complexities in sustainability implementation. From this point of view, examining the link among KPIs, fundamental sustainability aspects, and corporate practices is needed to justify how sustainability could be implemented and enhanced along value chains.

Supply Chain Management in the Luxury Fashion Industry
Luxury influences intangible features of products (Oelze, Hoejmose, Habisch, & Millington, 2014), and business models within the fashion industry provide end-consumers with an exquisite lifestyle through these products. Nevertheless, in recent years, the constant changes resulted in increasing complexity in global supply chain management (Oelze et al., 2014). Companies operating in luxury fashion industry seek

to reduce process lead times by introducing quick response dynamic planning processes (Caro & Martinez de Albéniz, 2014). Due to short product life cycles, low predictability of product demand, and high volatility, fashion companies need an identification of market changes to adjust their operational and managerial structures. Yet, many organizations struggle to expand the boundaries of environmental and social responsibilities to their supply chains. Seuring and Miller (2008) proposed a conceptual framework to incorporate sustainability into supply chain operations. Nonetheless, compared to other producer-driven supply networks, fashion and luxury have not been widely investigated from an operations point of view (Brun & Castelli, 2013; Caniato et al., 2012). Companies must integrate sustainability considerations into design and development, engage suppliers on sustainability issues, actively monitor labour practices, and communicate their results of sustainability performance by stating *what have been* and *what have not been* achieved.

Sustainable Supply Chain Management
Vertical disintegration of supply chains and globalization made fashion industry become a focal point for sustainability debate due to the heavy impact on environment. In this vein, sustainable supply chain management (SSCM) could be defined as socially and environmentally responsible supply chain practices to enhance capabilities (Seuring & Müller, 2008). The difficulty of embarking triple bottom line – people, planet, profit – in fashion supply chains is to ensure each individual component is ethically and environmentally secured and accounted for (Beard, 2008). Many studies defined the impact of SSCM on company performance, in particular on financial return (Martínez-Ferrero & Frías-Aceituno, 2013; Timmons, 2011). However, results are still inconclusive and cannot demonstrate strong correlations between SSCM and performance. It was noted that failure to manage SSCM responsibly could affect companies' financial and non-financial performance (Oelze et al., 2014). When companies cannot manage to broaden their responsible actions and communicate them – due to various reasons such as lack of training knowledge regulations, and commitment at the managerial level – operational and reputational risks could emerge (Hughes, 2012).

Sustainability Reporting
Over the last several years, there is an increase in numbers of companies sharing details on their sustainability initiatives in publicly available reports. The World Business Council for Sustainable Development states that sustainability reports are public reports to provide a depiction of corporate position and activities on environment, society, and economy. Nevertheless, despite the proliferation of these sustainability reports, a general consensus could not be reached on what these reports should encompass, and how they should be structured (Roca & Searcy, 2012). Academic debate on sustainability reporting is growing while concerns and doubts exist regarding the accuracy and accountability of these reports (Roca & Searcy, 2012). One possible explanation causing this issue could be the high degree of qualitative information disclosed in reports. Yet, only few studies were specifically conducted on KPIs to convey quantitative information. Nonetheless, it is important to know that the level of commitment, dissemination, and performance disclosure varies from industry to industry (Skouloudis, Evangelinos, & Kourmousis, 2010). Due to inconsistent body of knowledge, further research on KPIs and sustainability practices for specific sectors is needed. The present study is specifically focusing on environmental sustainability indicators featuring aspects such as material sourcing, energy, water, biodiversity,

emissions, effluents, and waste, products, compliance, and transport (GRI, 2006) in particular for luxury fashion supply chains. We aim at investigating (i) which KPIs are disclosed and which KPIs are not disclosed by luxury fashion companies, furthermore which aspects could be considered significant based on identified KPIs, (ii) which practices could emerge as the most distinguishing ones to preserve the future, (iii) how luxury fashion companies perform and are aligned within the industry according to their environmental impact, and (iv) what should be improved to better sustainability within the luxury fashion supply chains.

Research Design

Research Objectives
The central questions to guide this research were; (i) 'which are the indicators currently being disclosed in sustainability reports of fashion companies? – Accordingly, which indicators are not touched in these reports – ' (ii) 'Which are the most distinctive environmental practices deployed by fashion companies?' (iii) 'How do luxury fashion companies perform in terms of their environmental impact and carbon intensity? (iv) 'What could be done to improve sustainability within the luxury fashion industry?'

Background Information on Fashion Companies in the Sample
The global fashion industry was explored and following numbers derived. By the moment, 287 fashion retailers are registered in the United Nations Global Compact (UNGC). Furthermore, many of these retailers are also active in sustainability reporting. The numbers of sustainability reports published by the fashion retailers are significantly increasing: 113 reports were published in 2014, 122 in 2013, 108 in 2012, 83 in 2011, and 57 in 2010. By 2014, number of fashion retailers that disclose their carbon performance in Carbon Disclosure Project (CDP) was 18. Seven companies reported in CDP were luxury brands, and furthermore, only 12 fashion retailers (all luxury) have been indexed in Dow Jones Sustainability Index (DJSI) where corporate sustainability is assessed. Therefore, to address our research questions and provide applicable suggestions, a total of 15 luxury fashion companies were included in sample.

Research Methodology
Websites of a total of 15 fashion companies were content analysed based on their sustainability matters. Sustainability reports of 15 luxury fashion companies for the last five years (2010-2014) – in total 75 reports – were further analysed to identify 'addressed and 'not addressed KPIs, and explore practices by using content analysis. All reports were read then KPIs presented in the introduction or in a performance scorecard were highlighted. All charts, tables, and quantitative information were recorded to trace back to sustainability practices. A database encompassing KPIs, related aspects – where KPIs are regrouped –, and companies' environmental sustainability practices, was developed. Furthermore, according to companies' sustainability performance and annual carbon emissions, environmental impact was calculated in terms of carbon footprint as tonnes CO_2 equivalent (t-CO2e). Carbon intensity was then measured to highlight the environmental impact of the luxury fashion industry as tonnes per €1 revenue. Industry average for both environmental impact and carbon intensity was assigned and companies were positioned according to their actual intensity. Results are provided in the following section.

Results

Indicators 'addressed' and 'not addressed' in Sustainability Reports
The Global Reporting Initiative (GRI) structures environmental indicators in nine categories and describes a total number of 30 environmental indicators. Our findings suggest that 15 companies in our sample portrayed their environmental initiatives to address a total number of 18 KPIs. This implies that 18 KPIs were largely expressed in sustainability reports of luxury fashion companies. Whereas, surprisingly it was found that, a total of 12 KPIs were hardly addressed in sample reports. Nevertheless, it is highly important to highlight what is NOT addressed in the luxury fashion industry. Therefore, Table 1 clusters KPIs that were NOT, but should be, featured by luxury fashion companies.

Table 1 – Categories of KPIs not addressed in reports

Category	Explanation
Energy	Energy saved due to conservation
Water	Water sources significantly affected by withdrawal of water
Biodiversity	Location and size of protected areas and areas of high biodiversity value
Biodiversity	Habitats protected or restored
Emissions	Indirect greenhouse gas emissions by weight
Emissions	NOx, SOx, and other significant air emissions by weight
Water	Total water discharge by destination
Water	Total number and volume of significant spills
Overall	Total environmental protection expenditures by type
Overall	Monetary value of total number of non-monetary sanctions

Sustainability Indicators by Aspects
KPIs can be organized in numerous ways. We followed the approach of classifying them in terms of aspects according to the triple bottom line. Even though, the breakdown of indicators into environmental aspects is interesting, it is equally important to highlight that some KPIs are related to more than one aspect. The most frequently aspects, which was developed by grouping, addressed by the luxury fashion companies are, - Energy consumption (23%), - Process & packaging (22%), - Waste and emissions (20%), - Biodiversity (12%), - Materials sourcing and use (11%), - Water (4%), - Supplier management (20%). An analysis of these numbers shows that aspects do not represent a balanced breakdown along the environmental dimension. The majority of focus was devoted to energy and packaging. Nevertheless, water management, biodiversity, and material sourcing require more attention due to their profound importance in the industry.

The Most Frequently Implemented Environmental Practices
Subsequent to the identification of KPIs, and aspects addressed in sustainability reports; it is equally important to illustrate what practices are deployed in the industry. The percentage of environmental practices implemented by companies for each aspect is depicted in Figure 1. 15 luxury companies were further investigated based on their disclosures. In accordance with the key aspects, a total of 23% of environmental practices were classified in **Energy Consumption**. Despite companies' growing efforts, only seven companies were seen above the industry average.
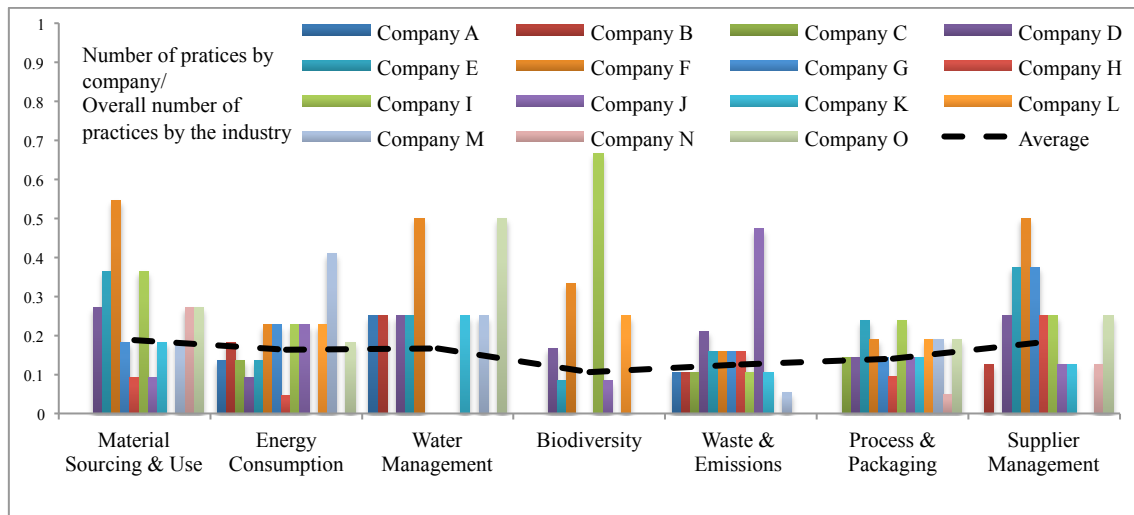
Figure 1 – Breakdown of highlighted aspects by practices per company

Company M fostered energy efficiency through solar panel installation. Company F, and similarly Company G, were actively engaged in installation of automatic dimmer switch, and heat recovery development. Nevertheless, energy efficiency should be further improved across the industry. Creation of e-learning modules on sustainability, sustainable building constructions, efficient use of heating and cooling systems could be promoted to foster this. The analysis was further broken down into other aspects. **Process and packaging** related practices accounted for a total of substantial 22% of all practices. The majority of the luxury companies, except Company N due to its very poor performance, were spotted on industry average. Company E and Company I dominated the industry through the use of natural materials, recycled plastic, and alternative plastic materials. Company F also work on these issues, and modify its box sizes to reduce the packaging material required. When it comes to **Emissions and Waste**, a total of 20% of environmental practices were implemented to deal with residues, climate change, and waste. Only Company J, followed by Company D, performs above the average by going towards zero waste and emission control. Company J replaced its cooling and heating systems to reduce greenhouse gas emissions. It also actively associated its waste with recycling processes. Company D similarly reused and/or recycled more than 70% of its waste. As for the aspect of **Biodiversity**, a total of 12% of practices were categorized in this group. Company L made its biggest contribution to improve animal welfare and protect precious species. This could be explained thanks to its business model, which highly depends on the use of precious materials. Similarly, Company F and Company I deployed practices to source materials from certified tanneries. Furthermore, a total of 11% of the practices implemented were classified in **Material Sourcing and Use**. Only eight companies in the sample implement distinctive environmental practices in terms of material sourcing and use. Company F was observed dominating this category through its well-established material sourcing strategy, and its collaborative actions with upstream suppliers. Similarly, Company E and Company I, were spotted performing above the average on this regard. Following these brands, Company D invests on material sourcing from responsibly managed forests. Nevertheless, the remaining companies of our sample were found below the average. This suggests that material sourcing and use should be further promoted in the industry. **Water Management** is in need for further enhancement even though eight companies intensely advanced their infrastructures. It is important to highlight that each company reported their progression on **Supplier**

Management. This is not surprising considering the dominating impact of vertically disaggregated supply chains in the fashion industry. Nevertheless, Company B, J, K, and N failed in disclosing their substantial activities or improvement strategies across supply chains.

Environmental Impact and Carbon Intensity of the Luxury Fashion Industry
Subsequent to the exploration of environmental indicators and aspects, and the alignment of luxury fashion companies, this section aims at providing an overview of environmental impact and carbon intensity. Within this study, we evaluate the impact on the environment created by a company in terms of carbon footprint. According to Greenhouse Gas Protocol (GHG), carbon footprint could be defined as the total sets of greenhouse gas emissions caused by an organization. Carbon footprint is often for the amount of carbon (usually in tonnes) being emitted by an activity or organization, and it is a common type of measurement for the environmental impact generated by a company. Therefore, it was logical to assess companies' impact based on their annual carbon footprint. We decided to focus on the top five companies in our sample that have higher environmental performance scores than their counterparts. Company F, Company I, Company E, Company J, and Company D were chosen to assess the luxury fashion industry's environmental impact. Nevertheless, despite its disclosure performance, Company J did not provide its annual carbon footprint in reports. Therefore, Company G replaced Company J for the assessment. Table 2 details the annual carbon footprint of five luxury fashion companies in terms of tonnes CO2-e. An industry average was also provided to compare companies.

Table 2 – Carbon footprint of luxury fashion companies and industry average

Annual Carbon Footprint (ton CO2-e)					
	2014	**2013**	**2012**	**2011**	**2010**
Company E	30,224.90	30,614.97	20,827.95	20,230.27	35,522.37
Company F	93,454.00	98,929.12	80,204.14	93,094.78	278,826.29
Company G	70,426.80	57,394.71	52,210.17	41,947.74	40,569.66
Company D	41,821.16	36,948.16	32,579.48	31,521.00	23,700.00
Company I	133.62	130.04	88.00	115.22	243.31
Industry Average	**47,212.10**	**44,800.4**	**37,181.95**	**37,381.80**	**75,772.32**

The results illustrated above highlight that, in spite of companies' disclosures and a growing number of reporting initiatives, annual carbon footprint of the industry constantly grows. We took into consideration the past five years and developed our database by tracing sustainability performance from 2010 up to date. Therefore, it is highly visible that in 2010, when sustainability was barely emerging, carbon footprint was extremely high, 75,772 t CO2-e. While ethical consciousness was growing, companies took measures toward reducing carbon footprint. With efforts, it drastically dropped to 37,381 t CO2-e in 2011. Nevertheless, despite this great success in reduction, sustainability could not be sustained, and from 2011, carbon footprint led to a constant growth – 44,803 t CO2-e in 2013, and 47,122 t CO2-e in 2014. At the company level, Company E, and Company G increased their annual carbon footprint. Company I, on the other hand, managed to reduce its carbon footprint throughout the years. Even though change is not significant, this can be considered a success story given that the company was growing in terms of size and revenue. Company D similarly managed to have the same amount of carbon intensity while financially growing.

Among these companies, the most volatile performance was recorded belonging to Company F. Even though this company is taking the lead in many aspects, its carbon footprint could not maintain a healthy performance, as it decreased then increased significantly. These findings suggest that luxury fashion companies, even the most sustainable ones in our sample, need to further improve their practices since industry average for carbon footprint is growing considerably. Table 3, moreover, illustrates carbon intensity of luxury companies as tonnes CO2-e per €1 revenue.

Table 3 – Carbon intensity in terms of tonnes CO2-e per €1 revenue

Carbon Intensity (t CO2 / €1 revenue)					
	2014	**2013**	**2012**	**2011**	**2010**
Company E	26.72	27.78	22.04	29.62	69.52
Company F	32.00	30.00	25.00	32.00	111.94
Company G	8.00	9.00	8.00	5.00	6.00
Company D	13.09	13.48	12.79	15.32	14.58
Company I	26.00	27.00	24.00	27.00	69.52
Industry Average	21.16	21.45	18.37	21.79	54.31

An industry average was also provided to see what €1 revenue constitutes in terms of its environmental impact, and what luxury companies must do to reduce it. Carbon intensity is a measure of how efficiently organizations use their energy resources. As Table 3 shows, great progress was made in reducing the fashion industry's carbon intensity. Industry's intensity was 54 tonnes while it was reduced to 21 tonnes per €1 revenue. Nevertheless, in the last three years industrial emissions as well as carbon intensity have risen. Even though some of our sample companies are ramping up renewables, all companies still rely on global distribution to drive economic growth. In order to decrease the carbon intensity, companies must ensure that their carbon emissions grow at a slower rate than their revenues. Based on luxury fashion companies' sustainability performances, the following section was created to provide elaborative suggestions to better embark sustainability in order to reduce the environmental impact of the luxury fashion industry.

Conclusion
According to the results, the following propositions are highlighted to improve sustainability implementation in the luxury fashion industry. As it was highlighted in Table 1, material sourcing, biodiversity, and water are the aspects that require a greater and better attention. Environmental impact is largely generated during raw **material sourcing**. Thus, fashion companies must implement strategic collaborations. **Biodiversity**, on the other hand, is a vital topic, and therefore suppliers must employ accepted practices and humane treatment in sourcing. To this end, brand owning companies and/or fashion groups must regularly control suppliers to ensure high standards in management practices. The procurement of precious skin should follow international regulations and procedures. The context of sustainable use of raw materials is a complex topic. Within the industry, there is a need of taking a number of initiatives to enhance traceable, and sustainable sourcing. Leather, an essential raw material for luxury fashion products, must come from responsible and verified sources that do not cause damage in sensitive ecosystems. 'Made in Origin' signature is a critical success factor for the luxury fashion industry. Hence, fashion brands must trace back leather back to its original source to verify procurement and management practices. Guidelines,

principles, recommendations, and requirements on supply chain traceability, certification, and animal welfare must be ensured through supply chains. Gold, diamonds, and precious stones are also important raw materials for the industry. In the pursuit of sustainable raw materials, mining operations should also be traced not to have a negative impact on biodiversity and local communities. Sourcing from the verified and certified mines having high social and environmental standards must become a business strategy. Given that recycled paper uses less water, chemicals and energy than production from virgin fibres, sourcing recycled materials could be a great option for packaging. To this end, the Forest Stewardship Council (FSC) provides extensive certification programs. Moreover, sustainable retail packaging that are coming from recycled and certified materials must be further promoted within the luxury industry. Therefore, sourcing recycled and certified paper and wood products play a vital role. PVC (polyvinyl chloride) is the third most commonly used plastic as a leather substitute and to replace rubber. Nevertheless, PVC holds a significant environmental and health threats throughout its life cycle. Thus, it is extremely needed to incorporate sustainable materials and renewable resources in processes. Material and product life cycle assessment could be further enhanced within the industry to evaluate the environmental performance of materials. As for the chemicals, across the clothing industry, there are more than 10,000 chemicals used in the manufacturing processes carry potential negative impacts for health and environment. Therefore, chemicals should be managed and new yet innovative ways should be explored to reduce and/or avoid use of chemicals. **Water** is also an extremely important topic that should be carefully taken into account. Guidelines including recommendation on management systems, certification and supplier engagement must be provided to ensure water efficiency across supply chains. Awareness raising campaigns, supplier engagement, and smart utilization and recycling based programs must be enhanced within the industry. Given that climate change and water scarcity are the biggest global challenges – it is predicted that 40% shortfall in water will be faced within the next 30 years – responsibility of a business should be driven towards becoming more responsible and sustainable.

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