



Social sustainability management in the apparel supply chains

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ABSTRACT

The apparel supply chain is an example of a complex global supply chain where sustainability issues are a concern and where no satisfactory answers have been achieved yet, especially in social aspects. The growth in importance of social sustainability represents a strategic change in the sector with the necessary involvement of different tiers and external stakeholders to mitigate the negative social impacts. In this paper, a qualitative analysis through the application of content analysis using NVivo software is carried out, first to identify the structure and the main entities in this supply chain, and then to understand the main drivers towards social sustainability management. Six global companies were analysed, considering their sustainability reports from 2014 to 2018. The findings showed that social sustainability is a part of strategic goals as policies and commitments, and several actions have been developed along the supply chain to promote human rights, labour conditions, social development, and product responsibility, with external stakeholders collaboration. Finally, this article contributes to understanding how social sustainability should be managed in the apparel sector in a global supply chain context. Furthermore, in order to enrich the knowledge on this field, this paper provides some insight throughout the definition of a roadmap for future research in the area.

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1. Introduction

At the beginning of the globalisation era, especially from the decade of 1990 onwards, many companies migrated to decentralised production systems, mainly offshore, in pursuit cost savings through an offer of cheap labour and economies of scale. The apparel industry (garment, footwear, and shoes) is one of these cases. These changes lead to a more competitive business model, with clear advantages regarding the production cost reduction and therefore, higher profit margins. However, the advantages of this business model, pledges the workers' quality of life and their rights, besides bringing environmental harm by using toxic and polluting products (Caniato et al., 2012; Ghosh and Shah, 2012; ITUC, 2016). It is worth mention that, in recent years, sustainability problems have received great attention, where Human Rights and Labour Conditions in the apparel supply chain have become frequent targets of news due to negative reasons, with international scandals and critiques from several stakeholders, compromising some brands' credibility (Kozłowski et al., 2015; Huq et al., 2016; Croom et al.,

2018). This situation has forced companies to take on corrective measures to minimise problems, implementing processes improvement, increasing transparency and betting in greater control along the supply chain to avoid new competitors.

Although the apparel industry is one of those that started the globalised production and there is a considerable increase on the studies in this area, they are more related to the processes (history/forecasting function, 26.3%) and consumption (19.2%) to the detriment of supply chains comprehension (Ha-Brookshire and Hawley, 2014). Most of the existent research reports on the apparel supply chain structure look into aspects of management, processes, technology, risks, and networks classification but do not explore an integrated view of the network and not even identify the origin of the products (Oxborrow and Brindley, 2014; Caniato et al., 2014; Choi et al., 2015; Egels-Zandén et al., 2015; Jakhar, 2015). Thus, there is a gap in a better understanding of the processes and structure of the apparel supply chain (Soroor et al., 2009; MacCarthy and Jayarathne, 2013).

It is undisputed that the apparel industry has significant importance in the global business environment, with many intermediaries throughout its process, which is considered one of the longest and most complex supply chain and object of several studies (Jakhar, 2015). Customer interest in new products is the main driver of this industry and the need for fast product

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development for seasonal consumption requires efforts at all links in the chain, in a continuous process of mutual collaboration for good performance and quality (Soroor et al., 2009). Some studies have been addressed to describe the processes and structure of this supply chain, but these studies have focused on parts and an integrated view is still missing (Soroor et al., 2009; Mazzuto et al., 2012; MacCarthy and Jayarathne, 2013). MacCarthy and Jayarathne (2013) pointed out a fragility in the knowledge about the reality of the apparel supply chain, in which processes were described for large players, but did not contemplate the classification of the network with a greater level of detail for in-depth knowledge of the structure and functioning.

It is important to note that although the apparel is an industry with many processes at different levels of supply, each one still works independently with its own forecast, following its own processes with little shared information and also a low collaboration between the SC entities (Lee and Kinkade, 2003; Anbanandam et al., 2011; Aksoy et al., 2014; Oxborrow and Brindley, 2014; Wilhelm et al., 2016b; Jacobs and Singhal, 2017). This is because in the apparel supply chain there are many small producers of various items and each SC tier is made up of a large group of small businesses, which most often cannot supply a large buyer and some sort of association is needed between manufacturers. Such associations, on the other hand, lead to a cluster formation, in which there is no information sharing (Huang and Xue, 2012; Oxborrow and Brindley, 2014; Macchion et al., 2015; Åsländer et al., 2016; Rodriguez et al., 2016).

In the sustainability point of view, this apparel sector is considered one of the most polluting since the process beginning. For example, the cotton production uses pesticides, the leather treatment and synthetic filaments process use chemical products, and in many cases toxic products that cause severe damage to health (Maxwell, 2015). It is also one of the major consumers of natural resources, especially water, which is consumed at all production stages (Around 10,000 to 20,000 L per kilogram) and has a short life cycle, increasing its negative impacts on a large scale (Maxwell et al., 2015). Additionally, companies do not invest in supply chain transparency, and so there is no clear understanding on how transparency is managed in the sector and what elements should compose the associated information (Karaosman et al., 2015; Zorzini et al., 2015). These factors can influence the supply chain sustainability since the control over the actions is not always taken into consideration, because data are not available as well as the distance of the operations can also influence the difficulty of access.

In long and fragmented supply chains such as apparel, especially in offshore models, balancing the three dimensions of sustainability requires effort and collaboration from various stakeholders, which has not been achieved yet (Karaosman et al., 2015; Freise and Seuring, 2015; Huq et al., 2016; ITUC, 2016). The longer and fragmented the chain, the less interaction between the different actors, and the auditing process and controlling compliance with codes of conduct becomes more complex (Taylor, 2011; Huq et al., 2014; Engels-Zandén et al., 2015; Macchion et al., 2015; Sardar et al., 2016; Wilhelm et al., 2016b). The lack of regulation in international operations leads to companies to develop and follow their rules-based mainly on local laws. In other words, at each stage of the production process, similar processes have quite different realities in different countries (Locke and Romis, 2010). The lack of transparency between the different entities, that are part of the supply chain, has also been quite evident and the focal companies are often unaware of all the entities that belong to their own structure by the number of existing subcontracts or even informal workers (Engels-Zandén et al., 2015; Chen et al., 2019).

All these factors impact directly on the supply chain social

dimension (Gold et al., 2015). There is an effort to improve good practices and changes along the chain, but when imposed to suppliers, especially in developing countries, it is not easy to maintain (Huq et al., 2016). One of the most critical issues identified is the need for support in education and collaboration in a joint effort between stakeholders. This is a problem, but there is no effective and quick solution to minimise or even solve them (Meckenstock et al., 2016; Khurana and Ricchetti, 2016; Nath et al., 2019). Additionally, less stringent legislation in many countries and the lack of labour and environmental control laws are some of the gaps found in the apparel supply chain that have been reported and discussed globally in recent years (ILO, 2016). Although companies have their codes of ethics and conduct, the lack of transparency in processes can be impeding audits by generating reports that may not correspond with reality (Taylor, 2011; Huq et al., 2014; Yu, 2015; ITUC, 2016; Luque and Herrero-García, 2019). Some companies already provide this information in their annual reports and websites, but for most organisations, this is not a common practice, which also makes it difficult to understand the processes and practices along this supply chain (Huq et al., 2014; Cubilla-Montilla et al., 2019; García-Torea et al., 2019).

Although many companies have sustainability speech, it has been noted that there is no effective practice to erases problems along the supply chain, especially when production is outsourced. This situation is worsened in international operations, where there is a more significant supply chain fragmentation and audits are not conducted with the same regularity and intensity as when the suppliers are geographically close (Luque and Herrero-García, 2019). This also demonstrates a weakness in the control of the entire production process, raising ethical questions and asking who is responsible for controlling environmental and social practices at different levels of suppliers (Zorzini et al., 2015; Åsländer, 2016). The imbalance of the sustainability dimensions (economic, environmental, and social) is also evident, and the social dimension has not been treated yet in the same way as the other two (Brandenburg et al., 2014; Barbosa et al., 2018; Bubicz et al., 2019).

Despite the less positive aspects identified above, sustainability initiatives have been implemented in the sector, and there is a consensus on the need to reduce the negative impacts of the use and fast disposal fashion, known as fast fashion, both in the environmental and social spheres. Industry brands have publicised sustainability commitments, however, it is still evident that actions have focused especially on the first and second tiers of suppliers and there is a shy look at the different levels, starting in the raw materials level. In the latter, actions are usually reactive or motivated by pressure from external stakeholders to give more visibility to the negative impacts of industry, especially in the undeveloped countries (Wolf, 2014). Examples such as the Indian child labour scandal in 2007 and the Rana Plaza collapse in Bangladesh in 2013, have defied the unsustainable fashion industry model at a global level. As a result, significant changes have been made on the Corporate Social Responsibility (CSR) policies, making companies expand the scope of their actions (Åhlström, 2010; Huq et al., 2016; Luque and Herrero-García, 2019).

There are initiatives to promote the sustainable development of this industry, with ethical, environmentally safe products (e.g., Better Cotton Initiative and Sustainable Trade Initiative), or socially responsible, but there is no defined standard. However, there is a consensus on the need to change the standards so that consumer products have the socio-environmental responsibility as a principle, becoming this not only a brand promotion but a necessity for the human development (MacCarthy and Jayarathne, 2013; Kozłowski et al., 2015). It is still a supply chain in the process management maturity, but has been making efforts to become more sustainable with the insertion of new technologies for greater

integration and improvement in the production processes (Carneiro et al., 2013; Jastram and Schneider, 2015; Winter and Lasch, 2016; Ho et al., 2016). Stakeholders pressure is one of the main drivers for improving practices and also increasing transparency (Murphy and Li, 2015; Egels-Zandén et al., 2015; Khurana and Ricchetti, 2016; Jacobs and Singhal, 2017).

To better understand how social dimension sustainability is addressed in the apparel industry, this article aims to first characterise the supply chain, its structure and organisation, and then it seeks to understand how the social dimension is managed along the different entities that compose it. In order to develop this approach holistically and taking into account previous studies addressing the structure of the apparel chain, although not in an integrated manner, neither the different perspectives neither their complexity, this paper follows Gardner and Cooper (2003) and Farris' (2010) recommendations for a standardised approach in mapping this supply chain.

The originality of the present study lies in the characterisation of the apparel supply chain, considering its physical structure and processes, as well as the different existing links amongst entities that compose it, to understand how this supply chain is organised from raw materials to the end of life cycle. Also, it is crucial to understand the relationships between the various stakeholders. When, in addition to textile clothing, a brand integrates the footwear and accessories in the same organisational structure, there is an influence on sustainability management because of the number of activities increases and, consequently, the sustainability actions. Even though many stakeholders are common to the different sectors, the sustainability practices differ when are treated in an integrated approach. Thus, additionally, and based on the complete apparel supply chain characterisation, this study also intends to contribute to the understanding on how sustainability has been managed in this system, especially on how social dimension has been treated on the different supply chain levels.

With these objectives in mind, the following research questions will be addressed:

RQ1: What is the common structure of a global apparel supply chain considering all its key stakeholders?

RQ2: How is social sustainability managed in the apparel sector considering the different stakeholders?

The answer to these questions translates, as mentioned, the main paper contributions.

To answer these questions, this article is structured into six sections. Section 1, the present, introduces the subject, objectives, and research questions. Section 2 characterises the methodology employed and data source. Section 3 is used to characterise the Apparel supply chain based on Literature Review. In Section 4, the results of the Content Analysis of the Sustainability Reports are used to validate the proposed characterisation as well as to identify how the sustainability social dimension is managed in this supply chain area. Section 5 presents a roadmap and some guidelines for future work. Finally, the conclusions are drawn in Section 6.

2. Methodology

To meet the objectives of this article, the methodology represented in Fig. 1 has been followed. Four steps are conducted, which are described in detail below:

2.1. Step 1 - Data sources, tools, and process of the analysis

In step 1 the main objective is to identify the relevant data sources to be used as a basis in the following methodological steps.

One of the main data sources comes from the development of a literature review using Thomson Reuters Web of Knowledge and Science Direct Data Bases, where only articles written in English, published in peer-reviewed journals and proceedings were contemplated. This literature review has involved two main searches. A first one related to the apparel supply chain structure and a second one targeting the analyses of sustainability concerns in the apparel sector, with a deeper analysis of the social aspects.

The first search has identified the articles by using the combination of the following keywords: "apparel supply chain", "apparel supply network", "textile supply chain", "textile supply network", "footwear supply chain", "footwear supply network", "footwear supply chain structure", "textile supply chain structure", "apparel supply chain structure", "clothing supply chain", "clothing supply chain structure" and "clothing supply network". The result was refined to identify articles with approach on network structure and supply network in the apparel sector. A sample of 18 articles was obtained.

The second search was carried out using the keywords: "apparel" and "sustainable supply chain"; "footwear" and "sustainable supply chain"; "textile" and "sustainable supply chain"; "apparel" and "social sustainability" and "apparel supply chain"; "social sustainability" and "footwear supply chain"; "corporate social responsibility and apparel" and "textile supply chain". The results were filtered discarding articles that did not present contributions to the characterisation of the supply chain in its different levels and sustainability issues. A sample of 59 articles was obtained (see Appendix 1).

Additionally, data sources related to general and statistical data of apparel sector were collected mainly from sector representatives and non-governmental and governmental organisations as Textile Exchange, Euratex, FAOSTAT, ILO Reports, APICCAPS, Statista, Comtrade, World Economic Forum, World Footwear Yearbook, and Better Cotton Initiative. This allowed the characterisation of the upstream of the supply chain.

Finally, in order to better understand how sustainability is treated in the apparel sector, the largest companies operating in this sector were identified through the Forbes ranking, considering the additional criteria: (i) companies that account for sustainability concerns, according to Dow Jones Sustainability Index; (ii) focal companies, buyers that have a contract with suppliers of the product production/confectionery. It means they are owners of their brands; (iii) companies must follow the Global Report Initiative (GRI) guidelines for their sustainability reports. Multi brands operating as only retailers were discarded. As a result of this method, the companies Inditex, GAP, H&M, Nike, and Adidas were considered as the focus of this study. The company Patagonia, although not being a large brand in terms of economic participation, it has been characterised as one of the most sustainable companies in the world in the apparel sector (Sathe and Croke, 2010; Achabou and Dekhili, 2013; Adams, 2011; Buxel et al., 2015; Saha et al., 2016). Their business model can be considered a benchmark for the apparel industry, and for this reason, it is also part of this study. The main characteristics of the six companies are in Appendix 2.

2.2. Step 2 – Apparel supply chain characterisation

The data identified in step 1 was organised based on extensive research for the apparel supply chain characterisation. First, a Literature Review analysis was carried out to identify the main characteristics of the supply chain, from raw material extraction to the final product treatment. An inductive approach was used from systematic reading (Gioia et al., 2013), describing and manually designing the paths employed, organising, and crossing the data of

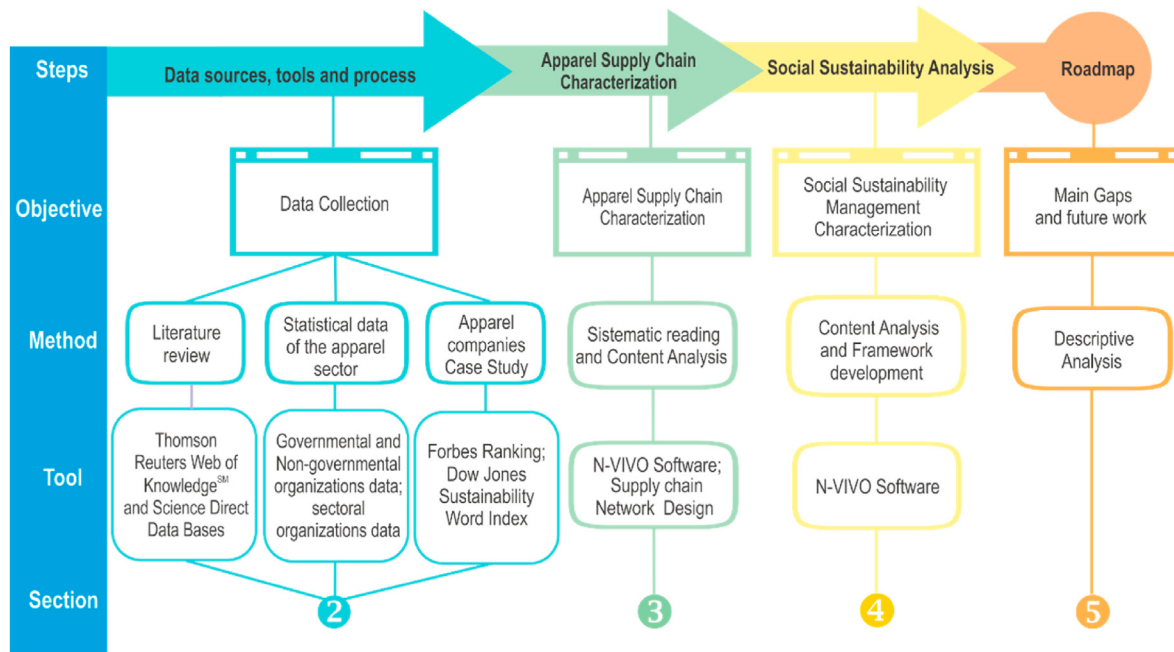


Fig. 1. Structure of the research methodology.

the 18 articles selected (Hartley, 2004). A content analysis of the textual information allowed to identify the main common characteristics in footwear, textile, garment, and accessories, that characterise the apparel sector. The NVivo 11 Plus software was used to identify the textual characteristics using the keywords “tier”, “echelon”, “supplier”, “supply”, “network”, and “raw material”, and the results were compared with the results of the manual design. The key entities in the supply chain were identified and the classification of the type of entity and the type of relationship existing amongst entities was performed. These results were crossed with the data collected from the selected six main companies’ websites, identified as key players in the sector, as mentioned in step 1.

To validate the analysis performed, it was required to meet quality control criteria that could guarantee the replicability of the coding and analysis process. Content analysis is a replicable methodology that provides reliability on the research process, especially to handle a large amount of data (Jaccard and Jacoby, 2010). It involves human coding of the analysis variables, even when processed automatically and computerised (Neuendorf, 2017). The term used for this form of analysis is CATA - Computer-Aided Text Analysis. Among the many advantages of using software, the speed of information processing and greater reliability stand out, as it eliminates part of the subjectivity inherent in manual content analysis (Duriau, 2007). Coding checks have been used systematic and repeated several times over a long period and were also discussed and analysed in meetings with other researchers. These meetings made it possible to improve the identification of the apparel chain structure as well as the coding through the software.

As a final result, a general characterisation of the apparel supply chain was obtained, which will be described in detail in section 3.1.

2.3. Step 3 – Social Sustainability analysis

The social dimension of sustainability analysis was first developed through a literature review performed on the 59 papers identified in step 1. This allows us to understand the main concerns of the authors of these research papers when addressing the social

aspects of the apparel supply chain. Afterwards, a social sustainability analysis was also developed in the six companies selected. This was performed through directed content analysis. The study considered a period of 5 years, including the Sustainability Report and Standards from 2014 to 2018. Based on the NVivos’ group coding was possible to identify the relationship between the Supply Chain Structure, identified in step 2, and the Social Sustainability Management along the supply chain, considering all entities. The coding scheme using computer programs followed the steps proposed by Mayring (2014), which are described as follows: 1) an automatic codification was created, indicating the main occurrences by word frequency and cluster, generating the “nodes” and “sub-nodes” (see Appendix 3 and 4). The words “sustainability”, “work”, “strategy” and “Policy” stood out. From these words, the interrelationships in NVivo were identified through the generation of automatic coding. From the nodes and sub-nodes, the sets generated were identified (see Appendix 4.c). The context of each sub-node was analysed to identify the structure of sustainability management and the themes of the social dimension. 2) From these “nodes”, the ones with greater relevance to the analysis objective were selected considering the sustainability strategies orientation, obtained in the previous analysis of the articles. Non-common words were selected, by manually verifying their context and assuring that they were not meaningful for the analysis. Inter-relations were then created in the NVivo software by manually generating new “nodes”: Strategy, Social Sustainability, Stakeholders, Human Rights (HR), Labour Condition (LC), Society (S), and Product Responsibility (PR). Words and context related to the first results were added, generating new “sets” (see appendix 5); 3) All nodes and sub-nodes were verified in their context to identify direct connections with the nodes generated, highlighting the most meaningful ones and relating them to the different levels of the chain and to different stakeholders. 4) Companies’ sustainability actions, as well as their evolution along the years, were possible to be identified. Later, with the results, a filter was performed to remove relations that were not in the social dimension and maintaining references to the four aspects of social sustainability dimension (HR), (LC), (S), and (PR). From this process, the sets were

created for each node. The codification results are in Appendix 5.

Using this methodology, the information on each company was analysed avoiding subjective judgments (Seuring and Gold, 2012). The results are described in Section 4.

2.4. Step 4 - gaps

In Step 4 the main gaps are identified and a guideline for future work is proposed.

3. Apparel supply chain characterisation

The apparel industry develops on different levels, from low range to luxury items. It is estimated that 100 billion new garments are produced annually in a labour-intensive supply network, led mainly by the buyer, i.e., the retailers (Data by National Council of Textile Organisations, 2018). Additionally, over 24,2 billion pairs of footwear are produced each year, accounting for 14% of the world’s employment (Data by The World Footwear 2019 Yearbook). It is a heterogeneous chain and there is no standard at the size of the companies, which are distributed in all countries, being China the main producer, exporter and supplier of the major global brands (STATISTA, 2019; Chaudhry and Hodge, 2012).

The apparel supply chain is typically characterised by outsourcing and subcontracting of the productive process, and the “flow” of the chain is defined by the buyer. It is an important sector with approximately 25 million employees in manufacturing, which handles 3 trillion dollars per year and corresponds to 2% of the worldwide GDP (Gross Domestic Product) (COMTRADE, 2016; Statista, 2016; EU, 2019; Armstrong and Associates, 2017). Cotton is one of the primary raw materials used, accounting for approximately 35% of the total raw materials, followed by chemical filaments, wool, silk, and others (Radhakrishnan, 2015; Connell, 2015). The supply network extends over several echelons and the physical structure has several agents interconnected by commercial transactions of purchase and sale. It is not yet a sustainable business model, especially in the environmental and social dimensions (Gardetti and Muthu, 2015; Khurana and Ricchetti, 2016).

From the information mentioned above, and in order to deepen the knowledge in the apparel sector, step one of the methodology has been performed to characterise the global apparel supply chain. A literature review has been undertaken and a summary of the supply chain main aspects, concluded from the papers analysed, is

presented in Table 1. The papers analysed essentially characterise the supply chain structure, process, and product flow. The authors have been looking into the type of interaction amongst the supply chain tiers and how supply chain integration and flows are managed. The multitier characteristics of the apparel supply chain are addressed but, even though they consider important to look at the entire chain, the focus is mainly on the first and second tiers. It is important to note that although many authors address interactions and links between entities that fulfil the supply chain, only four authors address the stakeholders.

Additionally to the data on the literature review, sectoral and government websites information, as well as NGOs and apparel companies’ websites, were also considered. A content analysis was performed, as described in steps 1 and 2 of the methodology. From this analysis, a generic characterisation of the apparel supply chain was developed as shown in Fig. 2.

It has been observed that a continuous forward flow direction of materials exists as well as information and financial flows follow a double-sided pathway. Moreover, the apparel SC comprises several entities/processes that start at the raw materials and end on sales. In this generic structure, various products are at stake and can be grouped into three main groups: clothing, footwear, and accessories. These products have different origins and go through different manufacturing processes, generating a complex supply chain structure. Additionally, this supply chain complexity also exists in terms of supply chain size and supporting activities, especially logistics and information management (Nath et al., 2019). From the literature review and companies’ data, it was observed that none of the authors, as well as the companies analysed, presents the characterisation of the type of input or product by supplier or origin, which makes difficult to identify all SC components. But through a more careful investigation, in sectoral organisations and trading economics databases, it was possible to identify data regarding the exporting and importing, and information about the type of supply from different countries. Nevertheless, no sufficient data in companies’ websites and reports were available to identify the details regarding the origin of raw materials. Only the “finished” product or component by suppliers list and websites information were available.

The generic supply chain representation as shown in Fig. 2, was broken down by main tiers and a deep study was performed, on the data identified, to better understand each activity in the supply chain.

Table 1 Summary of the articles analysed and their supply chain focus.

Author	Main Focus of Supply Chain Structure				
	Supply Chain Network	Entities/multitier	Interactions and SC Links	SC Integration and flow	Stakeholders
Chaudhry and Hodge (2012)		✓	✓	✓	
Chen and Fung (2013)	✓		✓	✓	
Das and Fox (2011)		✓	✓	✓	
Delbufalo (2015)			✓	✓	
Egels-Zandén et al. (2015)		✓	✓		✓
Farris (2010)	✓	✓	✓	✓	
Gunawardhana et al. (2014)		✓	✓		
Karunamoorthy et al. (2015)	✓	✓			
Köksal et al. (2018)			✓	✓	✓
Lewis et al. (2008)	✓	✓	✓		✓
Li et al. (2016)			✓	✓	✓
MacCarthy and Jayarathne (2013)	✓	✓	✓		
Macchion et al. (2015)	✓			✓	
Majumder and Srinivasan (2008)	✓	✓	✓		
Marufuzzaman and Deif (2010)			✓	✓	
Romano and Vinelli (2001)		✓	✓		
Shih and Agrafiotis (2015)	✓	✓	✓		
Su et al. (2009)		✓	✓	✓	

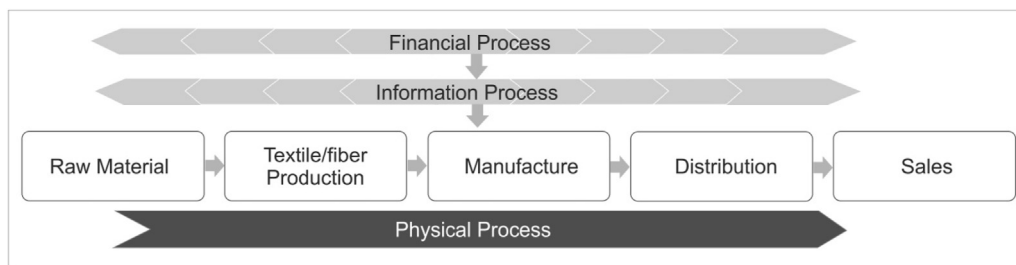


Fig. 2. Generic apparel supply chain network.

As a result, the *apparel supply chain network* could be better characterised and the following main entities were identified: Suppliers, Sub Suppliers, Informal suppliers and workers, Focal company, Sales, and Customers. Also, the following main process characterises such supply chain: Raw Material (extraction and treatment), Textile/Fibre production (first process, design, dyeing, weaving knitting, washing), Manufacture (second process, design, finishing, washing), Distribution, Sales, and Recycling. The latter are described below, and the *apparel supply chain network* is detailed in the next section.

Raw material - the following materials are used in the apparel supply chain: cotton, wool, silk, synthetic filament, leather, synthetic rubber, and natural rubber. This data was obtained from the literature review and the apparel sectoral entities as Textile Exchange, Euratex, APICCAPS, World Footwear Yearbook, and Better Cotton Initiative. The origin of the raw material was identified from sectoral entities. The data from entities as FAOSTAT, Statista, Comtrade, and World Economic Forum were used to identify the volume of the production and the largest producers' countries. Table 2 gives the size of the production of the raw materials for the sector, in tons, by the five main producing countries. A search was made for economic information on countries to establish the main raw material exporting countries, in percentages. It is important to note that on this stage, two steps were considered: raw material extraction (e.g. cotton planting and crop) and raw material treatment (e.g. cotton spinning, yarn).

Analysing Tables 2 and 3, it can be seen that raw materials come from different countries and continents, in international trade, being treated and processed in different parts of the world (Zhang and Huang, 2012; Teng and Jaramillo, 2006). The main producers' countries are Australia, China, Thailand, India, and Brazil. The main exported countries are USA, China, Australia, India, Thailand, and Italy. It is worth noting that many countries producers of raw material (Table 2) are not necessarily the greatest exporters (Table 3).

Textile/fibre production- Crossing information from the content analysis of the apparel sectoral entities and companies selected, it was possible to identify the product flows and the steps of the production process. The first production process – Textile/fibre production, involves the cotton dyeing and weaving fabrics. As the origin of the raw material is global, also the raw material processing

is distributed in several points, being necessary a complex structure of transport and logistics. This process has an impact on product costs and the logistical process (Zhang and Huang, 2012).

Manufacturing - This is the stage where the treated textile/fibre is transformed into clothes, shoes, and accessories. Several different processes compose the manufacturing (e.g., design, seam cotton garments, finishing and embellishment). Several raw materials as wool, cotton, silk, and leather, are processed and transformed into consumer goods in their origin countries (Teng and Jaramillo, 2006). The percentage of suppliers from different countries is large as it can be seen from the results of the supplier origin identification, by continents, of the selected companies for the case study (see Appendix 2). A significant fragmentation then characterises this stage and its distance from consumption is a fact, bringing as a consequence long lead times (Chaudhry and Hodge, 2012).

Distribution - From the content analysis, a global structure was identified with many supporting activities to guarantee flows, low costs, and information sharing. Distribution is one of these activities and it is defined as the physical movement of the products from suppliers to sale points. This depends on the collaboration among different entities along the supply chain (Lewis et al., 2008). The focal company tends to see the distribution process holistically because the activities are interrelated. Furthermore, in several cases, there is a level of dependence on each other, especially on resource availability and 3 PLs (Chen and Fung, 2013; Chu and Wang, 2012).

Sales - The product flow to the sales point is a part of the sales process. Activities related to this process, like quality control, marketing, customer service, human resources, and branding are essential for companies to maintain their market share (Lewis et al., 2008; MacCarthy and Jayarathne, 2013; Li et al., 2016)). As the focal companies have one or more brands, the supply chain management is centralised and strategically monitors the performance of all entities and process, so-called Strategic Control (Preble, 1992; Muralidharan, 2004). The consumer is the focus of the brands and the sales strategy is defined by the profile and visibility, following the global market trends, especially online sales and support (Lewis et al., 2008; Li et al., 2016).

Recycling - As the focus of this article is on sustainability, the

Table 2
Main Raw Material by the 5 top producing countries - 2017. Data by COMTRADE, 2018 - United Nations Statistics Division.

Wool		Cotton		Silk		Synthetic Filament		Leather		Synthetic Rubber		Natural Rubber	
Country	M Ton	Country	M Ton	Country	M Ton	Country	M Ton	Country	M Ton	Country	M Ton	Country	M Ton
Australia	434,163	China	6530	China	146,000	China	32,514	China	18,576	China	6356	Thailand	4600
China	386,764	India	6423	India	28,700	India	9754	Brazil	8547	USA	2547	Indonesia	3628
New Zealand	367,264	EUA	3553	Uzbekistan	1100	Turkey	4962	Italy	7892	Japan	1698	Malaysia	1112
USA	237,659	Pakistan	2308	Thailand	692	South Korea	4534	Russia	6781	Russia	1218	Vietnam	1094
Argentina	64,898	Brazil	2005	Brazil	560	Thailand	2823	India	6545	Germany	365	India	1053

Table 3
Main Raw Material by the major exporting countries – 2017. Data by COMTRADE, 2018 – United Nations Statistics Division.

Wool		Cotton		Raw Silk		Synthetic Filament		Leather		Synthetic Rubber		Natural Rubber	
Country	%	Country	%	Country	%	Country	%	Country	%	Country	%	Country	%
Australia	63	USA	36	China	53	China	38.7	Italy	17	USA	12	Thailand	34.8
South Africa	8.7	India	15.2	Italy	13.1	India	11.4	USA	10	South Korea	11	Indonesia	30
New Zealand	8.5	Brazil	13	Romania	4.6	South Korea	5.3	Brazil	7.3	Japan	9.8	Vietnam	7.5
Uruguay	2.1	Australia	7.1	Vietnam	4.4	Malaysia	4.3	China	5.4	Thailand	9.1	Malaysia	7
UK	1.9	Burkina Faso	4	India	3.7	Turkey	3.4	Germany	4.1	Russia	7.2	Côte d'Ivoire	5.7
Argentina	1.6	Greece	2.9	France	2.8	Thailand	3.3	India	3.3	Germany	7	Belgium	1.5
Turkey	1.4	Uzbekistan	2.8	Japan	2.6	USA	2.6	Spain	3	Vietnam	4.8	Myanmar	1.4
China	1.1	Cote D'Ivoire	2.3	Germany	2.5	Italy	2.6	Australia	2.8	Malaysia	4.7	Laos	1.3
Spain	1.1	Mali	2.1	South Korea	2.4	Vietnam	1.9	France	2.8	France	3.9	Liberia	1
Germany	0.8	Turkmenistan	2.1	Brazil	1.6	Japan	1.5	Argentina	2.7	Singapore	3.5	Germany	0.9

recycling activity was looked into detail. From the content analysis, it is observed that the use of recycled materials is still at an early stage in the apparel sector (Karunamoorthy et al., 2015). To identify the end-of-life process and the use of recycled materials along the apparel supply chain, a semantic analysis was carried out on all data sources selecting the keywords “recycle” and “recycling”. The results indicate the number of occurrences and the word related in the sentence, before and after the keyword. The word “clothing” is widely cited, as shown in Fig. 3 and Fig. 4. In the context analysis of the Sustainability Reports and articles, it is observed a growing use of recycled material like polyester and lyocell to produce clothes, shoes, and accessories (Inditex Sustainability Report 2018; Nike Sustainability Report 2018; GAP Sustainability Report). The company Adidas (Adidas Annual Report 2018) has a collaboration with Parley for the Ocean initiative to create products using recycled plastic from oceans. There is a commitment with the “materials revolution” in the fashion market to produce using sustainable materials, recycled and recyclable (Peters, 2014). It was also possible to identify an effort and commitment to increasing the use of recycled materials to promote circularity. For instance, Adidas’ company produced more than five million pair of shoes using plastic taken from the ocean, which represents only 1% of the total pair of shoes produced (Adidas Annual Report 2018). H&M company reports 57% of all materials used in the production process are recycled or other sustainably sourced materials, like lyocell and sustainable cotton. Their goal is to be 100% circular and renewable until 2030 (H&M Sustainability Report 2018).

The circularity in fashion is still not well developed even though there are many initiatives to make this happen effectively (Shih and Agrafotis, 2015; Köksal et al., 2018; Sandvik and Stubbs, 2019). According to the reports of the Ellen MacArthur Foundation (2017)

and UNEP (2018), only 1% of the textile materials have the end of life control and the remain wastes are landfilled, often in inadequate locations, without treatment. The return of the apparel materials is an opportunity to improve sustainability performance, reducing the use of water, chemicals, and toxic products, generating fewer negative environmental and social impacts on communities. The “Economy in Loops” (European Commission, 1976) is not a new concept to characterise the right end of life for products and circularity, bringing them back to the production process. However, as this process still requires high investment in technology, research and development, and logistic, it is a slow development process, but happens and impact local communities positively (Sandvik and Stubbs, 2019). To achieve this looping, it requires a joint effort, behaviour changes, and customer involvement to return used products as well as different stakeholders’ involvement (H&M Sustainability Report 2018).

From the generic supply chain (see Fig. 2) and the detailed analysis of the supply chain activities its now possible to characterise in detail the apparel supply chain network and the interactions between the stakeholders.

3.1. Apparel supply chain network

The apparel SC can be described as a centralised supply chain where the focal company performs Strategic Control for brand management (see Fig. 5). This is achieved through the use of Information and Communication Technology activities and processes across the several suppliers involved. These suppliers typically spread along four tiers of suppliers. Considering the generic apparel supply chain discussed above (see Fig. 2), and supporting a more detailed analysis on the data previously described, eight main

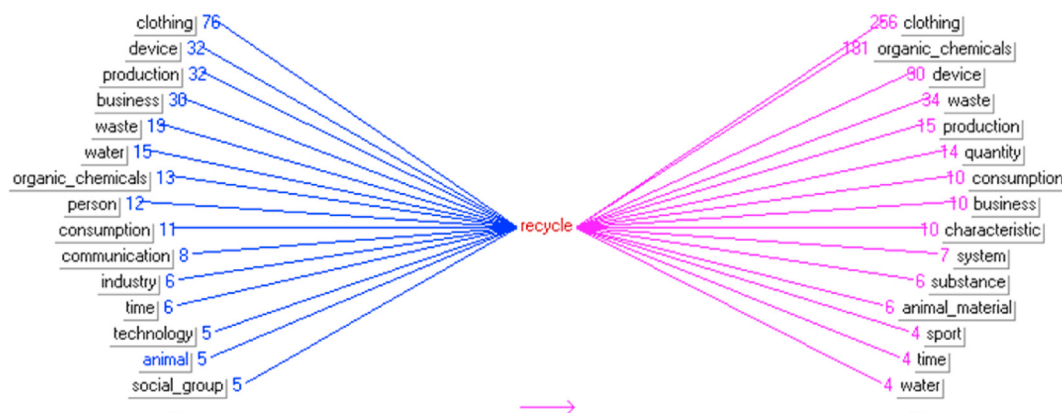


Fig. 3. Result of semantic analysis of the keyword “recycle”.

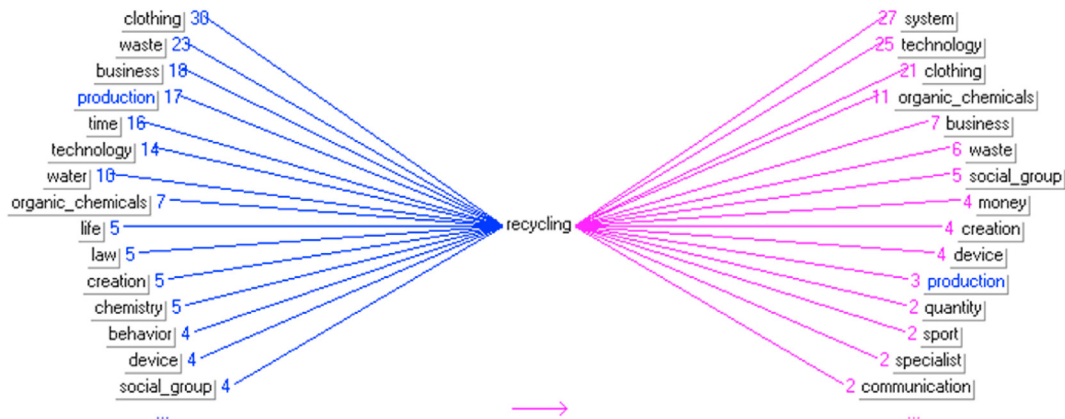


Fig. 4. Result of semantic analysis of the keyword "recycling".

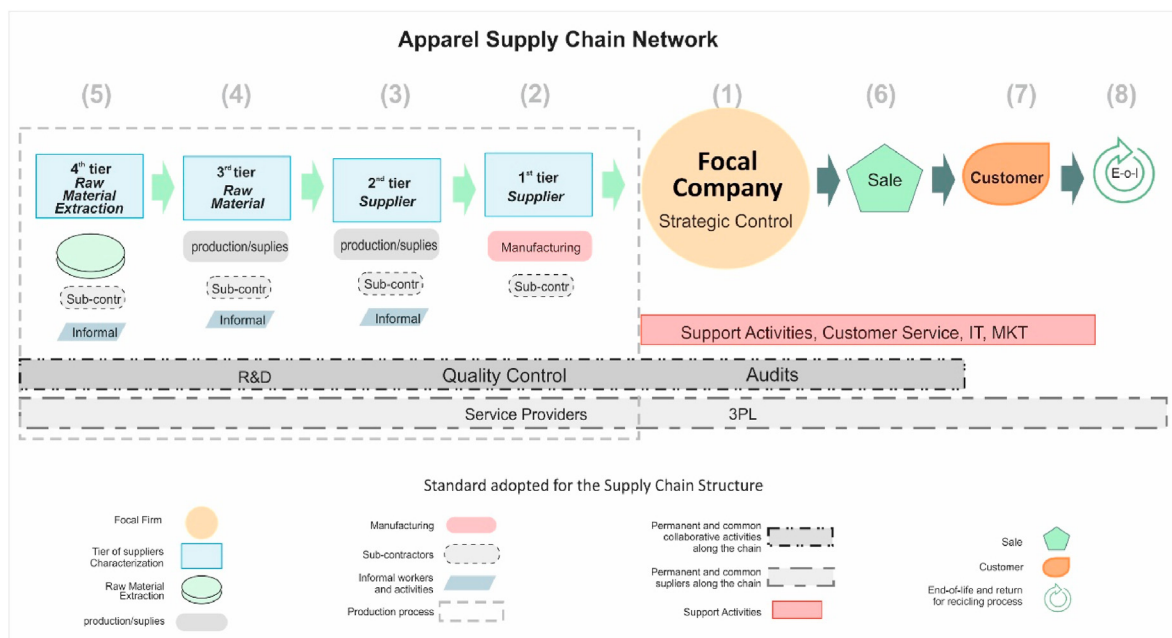


Fig. 5. Apparel supply chain network.

echelons were identified: focal company; 1st tier; 2nd tier; 3rd tier; 4th tier suppliers; sales; costumers; end-of-life process. These are below characterised and a social sustainability focus is considered.

Focal Company - Strategic Control (1) - the focal company performs "Strategic Control" and it is the base and foundation of this supply chain structure. It contains the management information that supports all chain activities allowing the company to perform activities control. It is a "cockpit" entity to centralises decisions and controls the brand management process (Boyson, 2014; Egels-Zandén et al., 2015). The focal company, as leading echelon of the supply chain, defines the business model, management strategy, sustainability guidelines and Codes of Conduct, audits, as well as the company's financial strategy, marketing, and customer experience (Egels-Zandén et al., 2015; Köksal et al., 2018; Porter, 1998). The control process considers product design decisions (R&D) and quality control of raw material and process, which influence the suppliers' selection and origin. Also, it defines contractors and sub-contractors as well as support activities as service providers, logistic and products distribution up to customer service (Marufuzzaman and Deif, 2010; Lewis et al., 2008; MacCarthy and

Jayarathne, 2013). In some companies, the Strategic Control integrates more than one brand, with its characteristics and targets (e.g. Inditex group with ten brands; Adidas with two brands). Considering the six companies analysed, all of them have horizontal integration as a production strategy.

At the brand level, actions are determined by the specific customer profile, in which purchases and sales are defined according to the pre-defined contracting criteria (Su et al., 2009). In sustainability terms, many companies submit product samples for toxicity and quality evaluation of the finished product in independent laboratories, in addition to their own assessment (Chaudhry and Hodge, 2012; Li and Shen, 2016).

Supplier 1st tier (2) - Giving the importance of the relationship at this supplier level the main contracts occur on the first-tier, prime manufacturer, where the highest level of codes of conduct control and compliance audits are performed (Köksal et al., 2018). It is possible to find some examples in the sustainability reports of the companies GAP (GAP Sustainability Report, 2018; pg. 68) and Adidas (Adidas Annual Report 2018; pg. 99). The number of suppliers depends on the type and quantity of products managed by the

supply chain and many suppliers deal with a small variety of items, regardless of quantity per item (Egels-Zandén et al., 2015; Ayhan and Kilic, 2015).

In this chain level, there is great complexity, mostly due to the high number of companies and workers involved. The sizes could vary from 5 to 10 thousand employees (e.g., Adidas Global Suppliers List of 2019; GAP Factory List of 2019; Nike manufacturing map of 2019). Some companies outsource their production to small workshops, small and medium companies (Lewis et al., 2008), which are not often audited (Khurana and Ricchetti, 2016; Egels-Zandén et al., 2015). This can be observed in the sustainability report of companies like Inditex (Inditex Sustainability Report 2018) and GAP (GAP Sustainability Report, 2018) in which only state audits in the first tier of suppliers contracted. They identify as non-compliance the outsourcing with no binding contract but do not refer the auditing procedures. The products finishing and embellishment are on this first-tier, consuming large amounts of water and resources, generating pollution by productions waste and left-overs as well as the use of chemicals in large scale (Romano and Vinelli, 2001).

Supplier 2nd tier (3) - At this level is found the fabric production, parts of products such as pieces, footwear parts, complementary items of clothing and accessories, props, etc. (Chaudhry and Hodge, 2012; Shih and Agrafotis, 2015). Dyes and washes are also at this level, corresponding to a very complex activity, often leading to severe environmental damages and workers contamination by the chemicals used (Romano and Vinelli, 2001). There is high consumption of water and often beside the incorrect and excessive use of this natural resource as well as the contamination of water and soil that damages the consumption by the local communities, increasing environmental risk and social cost (Tseng and Hung, 2014; Maxwell et al., 2015).

The amount of processing steps and companies involved in manufacturing depends on the types of product to be produced. For example, there are more than 100 different processes in order to produce more than 280 parts for only one pair of shoes (APICCAPS, 2016). Different companies, especially SMEs, produce most of these parts. In some cases, it is also possible to find situations of informal workers, which have already been reported by the international news in recent years, mainly in developing countries such as Bangladesh, India, and Brazil (Ma et al., 2016; Huq et al., 2014; Chowdhury, 2014; Khurana and Ricchetti, 2016).

At this supply chain level, it can be found the major manufacturers of fabrics for apparel product finishing. At this second-tier happens the significant part of the compliance control, requesting certificates such as product origin (Adidas Sustainability Report, 2016; GAP Sustainability Report, 2015; H&M Sustainability Report 2018; Inditex Sustainability Report 2018), no toxic chemicals (e.g., Adidas: 100% sustainable cotton, PFC free; Nike: 100% sustainable cotton, PFC free, 73%; Patagonia: Chemical and Environmental Impacts Program - CEIP), non-use of child labour and employment contracts (all six companies have actions to fight child labour and informality). However, in many cases, there is no direct contact and control at this level and the documents provided by the first-tier supplier are accepted. One example is the GAP Company that only started publishing the list of suppliers in 2016, after strong external pressure for greater transparency on its supply chain, and after several complaints of working conditions irregularities, mainly at the second and third level.

Several authorities and researchers have already stated that the brand is responsible for the production process at all levels of supply and not only in the first tier (Wolf et al., 2014). To ensure compliance, many companies have made changes to their contracts by tightening the auditing process along the supply chain, tracing the product origin (e.g., Inditex traceability of the supply chain,

2018, pp. 92) and meeting compliance specifications, codes of conduct and penalties for non-compliance. Audits became more frequent with process monitoring at all levels, assisting in the suppliers' development to reduce the negative impacts and risks to the brand (e.g., Adidas Fair Play Compliance Training; H&M Training and skills development for suppliers and Save the Children; Inditex Training and awareness for suppliers; and Patagonia Training to fight human traffic and slavery, and Fair Labour training).

3rd tier - Raw Material Process (4) - This level involves raw material processing. It is the first step of treatment, yarn fibre, weaving knitting, wool and leather tanning and crusting (Ammayappan and Moses, 2007; Samanta et al., 2015). For exported products, international control programs and environmental protection laws must be followed, but there are still many irregularities found when local legislation does not provide a full treatment of contaminated water after use (Chuang, 2014; Shih and Agrafotis, 2015). In several developing countries, like Brazil, it is an environmental crime any tanning activity that does not follow the law of the water and waste treatment, especially in leather treatment, considered one of the most polluting processes (Barbieri et al., 2007; Brazil, 2010; Karunamoorthy et al., 2015). No waste is permitted in soil or water. The water used in the processes should be treated, decontaminated, and reused in the process, reducing the amount of natural resource usage. There is a penalty (progressive for recidivism) or even the closure of the activities in case of non-compliance. Not all countries have the same rigour, so several international certifications must be followed for importers/exporters. Yet, in many countries, there is a strict control and banning several products due to the non-existence of compliance certifications. Companies are also pressured by governments, NGOs, and international institutions to not use noncompliance products, by international standards, both environmental and social (Chen et al., 2019).

There are also many types of metals, which can be inexpensive and easy to extract, used as props in clothing and footwear or even fashion accessories that are toxic and can cause allergy or more severe illnesses. There are several actions to ban its use due to health damage (Khurana and Ricchetti, 2016). The control is growing in developed countries (Ha-Brookshire and Hawley, 2014; Wilhelm et al., 2016b), however, it is possible to identify some fails in the audit process, as well as the absence of the control in import/export process in developing countries (Radhakrishnan, 2015; Luque and Herrero-Garcia, 2019).

4th tier - Raw Material Extraction (5) - The raw material production and extraction are at the fourth level. The literature usually refers to three tiers of suppliers or multitier (e.g., Wilhelm et al., 2016b; Winter and Lasch, 2016; Fontana and Egels-Zandén, 2019), and does not separate the raw material production and raw material first process. However, it is essential to determine extraction and first raw material treatment as a specific tier. Since the raw material extraction and processing involve different activities and process when compared to the other tiers. As an example, the first treatment of cotton is performed in a different place of extraction. The main raw material for apparel industry comes from different countries (see Table 2) and there are different processes in the destination countries to transform it in wires and fabric (e.g. the primary buyer of Australian natural wool is China, accordingly Statista database, 20189). It is mainly characterised by an agricultural activity like planting and cotton extraction, rubber, wool production, leather and silks. There are also metal materials and synthetic fibres (Textile Exchange; EURATEX, 2018, APICCAPS, 2018; The World Footwear 2018 Yearbook). These activities are also considered quite complicated from the sustainability point of view due to several reasons as irregular working conditions, child labour exploitation, human rights violation, and the large-scale

agrochemicals used (Khurana and Ricchetti, 2016). There is a higher claim, nowadays, that focal companies should have a greater control also in this supply tier, which is now a reality in most of the large companies, mainly in the international operations. The chemicals use restriction, as well as greater vigilance from governmental entities on the working practices and human rights violation, has been widely approached mostly motivated by civil organisations (Sneddon et al., 2014; Khurana and Ricchetti, 2016; Stevenson and Cole, 2018). There are collaborative actions among several stakeholders along the supply chain (Egels-Zandén et al., 2015) and audits have been undertaken regularly, as reported by companies as H&M (H&M Sustainability Report 2018), Nike (Nike Sustainability Report 2018), and Inditex (Inditex Sustainability Report 2018) with their raw material tracking. The disclosure of those actions has also influenced the consuming profile (Caniato et al., 2012; Mann et al., 2014; Eriksson and Svensson, 2016b; Yu, 2008).

Sales (6) - In this stage occurs the products assortment associated with quality, quantity, and price. The products reception is often made in distribution centres and performed based on sales strategies, inventory control, and customer service. Communication strategies are implemented through advertising, branding, and support services (Battista and Schiraldi, 2013). Results analysis are made for rescaling and, currently, strategies for better inventory control have been implemented through IT solutions for Supplier Managed Inventory (SMI), Vendor Managed Inventory (VMI), and Delivery Control Monitor (DCM) process with first-tier suppliers, optimising production by real demand (Chaudhry and Hodge, 2012; Li et al., 2016). From the moment the products arrive at the consumer, there is little control over the destination and the product end of life, only customer support is given in specific cases (Abraham, 2011).

Consumer (7) - The customer is a central part of the brands' strategy. The production aims to deliver to the customer the product he seeks in the right place, with the quality, price, and value that he is willing to pay. For this purpose, several access channels are used, as well as adequate communication. Segmentation by consumption profile is a part of the supply chain management process that receives careful attention, as it must meet different customer profiles in different geographical locations, as well as specific socio-economic characteristics (McCann, 2015). It is a sector in which the customer has demanded a greater number of different items in less time and, consequently, in less quantity. In other words, there is a faster pace of new collections, requiring a collaborative development effort throughout the supply chain (Karaosman et al., 2015; Delbufalo, 2015; Jung and Ha-Brookshire, 2017). The customer plays a decisive role in supply chain management, especially in sustainability strategies, as interest in sustainable fashion has grown (Kim et al., 2015).

End-of-Life (8) - After the consumption of the product, the end-of-life component is still an activity under development. Although some companies use recycled materials, the origin is not always the same sold product. As an example, Patagonia clothes and Adidas shoes are made of polyester from recycled plastic bottles. There are few post-use return and control initiatives on the disposal or reuse (Kumar and Malegeant, 2006; Connell, 2015; Bick et al., 2018). Large companies are progressively including recycled materials in the manufacture of the new product, both in the textile area, with fibres from plastics (PET) or footwear, with reuse of plastics, polyester, rubbers, and other types of materials (H&M Sustainability Report 2018; Adidas Annual Report 2018; Patagonia Report 2016; Inditex Sustainability Report 2018; GAP Sustainability Report). This activity is growing and expanding through several appeals from stakeholders, as well as raising customers interest who are increasingly choosing sustainable products, being, for this reason, a

part of this characterisation. The Global Fashion Agenda is an example of an initiative, by the 2020 Commitment for Circularity, where changes are starting in the apparel sector. This process has constant feedback to redesign and rethink the process and strategies, following the trends, new tools, new technologies and consumer behaviour (McCann, 2015).

Being the apparel supply chain so complex with several set of entities located in different world regions with differentiating goals, it is still considered an unsustainable chain (Khurana and Ricchetti, 2016). Large retailers such as Nike, Adidas and H&M are already using the reuse strategy for post-consumer material but admit the inefficiency in this process and a lack of reverse logistics structure and capacity. This is due to the SC, which is very fragmented and often intercontinental. Such facts make reverse logistics very expensive. Some studies already demonstrate that reuse of materials can be economically viable by reducing the cost of raw materials, reducing the cycle and shortening the supply chain in some products that can be recycled (Rivoli, 2006; Venkatesh, 2010; Singh et al., 2016). The Swedish company H&M has adopted this practice and receives used and returned clothes from customers in their stores for second-hand reuse or reusing in new materials taking advantage of their fibres for new products (Shen, 2014). These activities are developed in collaboration with suppliers and different stakeholders, which influence the supply chain network (H&M Sustainability Report 2018, pp. 29 and 31).

3.2. Interactions in supply chain

After identifying the supply chain structure, it is important to understand the interactions verified amongst the entities and stakeholders. Some of these interactions have already been addressed previously by MacCarthy et al. (2012), Chaudhry and Hodge (2012), Chen and Fung (2013), Farris (2010), and Assif et al. (2019), however only at the commercial level, not including external stakeholders and not explaining the type of interaction between the entities in the supply chain. Considering the apparel supply chain structure earlier defined (Fig. 6) and the data analysed in the content analysis of the sustainability reports and standards, we identify two main types of interactions along the chain: *influence* and *intervention*, which are characterised as follows.

- a) *Intervention interaction* - it is a closer interaction through contracts with suppliers and sub-suppliers, especially at the first-tier (upstream). This interaction was also verified at the fourth-tier, in the raw material extraction. As an example, the definition of sustainable materials by the analysed companies that are Better Cotton Initiative signatories (except Patagonia which develops its suppliers), it is an entity that promotes sustainable cotton production. This interaction is mandatory and occurs through internal actions and/or external stakeholders' involvement, such as the government. This type of interaction and relationship is still in the early stage in the apparel supply chain literature (Köksal et al., 2018). Intervention interactions are identified in Fig. 6 by a solid line. This type of interaction is also identified concerning sales channels and customer support (downstream).
- b) *Influence interaction* - it is an interaction in which the brand attitudes change due to internal or external influence from different stakeholders, and at different levels (Dargusch and Ward, 2010; Dass and Fox, 2011; Farris, 2010; Egels-Zandén et al., 2015). These stakeholders can be social organisations as well as governments, which in turn can also be influenced by pressure from different stakeholders and consumers or by institutional relationships. This interaction is not mandatory and it is also a result of changes in the consumption profile,

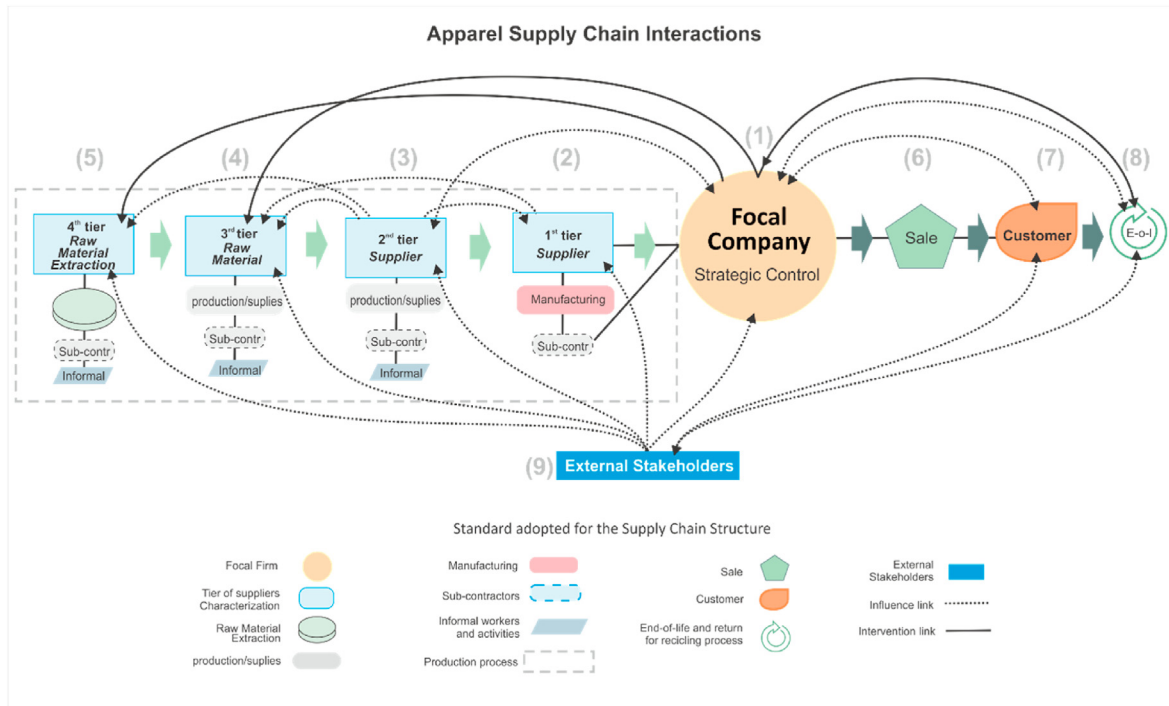


Fig. 6. Interactions between different stakeholders along the apparel supply chain.

which can be motivated by external stakeholders, mainly due to the definitions and specifications of materials, which will also influence the treatment of raw materials (Jung and Ha-Brookshire, 2017). As an example, the use of recycled polyester fibre, from recycled textiles and plastics, used by all six companies analysed, as indicated in their sustainability reports. This interaction causes a change in brand attitudes, generating changes in management practices and production processes throughout the SC (e.g., recycled materials, reduced use of animal skins, organic production, among others). Moreover, it also influences the codes of conduct and ethics adequacy, not only in the environmental but also in the social dimension (Egels-Zanden et al., 2015; Delbufalo, 2015). These changes go beyond the production dimension and are also part of the brands' communication strategy, providing transparency to their processes. Influence interactions are identified in Fig. 6 by the dashed line and are present at all levels of the chain.

In Fig. 6, we present the network structure including the external stakeholders and the identified interactions of influence and intervention observed from the sustainability point of view. In this analysis, the focus was essentially on the social dimension of sustainability. Government relations are not explicitly discriminated against in this classification as they can be both intervention and influence. When they are under the law, they exert interference interaction at different levels of the chain. However, when they are institutional relationships, they can be influential at some level or even at different levels, downstream and upstream.

4. Social sustainability in the apparel supply chain

The supply chain characterisation (see Section 3.1), structure and entities, as well as the main stakeholders and interactions, was the first step to understand the sustainability management in the apparel sector. In order to build their supply network and the various services, which are interrelated, companies define their

strategic objectives. Among the various strategies, the orientation towards sustainability is one of the main concerns, as well as the measures to be adopted throughout the entire SC and entities that comprise it. The six companies analysed consider sustainability within its corporate strategy. As an example: (i) Patagonia: "Build the best product, cause no unnecessary harm, use business to inspire and implement solutions to the environmental crisis."; (ii) H&M: "Our vision is to lead the change towards circular and renewable fashion while being a fair and equal company."; (iii) Adidas: "To be the best sports company in the world ... in a sustainable way". However, to define the different connections between the company's sustainability strategies and the level of intervention in the chain entities it was not an easy task.

Based on the Sustainability Reports it was possible to identify the management structure and how social sustainability is managed by these six companies (Adidas, GAP, H&M, Inditex, Nike, and Patagonia) along their Supply Chain. Being the apparel supply chain a Strategic Control Structure, as previously presented, the analysis of the main brand company helps to understand if sustainability concerns, namely the social component, are targeted.

A content analysis was then developed (step 3 of the methodology) and the automatically nodes and sub-nodes generated were identified and analysed. As an example, the node "sustainability", the object of this management structure analysis, has as sub-node "Sustainability Strategy" (see the example of the structure in Appendix 4). The sets generated by sub-nodes present the "strategy" context in all sources analysed (see example in Appendix 5). The context was then manually analysed to identify the strategic goals and the main components related to the corporate strategy. The results of this analysis are translated into Fig. 7. Here it can be observed that companies defined strategic goals to drive their sustainability strategy. This strategy is mirrored into a set of policies and commitments that should be followed along the supply chain (e.g., Inditex Corporate Social Responsibility Policy and the Human Rights Policy; and Nike Corporate Environment, Health, and Safety (EHS) Policy; and GAP Anti-Corruption Policy). Such policies and



Fig. 7. Overview of Sustainability Social Dimension Management along Supply Chain from sustainability reports of the six companies.

commitments are aligned with the Sustainable Development Goals agenda (SDG) and they aim to involve as much as possible all supply chain stakeholders. The SDGs can be found in the [SDG Compass \(2015\)](#), a guide developed by GRI, UN Global Compact, and the World Business Council for Sustainable Development (WBCSD) to drive the practical application of the SDGs in companies. The different commitments state the priorities for each SDG defined through actions that aim to promote positive impacts along the supply chain.

In concrete, all six companies (H&M, Inditex, Nike, Adidas, GAP, and Patagonia) have their policies and commitments developed based on the 17 Sustainable Development Goals (SDGs), set by the United Nations ([UN, 2015](#)). The six companies also have as strategic guidelines actions developed with several stakeholders, not only internal but also external as NGOs, investing in environmental and/or social welfare actions, supported by specific organisational policies (e.g., Adidas and Parley for the Ocean on Environmental Policy; H&M and UNHCR (United Nations High Commissioner for Refugees) on Human Right Policy; Inditex and Medicus Mundi on Corporate Citizenship Policy). There is a strong influence from external stakeholders in the policies and commitments definition, as well as the companies' actions related to the SDGs ([Fulton and Lee, 2013](#); [Pedersen and Andersen, 2015](#)). Excluding Patagonia, the other five companies use the GRI standard to develop their action plan, to define indicators and also for the development of the Annual Sustainability Reports.

As results of the "Strategic Goals" and its development into "Sustainability Strategy" are the "Codes of Conduct" and "Sustainability Actions". "Codes of Conduct" appear on all six companies as a set of rules to self-regulate actions, for employees and suppliers to act according to companies' strategies and values. GAP, Inditex, and Nike have their own specific codes: Code of Ethics and Code Leadership Standards - Nike; Code of Vendor Conduct - GAP; Code of Conduct for Manufacturers and Suppliers - Inditex. Therefore, "Sustainability Actions" are developed in three main types: "Programs", "Guidelines", and "Working groups" (e.g., GAP "program for monitoring, enforcing and addressing any issues related to our Anti-Corruption Policy"; H&M "working group In Italy, to map resources amongst local trade unions and government programs that ensure responsible conditions for migrant workers."; Inditex "Refugee Working Group, which is driven by the Fair Labour Association (FLA) in Turkey."

On the "Sustainability Actions" different ones have been identified, but many of them are common to all (see [Fig. 8](#)). According to the sustainability reports analysis, it can also be noted that these actions attempt to act with all supply chain entities, but unfortunately, these are mainly observed in the first-tier. An example is the freedom of association, an anti-corruption commitment which does not include sub-suppliers. Also, career development is present and promoted in the focal company, with some initiatives to encourage professional development on the first-tier suppliers (e.g., [GAP Sustainability Report](#); [H&M Sustainability Report 2018](#)). The actions to promote "Human Rights and Practices", "Working Conditions and Social Dialogue", and "Compliance" along the supply chain can be identified on the six companies.

Most companies have commitments at the raw material level, tracing the origin to be environmentally and socially responsible (e.g., Inditex and H&M) as well as performing programs for the development of sustainable raw materials. These programs lead to the development of joint actions with NGOs such as Better Cotton Initiative, Textile Exchange, and, most recently, the Fashion Revolution movement, among others. The objective is prioritising not only the control of the chemicals but also environmental preservation, reduction of natural resources uses, animal welfare, fighting child labour, and human rights promotion. Audits are conducted and quality and compliance certifications are required.

Considering working conditions and social dialogue commitment, this has been implemented along the chain by promoting dialogue with workers in factories. For example, Adidas, H&M, and GAP reports "human rights and labour condition dialogue in factories"; Inditex reports "dialogue with civil organisations and freedom association dialogue with workers"; Patagonia reports "dialogue in factories related to the fair-trade policy". This also allowed the improvement of transparency and better working conditions on different tiers.

4.1. – Social Dimension aspects

In addition to the above analysis, the sustainability reports were also verified, separating the results by company, considering the four aspects of the social dimension: Labour Condition (LC), Human Rights (HR), Society (S), and Product Responsibility (PR). Through the NVivo software, special care was taken to identify related words, as companies do not always use the same terms in

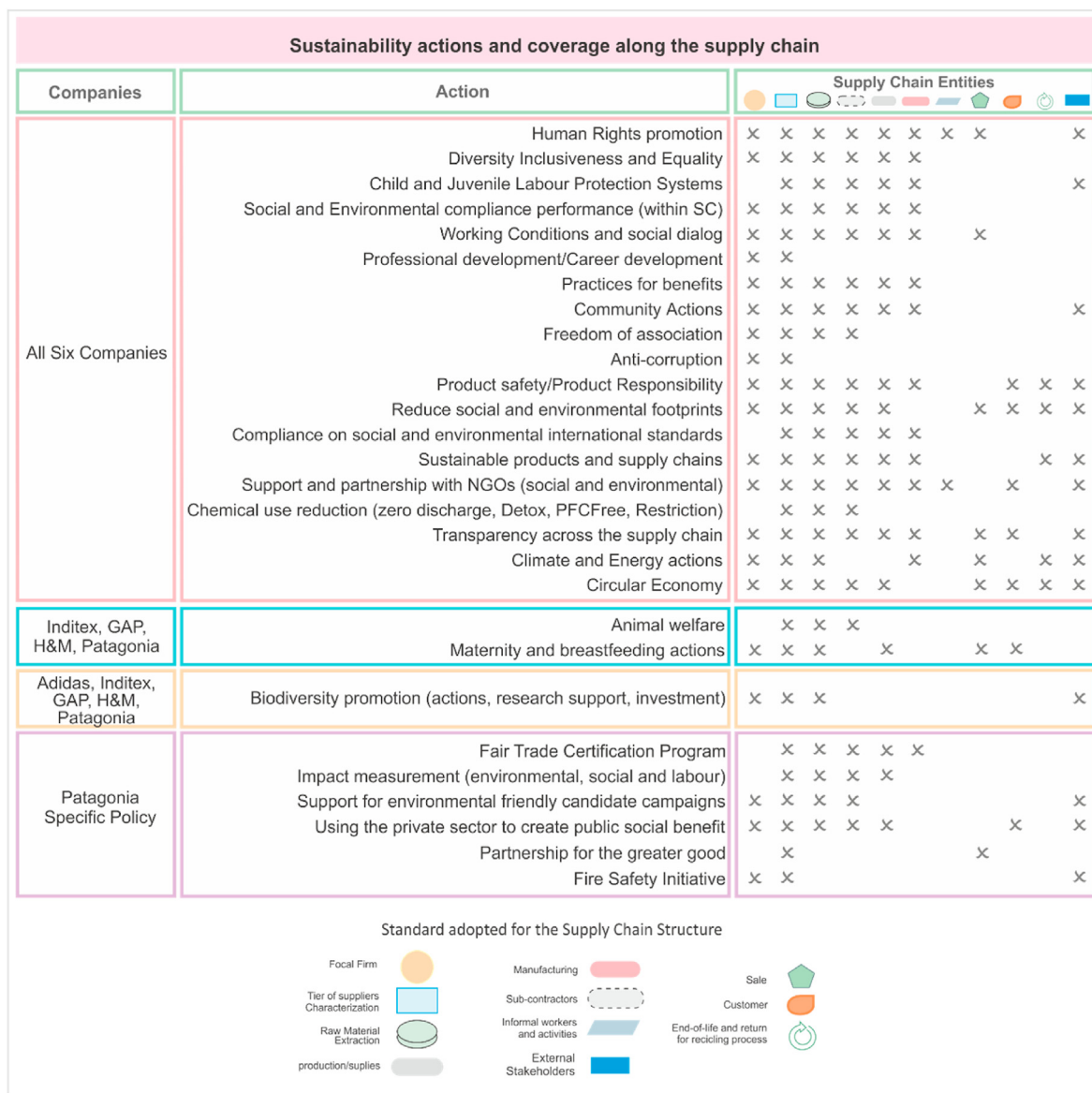


Fig. 8. Sustainability actions of the six companies analysed.

association with these four aspects. For example, the social aspect that is often related to actions promoting the well-being of communities and local development. These issues were considered when defining new nodes and sets. For the Labour Conditions (LC) it was considered the related words as Child Labour, Labour Rights, Exploitative Labour Practices (occurrence and fighting), and Forced Labour (occurrence and fighting). For Human Rights, the words Human Traffic and slavery (fighting) were considered. For Product Responsibility, words as Health Product, Toxic, Certified, Sustainable and Transparency were considered. The results are presented in Fig. 9.

Each company has the percentage of representation on each of the four aspects in the reports. These percentages are related to the actions developed by the companies which represent a result of the sustainability strategy mirrored into “policies” and “commitments”, as previously mentioned. Adidas and Nike have their efforts focused on Product Responsibility, representing more than 50% of the actions developed. According to the reports, this can be identified in actions developed along the supply chain with investment

in quality products, with a reduction in social and environmental impacts and greater control from the extraction of the raw materials to customer delivery. Among the actions, we highlight the investment in technology with no use of toxic products and products with a certified origin. These companies are characterised by the development of technical and high-performance sports products, which may justify their greater focus on Product Responsibility. However, they do not neglect the other three aspects, with several initiatives in the Human Rights promotion, Decent Work, and commitment to local development in the communities in which they operate. These actions are identified from raw material development, involving all tiers of suppliers in collaborative activities. The companies H&M, GAP, and INDITEX, present greater balance in the frequency of the four aspects, with specific actions in all areas, as it was shown in the previous analysis in which the actions are presented (see Fig. 8). Most of the actions are developed at different tiers of suppliers and some of these actions also promote customer involvement. These characteristics have also been identified in the literature such as in Meier (2015), Perry et al.

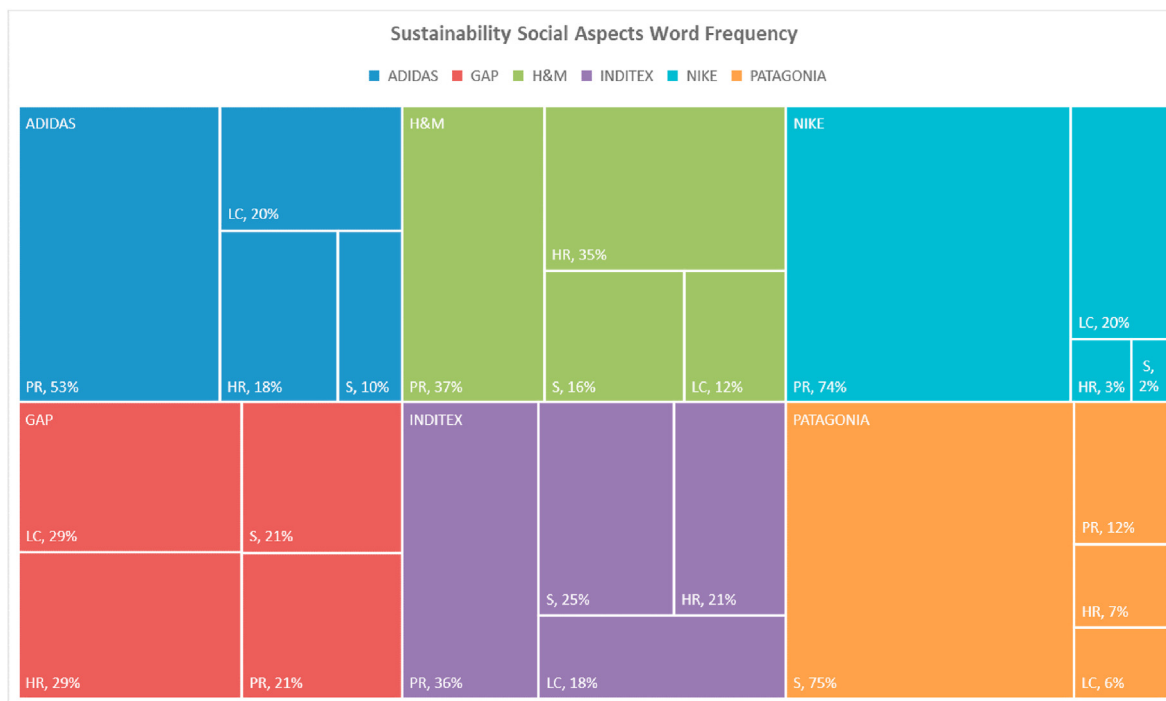


Fig. 9. Social aspects of the social dimension per company analysed.

(2015), and García-Sánchez et al. (2019).

Patagonia stands out in the social aspect with 75% of references, and what can be seen in the company’s reports is that a large part of these actions are also linked to environmental actions (Patagonia Report 2016 and 2017; Patagonia Wool Standard, 2016; e.g., “... We continue to grow our support for grassroots environmental groups working to restore rivers, stop mines and protect endangered wildlife”; and “... more than \$1 million to more than 250 grassroots environmental groups connected to the communities they serve.”). When defining the strategy to develop long-term products, the company starts this process with fair trade policy, both in the first level of supply and in the production of raw materials, especially cotton, looking for suppliers who pay their employees with a minimum wage and decent living conditions. These actions are directly related to the workers’ well-being along all supply chain tiers and have also been addressed in the literature by Smyth et al. (2013), Gardetti et al. (2015), Khan and Islam (2015) and Stevenson and Cole (2018). Throughout the production process, it develops several actions to support environmental issues, not only with NGOs but also with the government (Chi, 2011). All environmental actions are to promote social development to minimise negative impacts of production processes on both people and animals. These actions are not only directly related to the supply chain, but in different areas and different regions, considered as strategic to support financially, in different types of institutions.

An important point when analysing the sustainability reports is the great prominence of NGOs among the several stakeholders, demonstrating a clear concern of the companies in maintaining the dialogue and joint actions. External stakeholders have a significant presence when related to the word “social”, promoting sustainability (e.g., Better Cotton Initiative, Ellen MacArthur Foundation, and Sustainable Apparel Coalition). This is an important step because NGOs might be strong allies of the companies. Besides pressure for changes, they are institutions with know-how, skills, and capacity to help to minimise impacts, corroborating the studies by Sethi et al. (2017). As an example: (i) Nikes’ sponsored sports

programs, in partnership with local NGOs for more than 16 million children in different countries; (ii) the company Inditex with the NGO *Entreculturas*, in the EPGO Programme (Educate People, Generate Opportunities) in countries as Argentina, Bolivia, Venezuela e South Africa; and (iii) GAP, which sponsors projects with two NGOs, CARE, and Project Concern International, in Ethiopia and Tanzania (countries without suppliers), with women’s social and economic empowerment actions.

Finally, it is possible to see from actions identified that environmental and social dimensions are both concerns in the analysed companies. This characteristic is also common in research in several studies which may indicate that an interrelation between environmental and social action may influence one another (Bronzi et al., 2014; Freise and Seuring, 2015; Köksal et al., 2018; Bubicz et al., 2019). Having a holistic perspective on the dimensions of sustainability is an essential step in addressing them appropriately. Also, it is important to state that the three dimensions should be considered so as to achieve company sustainability.

5. Roadmap for future work

Based on the developed analysis, structure of the apparel supply chain was defined, the entities that comprise it and how the main apparel supply chains have been managing sustainability concerns. Through the identification of the entities that make up the chain, its different links and processes, a “big picture” of this complex structure was provided. Also, two main types of interactions that exist between the entities that make up the apparel SC, of intervention and influence, was pointed out. This allows a better understanding of how leading companies in the sector manage sustainability concerns, especially the social dimension.

Considering the leading companies in the apparel sector, it was concluded that sustainability is part of their management strategy and the social dimension is a concern. The sustainability strategy is translated into policies and commitments, which consider the SDGs, and are mostly monitored through GRI indicators. This

strategy goes beyond the limits of the companies. Some of them often work with local communities, and in some cases already mentioned, in countries and communities outside of their supply chain (e.g., where the companies do not have suppliers).

The research findings point out to a set of challenges that still deserve attention for future work by both the research and industrial communities, so as to enable a more assertive intervention towards social sustainability. To better understand the existing gaps, they are illustrated in Fig. 10, and next explained.

- (i) Sustainability - It is necessary that the focal companies (brands) effectively take responsibility for sustainability achievement along the entire chain, being sustainability part of the corporate strategy with a strong purpose to promote changes.
- (ii) SC Structure - Understanding the structure of the apparel supply chain and the different characteristics of the various entities that comprise it, as well as their interactions, is crucial for the development of actions and the commitments definition along the chain in order to make it sustainable.
- (iii) Entities - Knowing the entities that make up the supply chain, its context, and external stakeholders is also crucial to assess potential risks and opportunities for improvement.
- (iv) Relationships - Proactively, integrating all the involved stakeholders as allies, ethically, implementing joint improvement actions it is a way to minimise risks and negative impacts, as well as the negative consequences along the chain. Interactions between different stakeholders increase transparency in processes, especially with the growing use of technology and data sharing tools to monitor and track the production process in all supply chain tiers (e.g., IoT, Blockchain, AI and Robotics). Stakeholders have different roles throughout the supply chain, and, in many cases, they act jointly with the brands. What can be noted is that there are more and more initiatives by the focal companies to seek this interaction proactively, helping to mitigate the risks of non-compliance to promote sustainability.
- (v) Social Sustainability - The social dimension has been a frequent issue in companies and also in the scope of research and social discussions. Actions are achieved in the different tiers, but they still need to intensify control from the second tier downwards, where most of the problems are. This can be considered a consequence of the lack of monitoring, especially for suppliers in developing countries. Expanding monitoring throughout all tiers and involving the various stakeholders is crucial to achieve sustainability and balance the social dimension by promoting decent conditions for workers and the local community. Shared responsibility

must be promoted by companies throughout the entire supply chain, integrating the end of life of products and circularity, being a way to promote social innovation, generating jobs, income, and social well-being.

These significant challenges should then be considered to better managing social sustainability in the apparel sector, but there is still a need for greater knowledge of what must be addressed in sustainability social dimension (Missimer et al., 2017). A better understanding and awareness about the social dimension and its related issues may considerably improve the company's performance, thus providing greater equity in the sustainability triple bottom line.

6. Conclusion

The study shows that the apparel chain is long, fragmented and with many links among the different production processes. Although being a strategic control supply chain, the control is difficult in all stages and several authors have exposed several fragilities. However, from the work developed there are advances to make this chain more sustainable through different actions with the various internal and external stakeholders.

Along this article, and as main contributions, the apparel supply chain was characterised and were identified the entities and links that should be considered when analysing the social aspects of sustainability. An analysis departing from the focal companies was performed and the results point out the existence of environmental and social concerns and have been dealt with integrated actions. From the content analysis of the sustainability reports of the six leaders' companies in the apparel sector, the social sustainability strategy was identified. The findings show the company's main actions and coverage throughout the supply chain, and it is evident the proximity to external stakeholders, as well as mutual collaboration to improve the performance of the social dimension in the different entities. This may indicate that managers are attempting to look at sustainability in a holistic and non-fragmented way. From the results, the main gaps and challenges were identified, and a roadmap is proposed to improve social sustainability management.

However, the analysis performed is not conclusive and there is a long way to achieve social sustainability. Companies are still working in reaction to external pressure to avoid negative impact. Future studies may point out ways to achieve this balance. The starting point to ignite the shared responsibility along the chain are the Sustainable Development Goals. They are in the sustainability strategy of all six companies analysed and it is indisputable that there are several excellent initiatives, however, the main commitment of the brands is still the product low cost to increase profit.

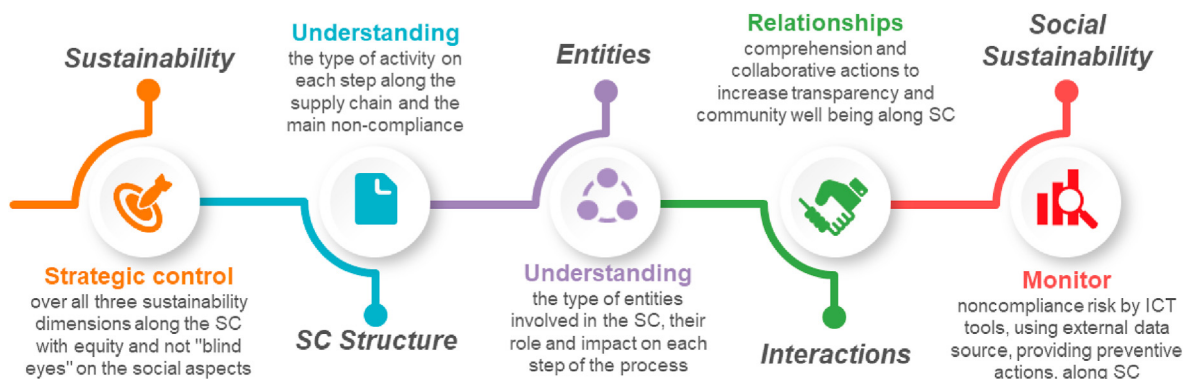


Fig. 10. Roadmap for sustainability problems understanding in future research.

Meantime, suppliers receive strong pressure to invest in sustainability compliance standards, but they must keep the cost low. This is only one of the main fragilities of the apparel supply chain, but one of the most important.

As future work, a sustainability analysis should be performed departing from other entities along the supply chain in different continents and realities. In this way, it will be possible to better understand how sustainability is managed along the global chain.

CRedit authorship contribution statement

Marta Elisa Bubicz: Conceptualization, Investigation, Methodology, Data curation, Formal analysis, Validation, Writing - original draft, Funding acquisition. **Ana Paula Ferreira Dias Barbosa-Póvoa:** Validation, Writing - review & editing, Supervision. **Ana Carvalho:** Validation, Writing - review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jclepro.2020.124214>.

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