Social Sustainability and Resilience in Supply Chains: The Role of Collaboration to Face Risks

Frida Betto[1(✉)], Andrea Zangiacomi[2], and Rosanna Fornasiero[1]

[1] IEIIT-CNR, National Research Council, Padua, Italy
{frida.betto,rosanna.fornasiero}@ieiit.cnr.it
[2] STIIMA-CNR, National Research Council, Milan, Italy
Andrea.Zangiacomi@stiima.cnr.it

Abstract. Nowadays, the global scenario is characterized by different trends affecting supply chains with several risks, which are increasingly challenging their resilience. This research focuses on a set of social trends such as those related to demographic change, urbanisation and new consumption patterns that put supply chains at risk of disruptions. Through a systematic literature review, this work provides an overview of the risks for supply chains derived from the analysed social trends. Moreover, through the proposal of a preliminary conceptualisation model, it investigates how collaboration practices can support supply chains in the mitigation of the identified risks by developing resilience and sustainability. Specifically, the model suggests possible actions to increase the social sustainability of supply chains mapping them according to different collaboration practices and categories of actors involved.

Keywords: Social sustainability · Collaboration · Supply chains · Risks · Resilience · Demographic change · Urbanisation · Consumption patterns

1 Introduction

Global trends shaping the current scenarios such as political, technological and economic ones are recognized to ask supply chains to implement appropriate actions to face the related arising challenges . However, companies cannot ignore social trends such as the ageing population, rising migration, consumerism and related risks for their supply chains [1]. This creates the urgent need to significantly adapt the way supply chains (SC) are organized and interlinked to avoid disruptions caused by these changes [2].

After identifying some social trends for the coming years, this paper maps the most important risks derived from them through a systematic literature review. These risks can cause short or long-term disruptions and can make supply chains vulnerable, affecting their resilience [3]. The concept of supply chain resilience has been explored since 2000s and it has been defined as "The adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function" [4] (p.131). However, supply chain resilience has become a topic of high

Published by Springer Nature Switzerland AG 2023
L. M. Camarinha-Matos et al. (Eds.): PRO-VE 2023, IFIP AICT 688, pp. 35–52, 2023.
https://doi.org/10.1007/978-3-031-42622-3_3

interest between scholars, policy makers and practitioners especially after Covid-19 pandemic.

Among supply chain resilience capabilities, collaboration is recognized as one of the most important capabilities to build resilience [5–7] and, at the same time, a structural aspect of sustainability [8]. Moreover, the focus on social trends which involve multiple actors such workers, consumers, suppliers, and society, implies to deeply concentrate on collaboration practices such as, for example information sharing with suppliers and consumers. As previously underlined, despite supply chain collaboration for sustainability and resilience has emerged as an important area of research in the past few years, supply chain collaboration towards social sustainability has been still poorly investigated [9].

Existing literature on collaboration at the supply chain level have mainly focused on the role of suppliers [5, 10] analysing disruptions derived from operational risks. Few recent works studied collaboration not only with suppliers but also with customers, competitors or other actors (without a clear definition of who these actors are). It is thus necessary to extend the point of view on the disruptions having in mind also risks coming from trends that have an impact on operations. Moreover, it is necessary to investigate the active role of customers, and collaboration with competitors and generally with society in facilitating the development of sustainable practices. NGOs (Non-Governmental Organizations) and local communities play an important role in prompting focal firms to extend sustainability to suppliers. Only a small amount of prior research considers the role of these actors in supply chain collaboration processes.

In light of this view, this paper aims to identify and map the most important risks that affect supply chain social sustainability and makes supply chains vulnerable. Then, it investigates how collaboration, as a resilience capability, helps supply chains to mitigate the identified risks. Reviewing literature, the paper contributes to both theory and practice with a proposal of a preliminary conceptual model to support supply chains in improving their resilience and social sustainability.

After a background analysis of the most important current social trends in Sect. 2, in Sect. 3 the methodology section describes how the literature review has been organised and which is the collaborative framework of reference. Section 4 describes the results in terms of risks for supply chains identified in the literature review and presenting a conceptual model where it is proposed to face the risks with different practices of collaboration involving different actors. Section 5 concludes the paper and set some further avenues for future research.

2 Background: Current Social Trends

This research focuses on a set of social megatrends retrieved from literature analysis and related projections are reported in the following. The first social megatrend analysed is demographic change concerning how human populations change over time. Life expectancy at age 65 is projected to increase in all countries. Globally in 2020, there were 728 million people aged 65 years or over and this is projected to double to 1.5 billion in 2050 [1]. The number of persons aged 80 years or older is expected to triple between 2020 and 2050 to reach 426 million [11]. In this context, the European population is and will remain the oldest one. Moreover, by 2050 more than two-thirds of the EU countries

are projected to have an old-age dependency ratio above 50% [12]. Currently, the world hosts the largest generation of young people in history, accounting for 1.2 billion people. Nearly 90 per cent of young people lives in developing countries and there represents a relevant population share [13]. Africa has the youngest population, with 70% of sub-Saharan Africa under the age of 30 [14]. Moreover, the world's poorest countries have some of the fastest-growing populations that will increase by nearly 80% towards 2050 [15]. In particular, the population in Sub-Saharan Africa is projected almost to double by 2050 [15]. Concerning migration, the current global estimate is that in 2020 there were around 281 million international migrants, (3.6% of the world's population) and this number has increased by 128 million with respect to 1990 [16, 17]. Nearly two-thirds of these were labour migrants [18]. It is expected that migration will exceed 4% of the global population by 2030, namely more than 350 million people [19]. Future forecasts estimate 200 million environmental migrants by 2050 [20]. Refugee flows are also increasing: by September 2022, almost 5 million refugees from Ukraine had been recorded [21].

The second social megatrend considered is urbanisation. Today, 55% of the world's population lives in urban areas; this quote is expected to increase to 68% by 2050, accounting for 6.7 billion people [22] with nearly 90% of this rise taking place in Asia and Africa [23]. Urbanisation is more advanced in developed regions where currently 79% of the population resides in urban areas and this quote is projected to reach 87% by 2050 [24]. Despite the number of megacities will increase from 33 in 2022 to 43 in 2030 [25], and 47 in 2050 [26], mainly in developing regions, almost half of the urban populations reside in cities of less than 1 million people [24] that represent the fastest-growing urban agglomerations [24]. People living in megacities will not exceed 8% of the global population in 2030 [24]. The fast growth in the global market of the request for smart city technology is projected to rise annually by 25%, with an overall market value of about US$517 billion [24]. The global smart cities market is expected to account for 1380.21 billion U.S. dollars by 2030 [27]. By 2028 is projected that there will be more than 4 billion connected IoT devices in commercial smart buildings. Moreover, it is expected that by 2040 about 80% of kilometres travelled in cities will be in shared autonomous vehicles [28].

Consumption patterns represent the last social megatrend identified. Consumers, in particular younger generations, show an increasing concern about how their own consumption impacts society at environmental, social, and governance (ESG) levels [29]. Consumers are thus willing to pay more for sustainable products. In particular, more than 78% would pay a higher price for a product locally produced or sourced, 77% for an item made from recycled or eco-friendly materials, and 75% for brands adopting ethical practices [30]. Moreover, conscious consumption pushes consumer goods brands to be transparent about their behaviour [31] with 71% of surveyed consumers willing to pay a premium for brands that provide traceability [32]. Consumerism is still relevant and particularly affects some industry sectors such as fashion where fast and ultra-fast fashion players are continuously increasing their inventory turn [33]. Indeed, the core business model of brands such as H&M and Zara is driven by low prices, rapid consumption and fast-changing trends [34]. The growth of cheaper, ultra-fast fashion brands such as Boohoo, Pretty Little Thing and Shein, has accelerated this consumerism

pace even more [35]. In particular, the Chinese fashion player Shein introduces more than 6,000 low-price new products per day in limited units to its website [33] promoting the idea that clothes are disposable and encouraging extreme waste [34].

3 Methodology

Since both well-known and emerging trends affecting the global scenario impact on supply chains vulnerability, the need to identify and map their related risks is increasing. Thus, this research aims to identify the main external risks derived from the social trends previously described through a systematic literature review, and then, to propose a preliminary conceptual model to support supply chains to tackle them.

3.1 Systematic Literature Review

To ensure the repeatability and transparency of the research, external risks for the supply chain have been identified through a systematic literature review [36].

Eligibility Criteria. In line with Tranfield et al. [36] and Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) methodology [37], once the purpose of the review has been defined, the eligibility criteria have been fixed:

- Purpose of the papers: papers must consider the risks, challenges or barriers for supply chains (or companies or suppliers) derived from the identified social trends;
- Topic: the search includes engineering, business and economics scientific areas;
- Article characteristics: papers must be written in English and published in scientific journals or conference proceedings due to the novelty of the topic;
- Time frame: in order to collect and map the external risks that are still open and supply chains are currently facing, the time frame has been limited to only papers published in the last 5 years.

Data, i.e., the papers, have been selected by searching on Scopus scientific database.

Information Sources and Search Strategy. Three main sets of keywords have been identified for collecting the paper:

- *Keywords related to the identified social trends.* Moving from the trends identified through grey literature (i.e., reports, newspapers, companies' websites) and literature, a set of keywords for each social sub-trends have been collected and used for the final search strings (see Table 1 below);
- *Supply chain-related keywords.* For this set, the terms "supply chain*" and "value chain*" have been used as keywords;
- *Risk-related keywords.* Risk, vulnerability and resiliency reducers have been used in the literature either as separate concepts, but also as interchangeable [38]. Thus, this set of keywords includes the terms "vulnerab*", "risk*", "challenge*", "effect*", "resilien*.

Study Selection Process and Data Analysis. The selection of papers follows the diagram developed by PRISMA [39] that includes three phases for paper selection, i.e., identification, screening and eligibility, to achieve the final sample of articles.

Table 1. Keywords for the search string related to the identified social trends

Mega trends	Trends	Selected keywords
Demographic change	Ageing population boom	*(older OR elder OR ageing OR aging) AND (worker* OR employee* OR population* OR workforce OR "labor force" OR "labour force")*
	Young population boom in developing countries	*(young OR youth) AND (population OR workforce OR employ* OR unemploy* OR worker* OR "labor market*" OR "labour market*" OR "labor force" OR "labour force")*
	Migration flows	*("migration*" OR "migrant*" OR refugee*)*
Urbanisation	Densely populated areas	*(megacit* OR "mega-cit*" megalopolis OR metropolis OR "dense* populated area*" OR "dense* populated cit*" OR "big cit*" OR "large cit*" OR "urbani*ation")*
	Smart cities	*(smartcit* OR "smart cit*" OR "intelligent cit*" OR "digital cit*" OR "information cit*")*

(*continued*)

Table 1. (*continued*)

Mega trends	Trends	Selected keywords
Consumption patterns	Consumer consciousness	*(“consumer consciousness” OR “consumer awareness” OR “conscious consumer*” OR “aware consumer*” OR “consumer responsibilit*” OR “responsible consumer” OR “customer consciousness” OR “customer awareness” OR “conscious customer*” OR “aware customer*” OR “customer responsibilit*” OR “responsible customer”)*
	Consumerism	*(“consumerism*” OR “cheap product*” OR “fast fashion” OR “low cost product*” OR “low quality product*” OR “poor quality product*” OR “cheap food” OR “junk food” OR “low quality food” OR “online product*” OR “fast-moving consumer good*”)*

The review’s diagram (last access: March 2023), illustrated in Fig. 1, shows firstly the number of identified papers per each social trend. Then, the paper’s title and abstract have been thoroughly screened to assess whether the paper is consistent with the research aim, i.e., to identify the external risks for supply chains. Thus, 114 papers have been included for the full reading of the text. The excluded papers do not consider the risks for supply chains, they focus on the risk for society, related to technologies adoption and implementation or remain at the trend level without considering their implication on supply chains or companies or suppliers.

As previously described in the Introduction section, current trends generate new risks for the supply chain that affect both their resilience through supply chain disruptions but also their sustainability. In particular, the focus of this review is on social sustainability as it is often poorly investigated despite investing in social sustainability improves also supply chain performance and reputation among stakeholders and society. Therefore, only the papers that consider both explicitly or implicitly the impact of the risks on social sustainability, and thus related to human rights, work practices, society and product-related responsibility [40, 41], have been included in the final sample of papers. Finally, 36 papers have been included in the analysis.

Then, the papers have been analysed and the risks related to each trend that have an impact on social sustainability have been collected. Finally, a categorisation of risks identified from each trend has been provided (see Sect. 4.1).

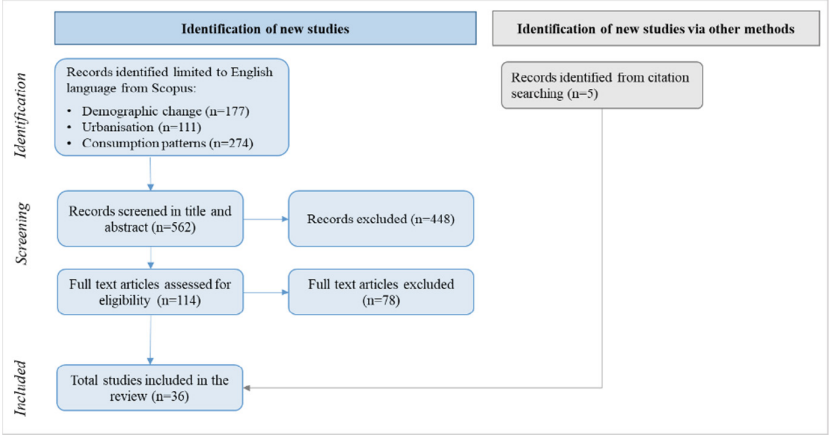

Fig. 1. Paper selection consistent with PRISMA guidelines [38]

3.2 Development of the Preliminary Conceptual Model

After the identification of the external risks that have an impact on the social sustainability of supply chains, the analysis moves to the identification of the actions to mitigate those risks. The investigation of the actions was developed through the already identified studies of the systematic literature review and by adding new papers focused on the emerged risks. Moreover, some actions have been identified based on authors' expertise in the field.

As explained in the Introduction section, collaboration has been defined as a formative element of resilience [5, 6, 42, 43], as well as a driver for enhancing sustainability in supply chains [8, 9].

Thus, the conceptual model is based on the collaboration components identified by Cao et al. [10], henceforth named collaboration practices, by extending their approach purely oriented to supply chain partners. Since the research aims at reducing the impact of the risks on social sustainability, the paper has included the role of consumers and society in the definitions of collaboration practices, as they are active participants in achieving social sustainability. By reconsidering the topic areas of collaboration in Chen et al.'s research [10], we introduce four main areas, i.e. internal collaboration, collaboration with suppliers, collaboration with consumers and collaboration with society.

Thus, the preliminary conceptual model has been structured as follows. The actions identified in literature and based on authors' expertise, have been crossed linked to the collaboration practices according to the actors that are expected to address them. The classification of the actions has been done iteratively by the research group, by evaluating the consistency between the definitions of the collaboration practices and the meaning of the actions provided by existing literature.

The main findings have been detailed in the following sections.

4 Findings

4.1 Risks for Supply Chains

The literature review revealed several risks for SCs which derived from each sub trends (i.e., ageing population boom, smart cities, etc.). As shown in Fig. 2, five risks for social sustainability emerged from ageing population boom, while only one social risk emerged from smart cities and densely populated areas.

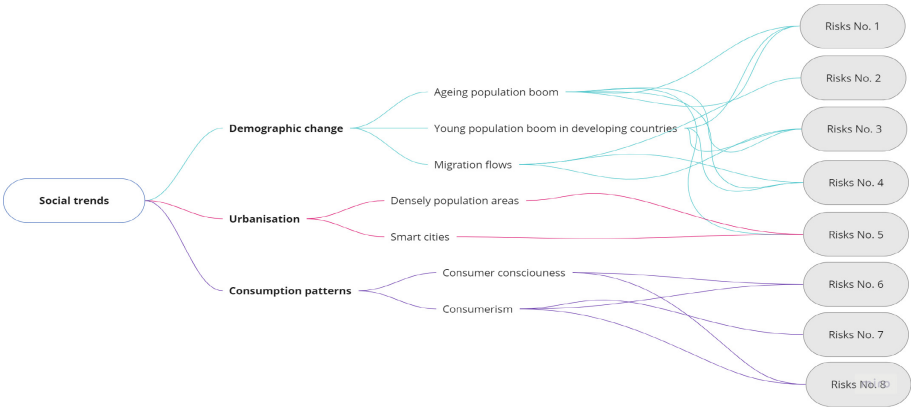

Fig. 2. Risks for supply chains derived from today's social trends

The identified external trends can bring risks for supply chains that can be classified as risks affecting social sustainability because they are related to human rights, work practices, society and product-related responsibility [40, 41]:

1. *Decreasing of functional capacities.* The decrease in functional capacities of senior workers (45–64 years) can bring more frequent injuries both during production phases [44] as well as in logistics operations (handling and transportation of goods) [45].
2. *Knowledge loss.* The lack of adequate investments in knowledge transfer generates a loss of knowledge in SCs due to senior workers' retirement [46, 47]. The departure of senior workers without succession plans determines knowledge loss [48]. The knowledge transfer process is at risk for many specific factors, such as the attitude of individuals, knowledge, relationship and contextual characteristic.
3. *Lack of skills and few training opportunities.* Senior workers are lacking digital skills compared to digital natives. This implies a risk of lower occupational mobility among senior workers than among young workers and a growing share of routine intensive jobs for them [49]. In the case of migrant workers, often lack of training opportunities can bring risks in terms of safety but also missing jobs and soft skills. The risks related to difficulties in understanding the language affect their work in terms of training, communication with supervisors, and their understanding of labour rights and duties [50, 51].

4. *Weak or missing control over workers' rights.* This risk is mainly related to migrants and refugees as vulnerable workers who are often exploited in terms of low wages [51, 52], overtime work [52], late payments, wage theft [53], passport retention, and modern slavery. The missing control over labour rights affects the most vulnerable workers: in terms of asylum rights, work permit issues [53, 54], in terms of wage cuts, harassment, treatment between migrants and native workers, in terms of accessibility to representatives' bodies, in terms of accessibility to knowledge about their rights due to language and culture barriers, in terms of labour exploitation [52, 55, 56].
5. *Poor working conditions.* This risk can affect supply chains along different processes like delivery operations when workers work overtime and this affects their well-being and manufacturing where the adoption of new technologies affects the workers' jobs in some cases by deskilling them due to, for example, the automation of some procedures [57]. The risk is related also to poor workplace ergonomics which increases the number of health issues and injuries of ageing workers. Ergonomics risks can cause serious health issues for workers such as musculoskeletal disorders which affect productivity [58].
6. *Lack of stakeholder involvement.* Regarding trends like consumer consciousness and consumerism, the lack of stakeholders' involvement can make supply chains vulnerable. Stakeholder involvement can be useful to increase demand, create redistribution markets [59, 60] and increase consumers' willingness to pay [61]. In the case of consumerism, the lack of stakeholders' involvement may put at risk the shift towards sustainable processes [62] and the level of tolerance related to non-conformities [63]. Moreover, this risk jeopardizes SC because it creates difficulties in aligning and motivating stakeholders and further criticism in some sectors (e.g., fashion) [64].
7. *Lack of interest in working conditions.* While in recent years environmental issues are stressed, there is the risk that consumers are less interested in the working conditions over supply chains [65] and some scholars highlight the risk that this lack of interest in labour exploitation and welfare [61, 66] can affect the capability of supply chains to implement appropriate actions.
8. *Social sustainability introduction-related risks.* These risks are related to improving or introducing social sustainability within the supply chains [62, 64]. They can be linked to the risks of missing managerial capabilities that affect the dissemination of sustainability standards along a supply chain, as well as the lack of trained employees to introduce and share information and the lack of technological capabilities [64, 67]. The lack of competencies and knowledge about social sustainability generates also the lack of dissemination practices of sustainability standards along the whole supply chain [67].

According to the numbered order of risk descriptions, Table 2 shows the related references derived from the systematic literature review.

Table 2. Risks for supply chains derived from social trends

	Social trends influencing SCs		
SC Risks	Demographic Change	Urbanisation	Consumption Patterns
1	[44, 45, 58, 68, 69]	[57, 78]	[59–65, 79, 80]
2	[46–48, 70–73]		[61, 65, 66, 80]
3	[49–51, 70]		[60, 62, 64, 67, 81, 82]
4	[50–56, 74–76]		
5	[44, 58, 77]		
6			
7			
8			

4.2 Preliminary Conceptual Model

After the identification of risks from the systematic literature review, collaboration has been considered as a mitigation capability to cope with them and reduce supply chain disruptions. On the one hand, collaboration has been frequently included among the capabilities required to build resilience in supply chains [5, 6, 42, 43]. Among many scholars, for instance, Scholten and Schilder [5] adapted from Cao et al. [10] collaboration practices to investigate supply chain resilience. On the other hand, collaboration has been studied in relation to the sustainability of supply chains [8, 9].

As detailed in Sect. 3.2, this study extended Cao et al. [10]'s collaboration approach to a more oriented approach to social sustainability. The extended definitions of collaboration practices have been provided in Table 3 (see the text in italics).

Finally, the results shown in Table 4 reveal the possible actions derived from both literature [44, 45, 48, 50, 83] and the authors' expertise to face the risks. They have been classified according to the collaboration practices definitions (see Table 3) and the classification main areas adapted from Chen et al. [9], i.e.:

- Internal collaboration = I in Table 4's columns
- collaboration with Suppliers = S in Table 4's columns;
- collaboration with Consumers = C in Table 4's columns;
- collaboration with sOciety = O in Table 4's columns.

Table 3. Definitions of collaboration practices adapted from [5, 10]

Collaboration practices	Definitions (adapted from [5, 10])	*Examples from* [10]
Information-sharing	The extent to which a firm shares a variety of relevant and accurate ideas, plans, and procedures with its *supply chain partners, consumers and society* in a timely manner	• *Information available to SC actors on-line and in real-time* • *It allows transparency which reduces uncertainty and bullwhip effect*
Goal congruence	The extent to which *supply chain partners, consumers, and society* perceive their own objectives are satisfied by accomplishing the supply chain objectives	• *Shared vision for supply chain management* • *Common business processes* • *Shared outcomes* • *Strategic planning including the needs and capabilities of SC actors*
Decision synchronization	The process where supply chain partners orchestrate decisions in supply chain planning and operations that optimise supply chain benefits *in terms of economic, social and environmental sustainability*	• *SC planning decisions: operations strategy planning, demand management, production planning and scheduling, procurement, and distribution management* • *SC actors should coordinate critical decision to avoid conflicting goals between them*
Incentive alignment	The process of sharing costs, risks, and benefits among *supply chain partners, consumers and society*	• *SC actors operate consistent with overall objectives* • *SC actors cooperates minimizing opportunistic behaviour* • *Incentive scores are traced and display through different tools*
Resource sharing	The process of leveraging and investing in capabilities and assets with supply chain partners *in terms of economic, social and environmental sustainability*	• *To achieve sustainable collaboration, SC partners need to invest in mutual resources, i.e., time, money, training, technology, etc.*
Collaborative communication	The contact and message transmission process among *supply chain partners, consumers and society* in terms of frequency, direction, mode, and influence strategy	• *SC actors communicate collaboratively with high frequency, bidirectional flows (i.e., up and down the supply chain), high informal modes (in a spontaneous and non-regularised manner), etc. of communication exchange.*
Joint knowledge creation	The extent to which supply chain partners develop a better understanding of and response to the market and competitive environment *by working together with consumer and society*	• *SC actors create and interpret knowledge to create value by developing new products, building brand image, and responding to customers' needs.*

Table 4. The conceptual model proposed

Actions to face the external risks	Collaboration practices [4, 9] and collaboration areas* [8]																							
	Information sharing				Goal congruence				Decision synchronization				Incentive alignment				Resource sharing				Collaborative communication				Joint knowledge creation			
	I	S	C	O	I	S	C	O	I	S	C	O	I	S	C	O	I	S	C	O	I	S	C	O	I	S	C	O
Decreasing of functional capacities.																												
Evaluation of optimal retirement age[45]	☑			☑	☑			☑																				
Invest in ergonomics [44]	☑																☑											
Move production to the countries with a younger workforce [44]										☑								☑										
Attract new young workers [44]				☑				☑																		☑		☑
Knowledge loss.																												
Monitored succession plans [48]					☑				☑												☑							
Hands-on training to share knowledge and best practices [48]	☑	☑															☑	☑			☑							
Mentoring programs [48]	☑	☑															☑	☑										
Lack of skills and few training opportunities.																												
Definition of education programs with higher education institutions [70]	☑	☑		☑													☑	☑		☑					☑	☑		☑
Commit senior workers for supporting young workers training [84]	☑	☑			☑	☑																						
Training on digital technologies [85]	☑	☑															☑	☑										
HR defines training programmes in collaboration with other depts. [experts]																												
Weak or missing control over workers' rights.																												
Promoting social dialogue [83]	☑	☑	☑	☑																	☑	☑	☑	☑				
Raise awareness [experts]	☑	☑		☑																	☑	☑		☑				
Monitoring suppliers [86]		☑	☑	☑		☑				☑				☑														

5 Conclusions and Future Development Areas

Nowadays, new emerging global trends are affecting the vulnerability of supply chains. Among them, social trends reflects the relevance of workers, suppliers, consumers, and society in playing a growing role in businesses. Therefore, SCs needs to develop resilience but also sustainability, and in particular social sustainability as it consider human needs, rights, wellbeing, etc. Framed in this context, collaboration has been widely studied as a practice to build resilience and as an enabler for supply chain social sustainability.

Through a literature review which identified the main risks derived from social trends, the paper develop a preliminary conceptual model that classified the actions to face risks according to the collaboration practices and the actors that are expected to address them, that enable SC to build resilience and social sustainability.

Notwithstanding the insights provided by the model, it is at an initial stage and it needs to be enriched with wider set of actions and validated with experts.

The following section details the future development areas for research among which future directions for improving conceptual model, the role of technologies in facing risks and the role of resilience phases in addressing the risks.

Future Development Areas. The study reveals also a few avenues for future research:

- The model sheds light on the enabling role of collaboration in the development of new actions to mitigate risks. The analysis identifies information sharing and goal congruence as the most supporting collaboration practices. Notwithstanding the essential role of collaboration, other practices, (i.e., incentive alignment, decision synchronization and joint knowledge creation) need a change of perspective in their definitions. Even if their role is recognized in the operations management field, for what concerns the social perspective they need further conceptualization. Thus, future development areas could focus on the investigation of the role of these three collaboration practices in mitigating risks for social sustainability with a particular focus on collaboration with customers and society.
- To enhance the reliability of results, future research can validate the model empirically and identify new actions derived from practitioners' expertise.
- The analysis does not take into account the role of digitalisation in tackling the risks. Many actions can be supported with dedicated digitalisation solutions that can be used for risk mitigation in supply chains. Although some digital technologies have already been proposed to support training and safety (i.e., smart wearables, IoT, virtual and augmented reality), specific solutions need to be developed and studied for the identified actions with the aim of assure social sustainability.
- Having in mind the resilience perspective, it is important to future developments can consider investigating which and when adopting the identified actions over the readiness, response and recovery steps.
- To assess the impact of the identified action on social sustainability and resilience, future research can develop a measurement system or a model to evaluate the maturity level of the actions (from bad practices to best practices).
- Future research could focus on specific supply chains in order to evaluate the practices of collaboration in different contexts and to analyse their enablers and barriers.

Acknowledgements. This paper is part of the research activities held within the projects ReSChape (n. 101061729 – REshaping Supply CHAins for Positive social impact) and Sotecin (n. 10105838 – Social and technology innovation factory), both co-funded by the EU under the Horizon Europe programme. The authors wish to acknowledge the European Commission for its support and project teams.

References

1. Berger, R.: Trend compendium 2050, Mega trend 1 People and society (2021)
2. Ramezani, J., Camarinha-Matos, L.M.: Approaches for resilience and antifragility in collaborative business ecosystems. Technol. Forecast. Soc. Change **151**, 119846 (2020)
3. Shekarian, M., Mellat Parast, M.: An Integrative approach to supply chain disruption risk and resilience management: a literature review. Int. J. Log. Res. Appl. **24**, 427–455 (2021)
4. Ponomarov, S.Y., Holcomb, M.C.: Understanding the concept of supply chain resilience. Int. J. Logistics Manag. **20**, 124–143 (2009). https://doi.org/10.1108/09574090910954873
5. Scholten, K., Schilder, S.: The role of collaboration in supply chain resilience. Supply Chain Manag.: An Int. J. **20**, 471–484 (2015)
6. Ali, A., Mahfouz, A., Arisha, A.: Analysing supply chain resilience: integrating the constructs in a concept mapping framework via a systematic literature review. Supply Chain Manag.: An Int. J. **22**, 16–39 (2017)
7. Christopher, M., Peck, H.: Building the resilient supply chain. Int. J. Logistics Manag. **15**, 1–14 (2004). https://doi.org/10.1108/09574090410700275
8. Lim, J.J., Dai, J., Paulraj, A.: Collaboration as a structural aspect of proactive social sustainability: the differential moderating role of distributive and procedural justice. Int. J. Operat. Product. Manag. **42**(11), 1817–1852 (2022)
9. Chen, L., Zhao, X., Tang, O., et al.: Supply chain collaboration for sustainability: a literature review and future research agenda. Int. J. Prod. Econ. **194**, 73–87 (2017)
10. Cao, M., Vonderembse, M.A., Zhang, Q., Ragu-Nathan, T.S.: Supply chain collaboration: conceptualisation and instrument development. Int. J. Prod. Res. **48**, 6613–6635 (2010)
11. Ageing and health. In: WHO. https://www.who.int/news-room/fact-sheets/detail/ageing-and-health (2022)
12. Population structure and ageing. In: Eurostat. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population_structure_and_ageing (2023)
13. Youth and Empowerment. In: Unesco. https://www.unesco.org/en/youth-and-empowerment (2023)
14. Young People's Potential, the Key to Africa's Sustainable Development. In: United Nations. un.org/ohrlls/news/young-people's-potential-key-africa's-sustainable-development (2021)
15. Wilmoth, J., Menozzi, C., Bassarsky, L.: Why population growth matters for sustainable development. In: United Nations Department of Economic and Social Affairs (2022)
16. Increasing significance of migration. In: European Commission. https://knowledge4policy.ec.europa.eu/increasing-significance-migration_en (2023)
17. World Migration Report 2022: Chapter 2 – Migration and Migrants: A Global Overview. In: UN International Organization for Migration. https://publications.iom.int/books/world-migration-report-2022-chapter-2 (2021)
18. Migration. In: United Nations. https://www.un.org/en/global-issues/migration. Accessed 20 Apr 2023
19. Boutenko, V., Harnoss, J., Lang, N.: 5 key predictions for the future of talent migration. In: World Economic Forum. https://www.weforum.org/agenda/2022/11/5-key-predictions-for-the-future-of-talent-migration/#:~:text=Migration%20will%20accelerate&text=Yet%20only%20280%20million%20people, more than 350 million people (2022)

20. A complex nexus. In: UN International Organization for Migration. https://www.iom.int/complex-nexus (2019)
21. International Migration Outlook 2022. In: OECD. https://www.oecd-ilibrary.org/sites/30fe16d2-en/index.html?itemId=/content/publication/30fe16d2-en (2022)
22. Urban Development. In: The World Bank. https://www.worldbank.org/en/topic/urbandevelopment/overview (2022)
23. 68% of the world population projected to live in urban areas by 2050, says UN. In: United Nations Department of Economic and Social Affairs. https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html (2018)
24. World Cities Report 2022: Envisaging the Future of Cities. In: United Nations Human Settlements Programme. https://unhabitat.org/sites/default/files/2022/06/wcr_2022.pdf (2022)
25. Shaping the Trends of Our Time. In: United Nations. https://www.un.org/development/desa/publications/wp-content/uploads/sites/10/2020/09/20-124-UNEN-75Report-2-1.pdf (2020)
26. Ecological Threat Report 2022: Analysing Ecological Threats, Resilience & Peace. In: Institute for Economic and Peace(2022)
27. Thormundsson, B.: Smart cities market revenues worldwide 2019–2030. In: Statista. https://www.statista.com/statistics/1256262/worldwide-smart-city-market-revenues/#statisticContainer (2023). Accessed 3 May 2023
28. Antunes, M.E., Barroca, J.G., Guerreiro de Oliveira, D.: Urban Future With a Purpose: 12 trends shaping the future of cities by 2030. In: Deloitte. file:///C:/Users/bettfri51805/Downloads/deloitte-urban-future-with-a-purpose-study-set2021.pdf (2021). Accessed 3 May 2023
29. Conscious Consumerism: Understanding the dilemmas of today's consumer. In: Deloitte. https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/deloitte-nl-consumer-conscious-consumerism-report-finaal.pdf. (2023) Accessed 9 May 2023
30. Butkovská, M.: PwC Consumer Insights Survey. In: PwC. https://www.pwc.com/sk/en/current-press-releases/pwc-consumer-insights-survey.html (2023). Accessed 15 May 2023
31. El-Warraky, N., Duran, E., Abreu, G., et al.: Track, trace, trust: The future is transparent. In: Accenture. https://www.accenture.com/_acnmedia/PDF-163/Accenture-Consumer-Goods-Reimagined-POV-02-Track-Trace-Trust.pdf (2021). Accessed 15 May 2023
32. Haller, K., Lee, J., Cheung, J.: Meet the 2020 consumers driving change. In: IBM. https://www.ibm.com/downloads/cas/EXK4XKX8 (2020). Accessed 15 May 2023
33. The State of Fashion 2023: Holding onto growth as global clouds gather. In: McKinsey & Company. https://www.mckinsey.com/industries/retail/our-insights/state-of-fashion (2022). Accessed 15 May 2023
34. Gerretsen, I., Kottasová, I.: The world is paying a high price for cheap clothes. In: CNN Business. https://edition.cnn.com/2020/05/03/business/cheap-clothing-fast-fashion-climate-change-intl/index.html (2020). Accessed 15 May 2023
35. Mahmood, Z.:Ultra-fast fashion is taking over – and using every trick in the book to get us addicted. In: The Guardian. https://www.theguardian.com/commentisfree/2022/apr/18/ultra-fast-fashion-retail-sites-shein (2022). Accessed 15 May 2023
36. Tranfield, D., Denyer, D., Smart, P.: Towards a methodology for developing evidence-informed management knowledge by means of systematic review. Br. J. Manag. **14**, 207–222 (2003)
37. Moher, D., Liberati, A., Tetzlaff, J., et al.: Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Ann. Intern. Med. **151**, 264–269 (2009)
38. Kochan, C.G., Nowicki, D.R.: Supply chain resilience: a systematic literature review and typological framework. Int. J. Phys. Distrib. Logist. Manag. **48**, 842–865 (2018). https://doi.org/10.1108/IJPDLM-02-2017-0099
39. Page, M.J., et al.: The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Syst. Rev. **10**(1), 1–11 (2021)

40. Morais, D.O.C., Silvestre, B.S.: Advancing social sustainability in supply chain management: lessons from multiple case studies in an emerging economy. J. Clean. Prod. **199**, 222–235 (2018)
41. Yawar, S.A., Seuring, S.: Management of social issues in supply chains: a literature review exploring social issues, actions and performance outcomes. J. Bus. Ethics **141**, 621–643 (2017)
42. Gunasekaran, A., Subramanian, N., Rahman, S.: Supply chain resilience: role of complexities and strategies. Int. J. Prod. Res. **53**, 6809–6819 (2015)
43. Han, Y., Chong, W.K., Li, D.: A systematic literature review of the capabilities and performance metrics of supply chain resilience. Int. J. Prod. Res. **58**, 4541–4566 (2020)
44. Bogataj, D., Battini, D., Calzavara, M., Persona, A.: The ageing workforce challenge: Investments in collaborative robots or contribution to pension schemes, from the multi-echelon perspective. Int. J. Prod. Econ. **210**, 97–106 (2019)
45. Bogataj, D., Bogataj, M.: Age management of transportation workers in global supply chains. IFAC-PapersOnLine **51**, 844–849 (2018)
46. Simpson, K., Murtagh, N., Owen, A.M.: Domestic retrofit: understanding capabilities of micro enterprise building practitioners. Buildings Cities **2**, 449–466 (2021)
47. Jin, S., Li, W., Cao, Y., et al.: Identifying barriers to sustainable apple production: a stakeholder perspective. J. Environ. Manage. **302**, 114082 (2022)
48. Cox, V., Overbey, J.A.: Generational knowledge transfer and retention strategies. Dev. Learn. Organ.: An Int. J. **37**(4), 10–13 (2022)
49. Lewandowski, P., Keister, R., Hardy, W., Górka, S.: Ageing of routine jobs in Europe. Econ. Syst. **44**, 100816 (2020)
50. Christ, K.L., Helliar, C.V.: Blockchain technology and modern slavery: reducing deceptive recruitment in migrant worker populations. J. Bus. Res. **131**, 112–120 (2021)
51. Shepherd, R., Lorente, L., Vignoli, M., et al.: Challenges influencing the safety of migrant workers in the construction industry: a qualitative study in Italy, Spain, and the UK. Saf Sci **142**, 105388 (2021)
52. Wang, J.J.: The labour surplus and COVID-19: the outlook for Chinese migrant low-skilled workers. Account. Finance **62**, 577–596 (2022)
53. Cole, R., Al-Ma'aitah, N., Al Hasan, R.: Integrating Syrian refugee workers in global supply chains: creating opportunities for stable trade. J. Humanitarian Logistics Supply Chain Manag. **12**(3), 404–424 (2022)
54. Zuntz, A., Klema, M., Abdullateef, S., et al.: Syrian refugee labour and food insecurity in Middle Eastern agriculture during the early COVID-19 pandemic. Int. Labour Rev. **161**, 245–266 (2022)
55. van den Broek, D., Wright, C.F., Howe, J., Reilly, A.: Pro-market governance, migration status and worker vulnerability: the case of Australian horticulture. Econ. Ind. Democr. **42**, 1305–1325 (2021)
56. Chanani, S., Spector, H., Restrepo Alvarez, S., et al.: Challenges to increasing visibility and support for children in Bangladesh's informal ready-made garment factories. Bus. Strategy Dev. **5**, 361–374 (2022)
57. Mirabelli, G., Solina, V.: Blockchain and agricultural supply chains traceability: research trends and future challenges. Procedia Manuf. **42**, 414–421 (2020)
58. Calzavara, M., Battini, D., Bogataj, D., et al.: Ageing workforce management in manufacturing systems: state of the art and future research agenda. Int. J. Prod. Res. **58**, 729–747 (2020)
59. Fan, J., Teng, H., Wang, Y.: Research on recycling strategies for new energy vehicle waste power batteries based on consumer responsibility awareness. Sustainability **14**, 10016 (2022)
60. Sinha, P., Sharma, M., Agrawal, R.: A systematic review and future research agenda for sustainable fashion in the apparel industry. Benchmarking: An Int. J. (2022)

61. Loaiza-Ramírez, J.P., Moreno-Mantilla, C.E., Reimer, T.: Do consumers care about companies' efforts in greening supply chains? Analyzing the role of protected values and the halo effect in product evaluation. Cleaner Logistics Supply Chain **3**, 100027 (2022)
62. Zanjirani Farahani, R., Asgari, N., Van Wassenhove, L.N.: Fast fashion, charities, and the circular economy: challenges for operations management. Prod. Oper. Manag. **31**, 1089–1114 (2022)
63. Galkin, A., Yemchenko, I., Lysa, S., et al.: Exploring the relationships between demand attitudes and the supply amount in consumer-driven supply chain for FMCG. Acta Logistica **9**, 1–12 (2022)
64. Alonso-Muñoz, S, González-Sánchez, R., Siligardi, C., García-Muiña, F.E.: Analysis of the textile supply chain from a circularity perspective: a case study. In: Eurasian Business and Economics Perspectives: Proceedings of the 34th Eurasia Business and Economics Society Conference, pp. 213–234. Springer (2022)
65. Brydges, T.: Closing the loop on take, make, waste: Investigating circular economy practices in the Swedish fashion industry. J. Clean. Prod. **293**, 126245 (2021)
66. Stringer, T., Payne, A.R., Mortimer, G.: As cheap as humanly possible: why consumers care less about worker welfare. J. Fashion Market. Manag.: An Int. J. **26**, 717–737 (2022)
67. Gong, M., Gao, Y., Koh, L., et al.: The role of customer awareness in promoting firm sustainability and sustainable supply chain management. Int. J. Prod. Econ. **217**, 88–96 (2019)
68. Battini, D., Calzavara, M., Sgarbossa, F., Persona, A.: MRP Theory supporting trade-off between investments in collaborative robots and production in foreign countries for a water pumps supply chains. In: SOR'17 Proceedings 229–234 (2017)
69. Bogataj, D., Bogataj, M.: Age management of human resources. In: SOR'17 Proceedings, pp. 235–241 (2017)
70. Kwabena Donkor, F., et al.: Attitudinal changes towards agriculture through the generational lens and impact on engagement in related activities: Case study from a mountainous area. In: Squires, V.R., Gaur, M.K. (eds.) Food Security and Land Use Change under Conditions of Climatic Variability, pp. 165–179. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-36762-6_9
71. Burmeister, A., Deller, J.: Knowledge retention from older and retiring workers: what do we know, and where do we go from here? Work Aging Retire **2**, 87–104 (2016)
72. Ropes, D.: Intergenerational learning in organizations. An effective way to stimulate older employee learning and development. Dev. Learn. Organizations **28**, 7–9 (2014)
73. Rubin, L., Sparzo, G.M.: An aging work force that will not retire. Strategic HR Rev. **19**(3), 103 (2020)
74. Cho, S.-H., Fang, X., Tayur, S., Xu, Y.: Combating child labor: incentives and information disclosure in global supply chains. Manuf. Serv. Oper. Manag. **21**, 692–711 (2019)
75. Fabry, A., Van den Broeck, G., Maertens, M.: Decent work in global food value chains: evidence from Senegal. World Dev **152**, 105790 (2022)
76. Cole, R., Shirgholami, Z.: The outlook for modern slavery in the apparel sector in a post-lockdown economy. Supply Chain Manag.: An Int. J. **27**, 526–537 (2022)
77. Bogataj, D., Battini, D., Calzavara, M., Persona, A.: The response latency in global production and logistics: a trade-off between robotization and globalization of a chain. Procedia Manuf. **39**, 1428–1437 (2019)
78. Vieira, J.G.V., Fransoo, J.C., Carvalho, C.D.: Freight distribution in megacities: perspectives of shippers, logistics service providers and carriers. J. Transp. Geogr. **46**, 46–54 (2015)
79. Xie, B., Li, W., Zhao, D., Jiang, P.: Effects of network externalities and recycling channels on closed-loop supply chain operation incorporating consumers' dual preferences. Math. Probl. Eng. **2022**, 1–20 (2022). https://doi.org/10.1155/2022/3347303
80. Reike, D., Hekkert, M.P., Negro, S.O.: Understanding circular economy transitions: the case of circular textiles. Bus Strategy Environ. **32**, 1032–1058 (2023)

81. Ebrahim, S., Niemann, W., Kotzé, T.: Sustainable supply chain integration: an exploration of South African fast-moving consumer goods manufacturers. South African J. Econ. Manag. Sci. **25**, 1–14 (2022)
82. Camargo, L.R., Pereira, S.C.F., Scarpin, M.R.S.: Fast and ultra-fast fashion supply chain management: an exploratory research. Int. J. Retail Distrib. Manag. **48**, 537–553 (2020)
83. Bubicz, M.E., Barbosa-Póvoa, A.P.F.D., Carvalho, A.: Social sustainability management in the apparel supply chains. J. Clean. Prod. **280**, 124214 (2021)
84. Rupčić, N.: Intergenerational learning and knowledge transfer – challenges and opportunities. Learn. Organ. **25**(2), 135–142 (2018)
85. Hecker, I., Spaulding, S., Kuehn, D.: Digital Skills and Older Workers: Supporting Success in Training and Employment in a Digital World. Urban Institute (2021)
86. Özdemir Akyildirim, Ö.: Materiality of supplier sustainability assessment for buyer companies in a global context. Supply Chain Forum: An Int. J. 1–18 (2023)
87. Gilbert, D.U., Huber, K.: Labour rights in global supply chains. Corporate Responsibility, 2nd edn. Cambridge University Press, Forthcoming (2023)
88. Mani, V., Gunasekaran, A.: Four forces of supply chain social sustainability adoption in emerging economies. Int. J. Prod. Econ. **199**, 150–161 (2018)
89. Srhir, S., Jaegler, A., Montoya-Torres, J.R.: Uncovering Industry 4.0 technology attributes in sustainable supply chain 4.0: a systematic literature review. Bus Strategy Environ. (2023)