Ulm University

Institute of Sustainable Corporate Management

# Empirical analysis of focal company tools and instruments for implementing sustainability in supply chain management (SSCM)

Cumulative doctoral thesis

Submitted to the Faculty of Mathematics and Management of Ulm University

For the academic degree of Doctor of Management and Economics Dr. rer. pol.

By

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2021

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Date of the oral examination: 16th of June, 2021

# Declaration

The research contributions reproduced in Part B of this cumulative dissertation have been published in the form of the original research articles in academic journals, which are cited in full below:

Fraser, I. J., Müller, M., & Schwarzkopf, J. (2020). Dear supplier, how sustainable are you? *Sustainability Management Forum | NachhaltigkeitsManagementForum,* 28 (3), pp. 127-149. Springer Berlin Heidelberg. doi:10.1007/s00550-020-00507-z

Fraser, I. J., Schwarzkopf, J., & Müller, M. (2020). Exploring Supplier Sustainability Audit Standards: Potential for and Barriers to Standardization. *Sustainability*, 12(19), 8223. doi:10.3390/su12198223.

Fraser, I. J., Müller, M., & Schwarzkopf, J. (2020). Transparency for Multi-Tier Sustainable Supply Chain Management: A Case Study of a Multi-tier Transparency Approach for SSCM in the Automotive Industry. *Sustainability*, 12(5), 1814. doi:10.3390/su12051814

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# Acknowledgements

The completion of this doctoral thesis marks the end of a significant journey. Reaching the finish line would not have been possible without high-quality, unfaltering and patient support from my excellent supervisors, fellow doctoral candidates, and colleagues as well from an important and diverse support crew, including: close colleagues and PhD candidates, dearest friends near and far, a supportive and communicative family and an unwavering, fantastic partner.

To my supervisors, Martin Müller and Julia Schwarzkopf, thank you both for taking on a candidate who had had a significant break from university, and was coming to business and economics from an exotic background. I highly appreciate the time you took to review the many drafts and for providing sound methodological and academic input throughout the years. Together your wealth of knowledge and practical experience has really enrichened my understanding of the subject material. It has been a pleasure to learn from you both, collaborate on papers and to work with you. I really consider myself a fortunate doctoral candidate to have had not only one, but two, excellent supervisors! Thank you for giving me the chance to work at the nexus of practice and research in sustainability and for guiding me to three publications by the end of 2020 and the successful completion of this thesis.

Being an external PhD candidate, based far away from Ulm University could have been a lonely affair. However, my academic journey was greatly enriched by helpful input and many friendly interactions with other professors and talented PhD candidates involved in the corporate sustainability research colloquium. Special thanks to Profs. Rüdiger Hahn, Stefan Gold, Michael Hiete, Stefan Seuring and Markus Brandenburg for your constructive critique and feedback on various papers. Heartfelt thanks to numerous fellow doctoral candidates for the solidarity, academic and personal support over the years.

This research was consciously chosen to be applied and based on realities as practiced in the business world. Many passionate colleagues have accompanied me in the last four years and together we have worked hard to improve sustainability in supply chain management. Huge thanks to Daniel Goehler, for supporting me through this challenging period and making sure that I didn't take on yet another interesting project, further distracting from the dissertation. To the K-BG/BB/BB/N and SiSR crew: thanks for being one of the most fun and inspiring teams I could imagine working in!

The long road to a doctorate would never have been possible without a supportive family that always encouraged my curiosity and thirst for knowledge – endless gratitude to you all. Despite 16 – 18,000 kilometres distance, we remained close. I appreciate your positivity, humour, encouragement, curiosity, and healthy sense of confidence that you frequently instilled in me. I also want to thank my partner's family, who have been the best adoptive family I could ask for in such a testing life phase. I really appreciate your encouragement and for enabling dissertation sessions on our various holidays/vacations together.

To my dear friends near and far, thank you for your patience, support, distraction, and encouragement. Some of you became something of a surrogate family for me in Berlin, particularly when the going got tough. This I particularly appreciate given that my own family is so far away.

Finally, to my amazing partner, Lisa. Thank you for encouraging me to check and test myself. You have been my rock throughout these last four years. I simply cannot thank you enough for the companionship, love, patience and support throughout this time. I am indebted to your kind and steadying support, which enabled me to successfully complete this challenging project. So much love and appreciation!

# Executive Summary

The rapidly growing field of Sustainability in Supply Chain Management (SSCM) constitutes the academic and practical context for this dissertation. The research takes note of the theoretical and high-level nature of most research in the field of SSCM and responds to challenges to make future research more practical and ensure operational and managerial relevance for the companies that have to implement sustainability in their supply chain operations. As stakeholder pressure continues to demand more accountability and responsibility of global brands, so-called focal companies (FC), it is important that these companies have the means to understand the sustainability issues in their supply chains. Undertaking empirical analyses of tools and instruments used by FCs to monitor their suppliers' conformance with sustainability expectations and measure their sustainability performance, this dissertation provides qualitative, in-depth insights into how sustainability can be operationalised by companies at varying stages of SSCM implementation and maturity. The three published, peer-reviewed research contributions that constitute this cumulative dissertation, concern different tools and instruments employed at different stages along a journey toward SSCM.

The first research contribution, titled: "Dear supplier, how sustainable are you? A multiple-case study analysis of a widespread tool for sustainable supply chain management" offers a good starting point for thinking about the instruments that constitute active management of sustainability in a FC's supply chain. It begins by arguing that supplier self-assessment questionnaires (SAQ) seem to constitute a primary tool for companies to measure their suppliers' sustainability practice and performance, but that these tools are assumed to be neutral measurement devices. Using an abductive research design the article identifies a significant research gap in the canon of SSCM research, whereby these constitutive tools that potentially inform various SSCM assumptions have not been empirically, academically assessed or critically reflected upon. Drawing on interdisciplinary insights regarding questionnaire design, response desirability and particularly considering supplier assessment fatigue, this contribution compares and analyses over 25,000 supplier responses to two different types of sustainability SAQs. The findings show that the questionnaire design and process in which the questionnaire is embedded, coupled with the inclusion of response validation and sharing mechanisms (suppliers can share their SAQs with multiple buying companies) in the assessment process, may significantly affect supplier responses. Given that questionnaires are a cost-effective tool to assess a large number of suppliers, it is advisable to understand the limits and risks inherent in them and how to implement them in an effective manner.

The second published research contribution, analyses an instrument employed in SSCM that represents a more mature, resource-intensive form of sustainability monitoring and performance measurement, namely auditing. The article, titled: "Exploring Supplier Sustainability Audit Standards: the potential of and limits to standardization" provides data on the phenomenon of joint audit standards that have been developed by private, voluntary sustainability initiatives and associations to ensure consistent assessment of suppliers within an industry or across multiple branches. Hence the second contribution builds on the concepts expounded in the first contribution, such as supplier fatigue and tools that produce data, which can be shared by the supplier with multiple buyers. The research assumes that audit activity is increasing and asks to what extent the various audit standards can be cross-recognised between initiatives and eventually themselves standardised. The article gathers data from eight initiatives and the data generated confirms a massive growth in the number of common audits conducted in the last ten years. This contribution finds a striking similarity among audit standards in terms of audit process and phases. Furthermore, 13 major sustainability categories are identified as areas of major focus in the audits. Seven of these categories are covered by all eight audit standards, and the other six categories are present in three-quarters of the standards surveyed. These finding lend support to the hypothesised potential for cross-recognition and standardisation. However, deeper, more granular analysis of the audit standards at the level of individual questions found in the audit protocols, reveals much heterogeneity among the standards, indicating significant barriers for cross-recognition and developing a universal audit standard.

The third and final research contribution, titled: "Transparency for Multi-Tier Sustainable Supply Chain Management: A case study of a multi-tier transparency approach for SSCM in the automotive industry" also entails a qualitative, in-depth case study of a project undertaken by a global FC to achieve more transparency in a critical supply chain, back to the level of raw material production. This research seeks to understand more mature SSCM activities, that look to extend their reach beyond the direct suppliers upstream to sub-suppliers. Much SSCM literature assumes the need to manage and improve sustainability further upstream in global SCs and a number of frameworks have been proposed about how SSCM might be extended and applied to sub-supply chains. But very little empirical evidence has been uncovered and presented on how supply chain transparency can be achieved and implemented by FCs. This article argues that supply chain transparency is the defining pre-condition, which must first be achieved, for FCs (and downstream, tier-1 suppliers) to be able to know where to direct their SSCM activities. The research found that both the FC and the first-tier supplier had grossly underestimated the supply chain complexity; the transparency instruments and processes revealed nearly thrice as many SC actors as initially known. The contribution concludes by pointing to the potential for multi-tier supply chain

transparency for SSCM to contribute to more supply-chain wide collaboration and improvement of supply chain governance. All three published research contributions were co-authored (15%) by professors Martin Müller and Julia Schwarzkopf and the author of this dissertation (85%).

This dissertation provides unique and novel empirical insights and relevant analysis of core SSCM tools and processes that have emerged and increasingly been implemented in the last decade. The qualitative research enabled in-depth understanding and critical reflection on these core instruments of SSCM that have often been taken for granted in extant SSCM literature. The findings in the individual research articles provide both academics and practitioners within the field of SSCM, as well as interested and concerned stakeholders, with a better understanding of how abstract terms such as 'supplier sustainability performance' and 'sustainable supply chains' are currently being measured, monitored and communicated. The author concurs with existing conceptions of the implementation of sustainability in to traditional supply chain management as a journey, and this dissertation provides snapshots of empirical evidence for how tools and instruments can be applied at various stages on such a journey towards SSCM.

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## List of Abbreviations

| | |
|---|---|
| AFC | Automotive Focal Company |
| CoC | Code of Conduct |
| e.g. | For example |
| FC | Focal Company/ Focal Companies |
| MT-SC | Multi-Tier Supply Chain(s) |
| MT-SSCM | Multi-Tier Sustainable Supply Chain Management |
| OEM | Original Equipment Manufacturer |
| SAQ | Self-Assessment Questionnaire(s) |
| SC | Supply Chain(s) |
| SCM | Supply Chain Management |
| SI/A | Sustainability Initiative(s) / Association(s) |
| SSA | Supplier Sustainability Audit |
| SSAS | Supplier Sustainability Audit Standard |
| SSCM | Sustainability in/ Sustainable Supply Chain Management |
| TfS | Traceability / Transparency for Sustainability |

# **A.** Cumulus – Compiled Thesis

The cumulative thesis consists of a compilation of three, self-contained, academic contributions in the form of original research articles (see section 'B. Published Research Contributions'), published in peer-reviewed academic journals. The title 'Empirical analysis of focal company tools and instruments for implementing sustainability in supply chain management (SSCM)' includes the common foci of the contributions (tools and instruments) and indicates that the complex topic of sustainability in supply chain management is approached from the perspective of large, multi-national corporations, 'focal companies' (FCs). These FCs are usually required to take responsibility for sustainability in their global supply chains (SCs) and are typically the actors that have leverage and resources to do this. As global SCs are both vertically and horizontally diverse and complex, FCs have to develop multi-faceted sustainability strategies for their supply chain management (SCM), which involve an array of policies, tools, processes and standards. Each research contribution in this thesis takes an in-depth look at a tool or instrument, which together give structure to different developmental phases on the path towards SSCM.

The cumulus section of the dissertation (section 'A.') aims to provide an overarching framework for the individual research contributions that follow in section B. Section A outlines how they each contribute new and important knowledge – obtained through empirical methods – to different aspects of the broader field of SSCM. It demonstrates the important research gaps that they have addressed and how they are beneficial for academia. They also illustrate practical lessons and potential implications for actors and practitioners in the field of SSCM. After an introduction to the area of SSCM research, the academic context of the dissertation (A1), the cumulus presents the scope and delineation of the research as a whole, and hence how the individual research contributions correspond to extant research in general (A2). In order to gain a deeper understanding of the actual application of SSCM in a global FC context, qualitative, multi-method research was undertaken. Section A3 summarises the research designs that were followed as well as the methods that were applied in order to generate empirical data and undertake a thorough analysis of core tools and instruments. This is followed in section A4 by a summative discussion of the research contributions'

findings and how these relate to existing SSCM knowledge and research. The relevance of the cumulative findings in terms of its implications for both academia and practitioners, is presented in section A5. Finally, conclusions drawn from the research as a whole are summarised in section A6. Section A is followed by the individual research articles, presented in their entirety in Section B.

# 1. Introduction

*"A company is no more sustainable than its supply chain"* Krause et al. 2009, p. 18.

Over 10 years ago, Krause et al. (2009) formulated this bold premise to underline the central importance of supply chains (SCs) to a company's sustainability strategy and general performance, and to strengthen the case for the emerging sustainability dimension in supply chain management (SCM) research and practice (Pagell and Shevchenko 2014). Since that time, research activity within the field of sustainability in supply chain management (SSCM) (Ahi and Searcy 2013; Ashby et al. 2012; Gimenez and Tachizawa 2012; Seuring and Müller 2008; Carter and Easton 2011) has flourished, in particular over the last five years (Carter et al. 2019; Beske-Janssen et al. 2015; Ansari and Kant 2017; Koberg and Longoni 2019; Brandenburg et al. 2019; Kashmanian 2017; Lis et al. 2020; Dubey et al. 2017b). This development in academic output reflects corresponding developments and activity in the world of international business and global governance (Kashmanian and Moore 2014; Locke 2013; BSR & UNGC 2015; Villena 2019; Alexander 2020; Walker and Jones 2012; Thorlakson et al. 2018; Harms et al. 2013).

Regardless of whether explicit or implied, the predominant SSCM analytical focus, remains on powerful and visible, multinational, focal companies (FCs) (Frostenson and Prenkert 2015), which design and/or offer final products and services to customers, tend to have power and exert influence over their supply chains (Seuring and Müller 2008). Increased market access and trade liberalisation, hallmarks of the most recent wave of globalisation, which has occurred since the 1990s (Borja Reis and Cardoso 2020), have enabled multinational FCs to extend their global reach, and respectively, their purchasing activities and capabilities (Petersen et al. 2000; Gunasekaran et al. 2004). These developments have coincided with a privatisation of global governance, wherein private actors (such

as FCs) are supposed/assumed to voluntarily commit to sustainability goals and ensure sustainable development, as it relates to their business activity around the world, in lieu of public actors who have not enforced strict sustainability standards (Mayer and Phillips 2017; LeBaron et al. 2017; Boström et al. 2015; Locke et al. 2013; Morcillo-Bellido and Duran-Heras 2020; Alexander 2020). Yet, serious problems such as excessive overtime, worker discrimination (ITUC 2020; Locke 2013), human rights abuses and modern slavery (Caruana et al. 2020), and environmental degradation and accidents (Ferri and Pedrini 2018; Wolf 2014; Hartmann and Moeller 2014; Bové and Swartz 2016) continue to be persistent features of global SCs. Hence, unsurprisingly, FCs are confronted with increasingly demanding stakeholder expectations and requirements that aim to increase FC accountability and improve sustainability in global SCs (Meixell Mary J et al. 2015; Wolf 2014; Rebs et al. 2019; Villena and Gioia 2018; Busse et al. 2017).

Thus, the question arises: how can FCs manage (and ideally improve) the sustainability in their SCM? Much of the extant SSCM literature has either been theoretical (e.g. Rebs et al. 2019; Beske et al. 2014; Mena et al. 2013; Sauer and Seuring 2018a) and/or conducted towards a higher level of abstraction that focuses on SC-wide outcomes or tries to develop frameworks (Seuring and Gold 2013; Garcia-Torres et al. 2019; Hoejmose et al. 2013; Fritz et al. 2017). These are removed from the practical challenge of *how* to operationalise, implement, and improve sustainability in FCs' supply chain operations (Das 2017). More than a decade after SSCM as an academic discipline was formalised by early and widely accepted, seminal definitions (Carter and Rogers 2008; Seuring and Müller 2008), the challenge remains that companies' progress towards SSCM is limited and reduced by a lack of guidance for companies about how to implement sustainability in their operations (Fritz 2019; Baumgartner and Rauter 2017).

As an initial instrument for implementing SSCM, supplier codes of conduct (CoC) establish sustainability expectations of suppliers and have been well researched (see, e.g.: Egels-Zandén 2014; Locke et al. 2013; Kashmanian 2018). Moreover, individual studies have analysed environmental tools (Lee and Kashmanian 2013) and tools for social sustainability (D'Eusanio et al. 2019) at a higher level. However, in general, analytical research is lacking on SSCM *tools and instruments* that can enable FCs

to measure, assess, monitor and ideally improve the sustainability performance of their suppliers as envisioned by various frameworks (Qorri et al. 2018; Sancha et al. 2016; Schoeggl et al. 2016b). Indeed, Imbrogiano (2020) challenges both SSCM academia and business practitioners by pointing to the common assumption that management tools, mechanisms and processes even promote sustainability performance at all, without understanding how performance occurs, is defined, and measured, and that these assumptions create a contingency in much SSCM research design. This dissertation seeks to address the identified research gap and provide empirical insights into the assumptions and workings of core tools employed by FCs for SSCM. The dissertation thematises issues connected to tools and instruments, such as: supplier assessment fatigue (Newitt 2012), social desirability bias in supplier self-assessment, barriers to standardisation, the importance of embedding tools and instruments in core purchasing processes, and the need for supply chain transparency as a precondition for extending the implementation of such tools in multi-tier supply chains (MT-SCs). In the following section, the dissertation is framed in depth vis-à-vis existing research and the scope of the research is delineated.

## 2. Framing the Research and Dissertation Scope

In response to an identified need for a better understanding of how SSCM has been (and can be) operationalised, practised and pursued by global FCs, this dissertation provides empirical insights into some of the core SSCM tools and instruments. The research argues that tools and instruments, as well as the processes they require and entail, form part of the SSCM strategies that necessitate various degrees of effort, and hence necessitate a more mature SSCM. In this manner the dissertation can be framed within the conception of SSCM as a journey of development from traditional SCM toward implementing SSCM, as proposed by Silvestre (2015) and continued by others (e.g. Roy et al. 2018; Brandenburg et al. 2019; Meqdadi et al. 2020). An extensive initial review of SSCM literature demonstrated that there is much research being conducted that refers to SSCM. This involves SC partners and actors, and requires buy-in from assorted internal and cross-organizational stakeholders, among others (Canzaniello et al. 2017; Alexander 2020; Boström et al. 2015). However,

in the extant literature there were few papers found that outline what SSCM tools are employed, and if they did, they did not explain how the tools are designed, what purpose they (should) fulfil, how they are operationalised, what SSCM data they generate, and - just as importantly - the extent to which such data is accurate and trustworthy. Neither were concrete mechanisms found that analysed how such SSCM performance can be aligned and shared, nor how to apply such SSCM tools, approaches and strategies further up multi-tier supply chains (Meinlschmidt et al. 2018).

Owing to the lack of established research on the tools and instruments that constitute SSCM, this cumulative thesis seeks to redress this gap by exploring different examples of tools and processes, describing how they function, and then analysing them in order to make well-founded suggestions for practitioners and academics within the field. In alignment with the notion of SSCM as a journey or process of implementation (Brandenburg et al. 2019; Silvestre 2015; Roy et al. 2018), this research includes in-depth analyses of tools and instruments that can be implemented sequentially. It represents increasing levels of required effort, and, as a result, SSCM maturity and supply chain reach as well. Underlying the frame of this dissertation is the concept that different tools, instruments and processes correspond to different phases of SSCM implementation (Roy et al. 2018). Typically, in the first phase (adoption) a FC publicly communicates the importance of sustainability in the supply chain and establishes sustainability requirements, i.e., a Code of Conduct (CoC). The next phase, implementation, requires the FC to monitor supplier conformance and adherence to such requirements as well as their general sustainability performance (Kashmanian and Moore 2014; Beske-Janssen et al. 2015). Once SSCM has been adopted and implemented, it can be extended. This can entail extension in the sense of more intensive monitoring, proactive risk management and supplier development and/or extending the reach of SSCM activities further up the supply chain (Busse et al. 2017; Gimenez and Tachizawa 2012; Sauer and Seuring 2018b; Grimm et al. 2016).

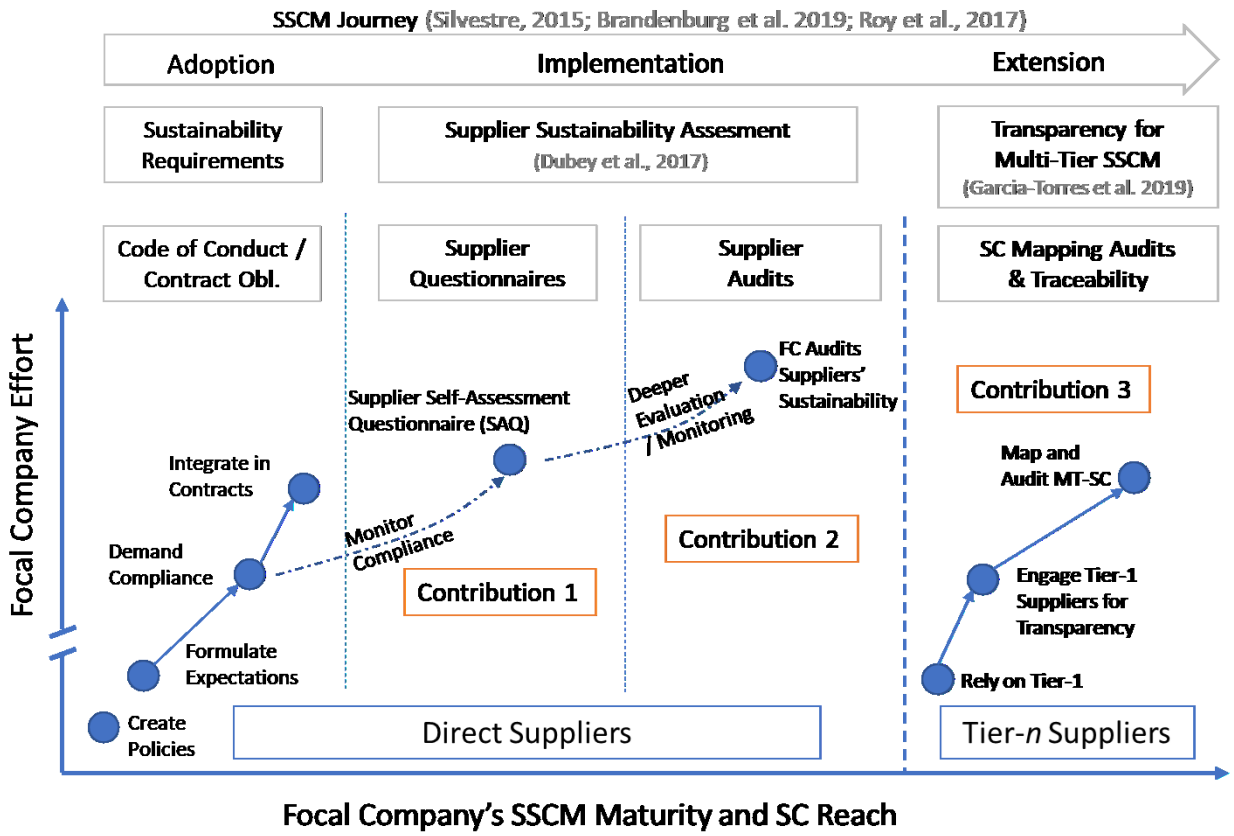


**Figure 1.** Framing the dissertation on SSCM tools and instruments within a broader SSCM Context

Figure 1 depicts the framing of the individual research contributions within current SSCM research. At the top of the figure are the three first facets of SSCM (Roy et al. 2018) along a typical journey from traditional SCM to SSCM: company adoption, implementation and extension. Below this, the figure is divided into three thematic areas that are of recurring relevance to the dissertation and correspond to instruments: FC sustainability requirements, supplier sustainability assessment and transparency for multi-tier SSCM. Below this, SSCM tools are assigned to each of these themes. The y-axis depicts company effort, such that upward movements across all phases and categories means that these require more resources to implement. The x-axis represents SSCM maturity and supply chain reach. Hence, Figure 1 summarises how such tools and instruments are embedded in the larger SSCM context and demonstrates how each tool can be seen to fulfil a function as part of a SSCM trajectory or journey.

In response to increasing pressure from a growing number of stakeholders, FCs formulate sustainability expectations of and requirements for their suppliers and can include these in contracts

(Egels-Zandén 2014; Foerstl et al. 2015; Bartley and Egels-Zandén 2015). This initial SSCM step ("Adoption", see Figure 1) requires little operational resource commitment from FCs, insofar as policies, management awareness and the public announcement of the adoption step are not resource intensive. Once FCs have decided on and declared their minimum requirements of their suppliers, they will require suppliers to comply with these sustainability requirements. In order to monitor whether this is taking place, FCs may utilise tools to measure compliance, as well as introduce instruments to move beyond compliance and measure their suppliers' sustainability performance and risk (Foerstl et al. 2015; Seuring and Gold 2013). Given that adoption (e.g., CoCs and contractual obligations) has already featured in previous extant research, this dissertation analyses the three tools and instruments located in the next columns of SSCM implementation that come after establishing sustainability requirements, namely: supplier sustainability assessment (questionnaires and audits), SC transparency and mapping audits for sustainability in MT-SCs (see Figure 2).

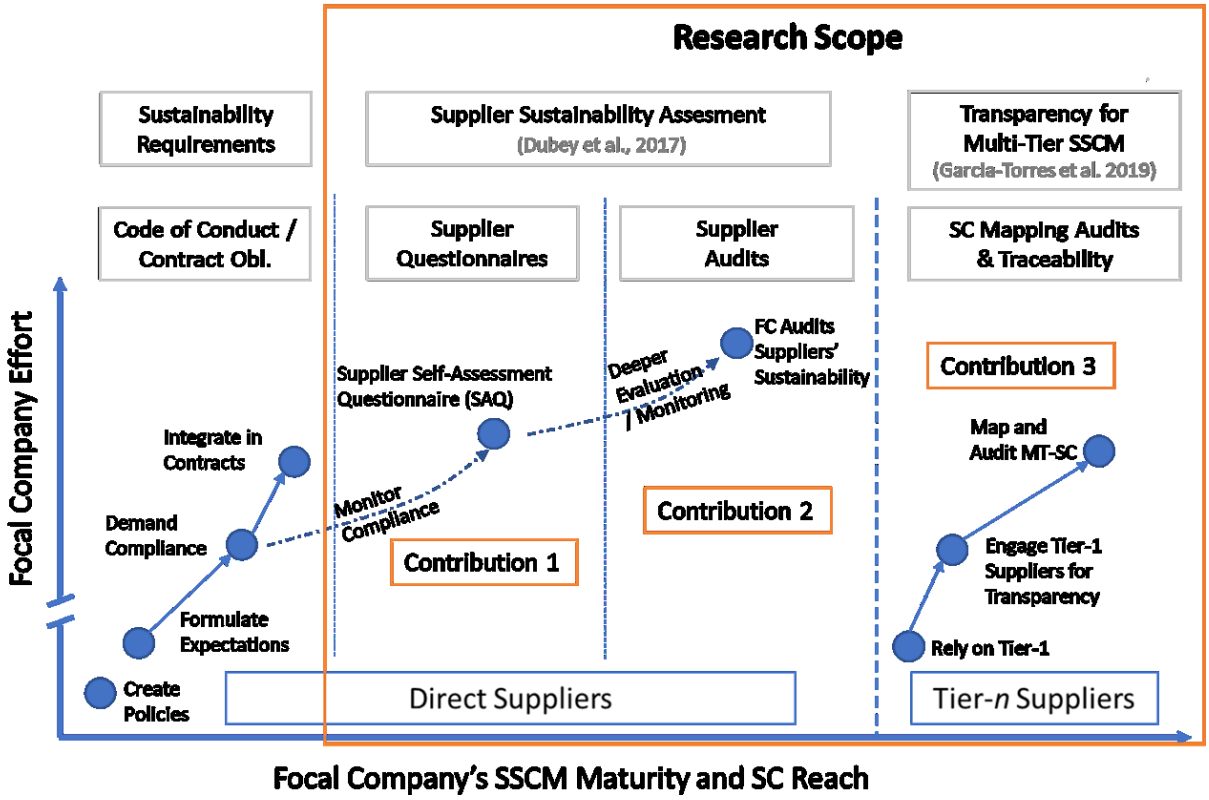


**Figure 2.** Framing the dissertation's focus on SSCM tools and instruments

Within the scope of the research delineated above in Figure 2, the dissertation focusses on three distinct SSCM processes:

1. Broad-based, high-level assessment of supplier sustainability practice and activity, typically conducted in the form of self-assessment questionnaires (SAQ).
2. Deeper assessment in the form of a facility audit of the suppliers' operations to determine the observable, snap-shot reality of sustainability performance as practised on the ground.
3. Tier-for-tier establishment of transparency for sustainability purposes, in particular high-risk supply chains, in order to understand material flows from the raw material source and assess sustainability performance (for example, by including responsible sourcing practices).

This dissertation contains three separate but related analyses of exemplary tools that provide an in-depth understanding of how SSCM is currently being implemented by FCs. They involve differing degrees of FC effort and SSCM maturity (as depicted in Figures 1 & 2 above). In the following, the research goal and research questions are presented and summarised.

## 2.1 Dissertation's Research Goal and Research Questions

The overarching research goal of this dissertation is to provide empirical insights into core tools and instruments. In determining the foci of the dissertation, the author recognised recommendations from both international organisations and academia that suggest and assume various implemented SSCM processes. Examples include: monitoring suppliers' broad compliance with CoC, assessing actual performance at local supplier sites, or establishing supply chain transparency. However, little empirical, qualitative analysis could be identified that had been undertaken to understand what tools and processes might underly these types of suggested processes, or how they function in practice. Only with an informed understanding (also of the weaknesses and challenges, as contested by Imbrogiano 2020) can one begin to think about the effectiveness of such tools for SSCM outcomes, as well as optimal processes and strategies for FCs to employ that are necessary for accommodating those tools and enabling them to be effective. Recognising the need for an empirical understanding and an initial analysis of the actual mechanisms that constitute practiced SSCM, this cumulative dissertation aims to analyse core tools and processes in use in the phases depicted in Figure 2. The following sub-sections introduce the research questions underlying the individual research contributions. They are depicted together and are matched to the research framework in Figure 3.

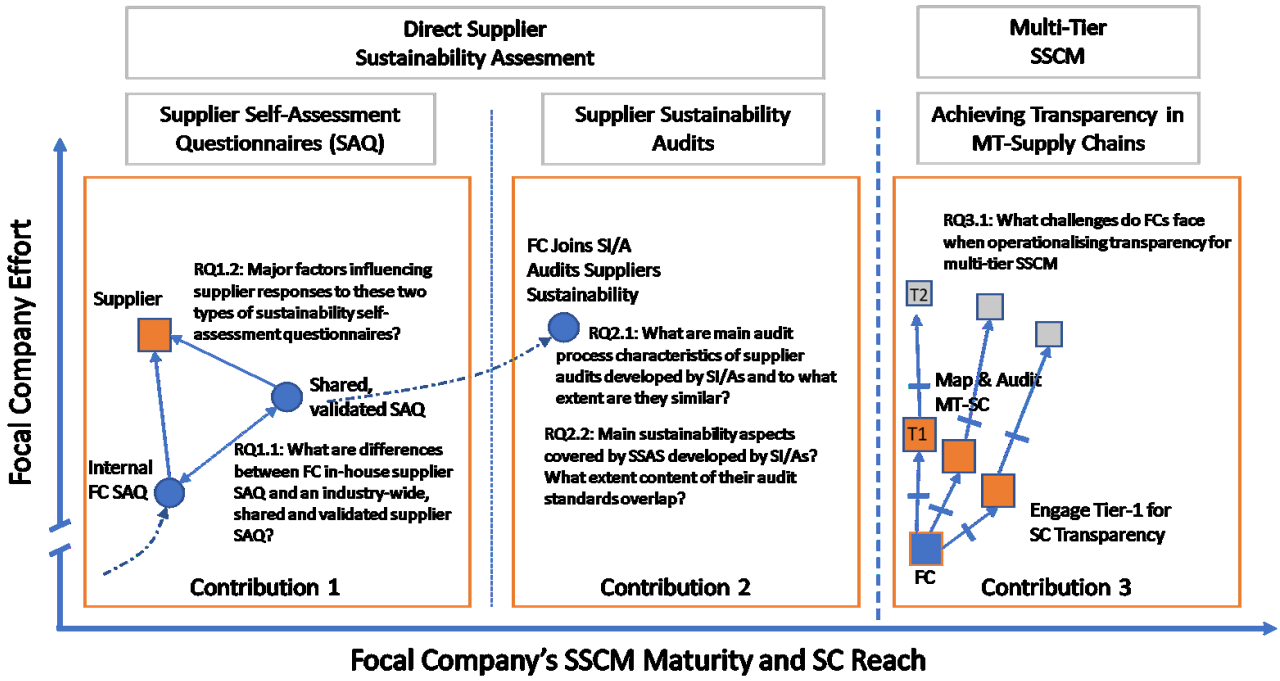


**Figure 3**. Locating the research questions within the dissertation's framework

### 2.2.1 Supplier Self-Assessment Questionnaires for SSCM

Sustainability self-assessment tools are a natural and wide-spread choice for this initial monitoring and measuring step (Müller and Bessas 2017), as they allow FCs to cover a large number (and preferably all) of their suppliers in a cost-effective manner. As central as self-assessment questionnaires are to SSCM (e.g., Ecovadis, Sedex, Chemical Industry Initiative 'Together for Sustainability', Automotive Initiative 'Drive Sustainability' etc.) there is very little extant academic literature that focusses on these tools in the context of SCM, on what they are capable of and what their weaknesses are, as well as the necessary processes associated with integrating them into strategies. Thus, the first research contribution (B1) comprises a multiple-case study of supplier sustainability SAQs that compares and contrasts a questionnaire developed internally by a global FC, and a SAQ co-developed at industry level that is validated by an external service provider. Addressing an apparent research gap and a lack of empirical insights into what constitutes types of SSCM self-assessment, the first research question was both exploratory and descriptive:

> RQ1.1: What are the differences between an in-house, one-off supplier self-assessment questionnaire and an industry-wide, shared and validated supplier self-assessment?

The research did not just seek to describe the constitution and process differences between two questionnaires employed for similar SSCM purposes, but also sought to understand how such differences might affect supplier responses:

> RQ1.2: What might the major factors influencing supplier responses to these two types of sustainability self-assessment questionnaires be?

Given calls for sharing sustainability data among supply chain data (Lechler et al. 2019; Schoeggl et al. 2016b), the research on SAQs takes an in-depth look at the tools by which such supply chain sustainability performance data is generated.

As depicted in Figure 1, the supplier self-assessment is portrayed as requiring less effort and being a more cost-effective approach to monitoring supplier compliance with sustainability expectations (Hajmohammad and Vachon 2016; Canzaniello et al. 2017; Müller and Bessas 2017). However, the sustainability focus of this type of evaluation is at a higher level and typically involves more abstract questions (e.g., 'do you have a management system for xyz?'; 'is there a responsible management person for xyz?') and can demonstrate variations in supplier awareness and the implementation of sustainability within their operations. Furthermore, this type of self-assessment, whilst susceptible to social desirability bias, can ideally return differentiated sustainability performance results, which can point to where further risk identification and monitoring might be advisable (Foerstl et al. 2010; Short et al. 2016).

### 2.2.2 Supplier Sustainability Audits

Questionnaires cannot realistically be depended on to determine variable factory conditions and specific local sustainability issues. Hence, FCs often see the need to evaluate sustainability performance and monitor compliance in more detail by commissioning and/or conducting supplier sustainability audits (SSA). SSA activity appears to be increasing and FCs have joined multi-brand, private voluntary supply chain sustainability initiatives (Terwindt and Armstrong 2019) that have aligned and developed common standards for SSAs. The second research contribution (B2) explored eight sustainability initiatives / associations (SI/As), which represent multiple industries employing a common audit standard. The research set out to explore the phenomenon of SSAs, which was

perceived to be increasing; collect empirical data on the status quo of such audit standards; gather data on their prevalence, structure and content in order to compare them; and to determine the potential for standardisation. The following are the research questions that the second research contribution sought to answer:

> RQ2.1: What are main audit process characteristics of supplier audits developed by multi-brand sustainability initiatives/associations, and to what extent are they similar?
>
> RQ2.2: What are the main sustainability aspects covered by SSAS developed by SI/As, and to what extent does the content of their audit standards overlap?

### 2.2.3 Supply Chain Transparency for Multi-Tier SSCM

Both supplier audits and self-assessment questionnaires were analysed as prevalent tools employed by FCs as part of their SSCM involving their *direct* suppliers. But what about major sustainability risks and issues that occur further upstream in the supply chain, at tier two or much further up at the level of raw material extraction? Many authors point out that many more severe social and environmental sustainability risks do not occur at the tier one supplier sites, which have been subjected to multiple decades of scrutiny by global purchasing customers, but rather beyond the 'visible horizon' in the mid- and upstream SC (Villena and Gioia 2018; Busse et al. 2017; Meinlschmidt et al. 2018). Although SSCM scholars recognised that SSCM depended on the entire supply chain, much SC research had solely focussed on dyadic supplier-buyer relationships, which prompted Mena et al. (2013) to propose a theory of multi-tier SCM. This was extended to a conception of MT-SSCM shortly thereafter by Tachizawa and Wong (2014). In 2019, Garcia-Torres et al. proposed a Traceability for Sustainability (TfS) framework, based on a review of the apparel industry that shows how transparency, governance and collaboration interact and can lead to improved SSCM throughout supply chains (Garcia-Torres et al. 2019). This model served as the basis for the third research contribution, which sought to better understand how MT-SC transparency can actually be pursued by FCs as part of SSCM, as theoretically envisioned by the TfS framework. The third research contribution sought to answer the following research questions:

RQ3.1. What challenges do focal companies face when operationalising transparency for multi-tier (sustainable) supply chain management, in particular opaque supply chains?

RQ3.2. How might these challenges be overcome and what are the implications for the TfS model?

Focal Companies are considered the reference point (given their central role in driving and implementing SSCM) and lens (the contributions are primarily written from the perspective of FCs) for this dissertation as apparent in Figure 3. The constant research setting of all three contributions are supply chains and, more specifically, sustainability management within SCs. In terms of actors, articles one, two and three involve FCs and first-tier suppliers, while contribution three (B3) also includes sub-suppliers. Moreover, research contributions one (B1) and two (B2) also include one or more private, voluntary, multi-brand sustainability initiatives/associations (SI/As) focussing on supply chains. All three contributions also include an empirical analysis of the role of intermediaries in the form of questionnaire validators and a shared platform provider in article one, facility auditors for determining supplier sustainability practices on-site (B2 and B3), and expert auditors for confirming material flows and undertaking supply chain mapping for transparency (B3).

In the first (B1) and third (B3) contributions, a global Automotive Focal Company (AFC) is not only the primary actor but also constitutes the research setting as well. In the first contribution, the FC administers self-assessment questionnaires (the object of analysis) to its suppliers and a comparison is undertaken within the setting of the FC. In the third contribution the setting is a FC's endeavours to achieve more transparency in a high-risk multi-tier SC. SSCM provides the overarching research context, while the research lens is derived from the perspective of focal companies. Hence the research analyses approaches, processes, instruments and tools at the corresponding levels of operationalisation within SSCM, as practised by FCs. The following section (A3) presents the compiled research designs and the corresponding qualitative research methods that were employed to pursue the research questions introduced above.

# 3. Methods

This section introduces the various research designs and methods that were employed across all academic contributions. Although each academic contribution focussed on different objects of investigation, all research pertaining to this dissertation was qualitative in nature (Flick 2009; Yin 2018). Section 3.1 begins by describing the research design selected in response to the research questions introduced in subsections A2.2.1 to A2.2.3 above. This is followed by a description of how data was collected and analysed in 3.2. Finally, in 3.3, a summary of the high-level findings of all research contributions is presented.

## 3.1 Research Design and Methods

Reiterating the summary of the literature in sections A1 and A2, the academic field of SSCM is a multi-faceted topic. So too are the predominant actors, namely focal companies, both in terms of the maturity / advanced degree of their SSCM operationalisation, as well as the diverse drivers and motivations for undertaking such SSCM activities (Chen and Chen 2019; Canzaniello et al. 2017). Global FCs are progressively adopting SSCM, but the form this adoption / implementation takes is highly varied. In order to gain detailed, empirical insights into these variations and complexities, the dissertation favoured a multi-faceted, qualitative research approach (Cavaye 1996). Multiple research designs were employed and, correspondingly, a number of research methods were used that were appropriate for each contribution's central research questions. This was in order to generate rich data and provide a deeper understanding of real-world phenomena. In order to answer the research questions (presented above in section A2.1), various qualitative research designs and methods were applied, as summarised below.

### 3.1.1 Methods: Supplier Self-Assessment Questionnaires (SAQs) (B1)

The under-researched nature of SAQs in SSCM necessitated in-depth, empirical research to identify and describe the phenomenon of supplier sustainability SAQs before response data was collected. As the author had access to a large global FC, which at the time the research was conducted was employing two different types of SAQs, a multiple-case study research design was chosen in

order to compare and analyse two different types of supplier sustainability SAQs that constituted the same object of analysis (Yin 2018; Ketokivi and Choi 2014). This research combined qualitative and quantitative analysis of supplier questionnaire responses, representing a form of triangulation, in order to obtain exploratory understanding, collect large data sets and then attempt to understand complex causalities (Flick 2009). The quantitative aspect entailed analysing the response landscape of over 20,000 of one type and 5,000 of the other type of questionnaire submitted to a global FC. On the other hand, the qualitative aspects involved analysing not only the construction of the questionnaires, thinking about how this might affect social desirability bias, but also an analysis of the accompanying process the questionnaires were embedded in and of barriers, such as supplier assessment fatigue. An abductive research design was employed, iterating between themes emerging from the qualitative and quantitative data and returning to multi-disciplinary, extant research (e.g., SSCM, psychology, organisational behaviour) in order to propose plausible explanations. The multi-case study design enabled cross-case synthesis of the results pertaining to each type of questionnaire. This was done by employing 'theoretical replication' in order to determine similarities and differences in results and to draw general conclusions (Yin 1989).

### 3.1.2 Methods: Supplier Sustainability Audits (B2)

As extant research on initiatives had focussed at a higher, aggregate level on multi-stakeholder initiatives and less so on the tools employed by such initiatives, an exploratory research approach was taken. Exploratory research seeks to uncover rich contextual information (Yin 2018; Hahn and Ince 2016), and in the case of supplier sustainability audit standards, the goal was to address an empirical research gap in terms of what types of private, voluntary sustainability initiatives /associations (SI/As) there are that primarily deal with supply chain sustainability, and that also have their own supplier sustainability audit standard (SSAS). Once the exploration had uncovered a broad range of SI/As, each with a SSAS, an inductive research design was employed to extrapolate audit process phases, major sustainability categories, and to understand which topical audit questions were covered by the standards. Due to the lack of research on such SSAS, inductive research was deemed to appropriate for generating data from which preliminary conclusions would be drawn (Ketokivi and Mantere 2010; Timmermans and Tavory 2012) about the potential for cross-recognition

and standardisation. Furthermore, a multiple-case study approach was chosen to discover, collect and compare illustrative new empirical SSAS data on an under-researched phenomenon. Common sustainability themes were induced from the comparison of SSAS in order to allow a juxtaposition of SSAS processes and protocols, which in turn enabled a granular comparison of the audit standards. Once this comparability, based on empirical data, was achieved, the potential for and barriers to standardisation could be identified. This research was complemented by desk-based research of SI/A's annual reports in order to collect data on the number of audits conducted since 2010 as well as an overview of auditing service providers. Taken together the research methods provided a better contextual understanding of the research's focus.

### 3.1.3 Methods: Transparency for SSCM in Multi-Tier Supply Chains (B3)

Whereas the methodological approach in the first two contributions involved discovering and accessing empirical data, the third contribution began with an abductive research design (Ince and Hahn 2020) that had been applied to existing literature and a TfS Framework (Garcia-Torres et al. 2019). The ensuing research approach entailed an in-depth, single-case study of a Multi-Tier Supply Chain (MT-SC) Transparency implementation (including the author's participant observation (Yin 2018) in the case-studied project). As the project unfolded, data was generated and collected in an ongoing manner, and abductive logic was applied in order to understand the data as it became available and to categorise findings. This method, involving abductive reasoning (Biggs 2011; Helmreich 2007), expects an iterative process of unfolding data, and returning to the literature in order to finetune the analysis of the data and improve abductive conclusions (Ince and Hahn 2020; Timmermans and Tavory 2012). Hence, as the data was further analysed, this sometimes led to an extension of literature from other disciplines that had been taken into consideration. This was done in order to better formulate possible explanations for the findings.

Indeed, this was a common methodological facet across all three contributions, which led to the inclusion of literature from non-SSCM / operations research fields, such as psychology (e.g. Tourangeau 1984; Jenkins and Dillman 2012) for the first contribution (B1), global political economy and global governance (e.g. Bair 2017; Rasche and Gilbert 2012; LeBaron et al. 2017), and legal

compliance and accounting (Terwindt and Armstrong 2019) for the second (B2) and third (B3) contributions.

## 3.2 Generating and Collecting Data on SSCM Tools and Instruments

Adequately and successfully responding to the research questions introduced in section 2.1 necessitated qualitative, exploratory, inductive and abductive research approaches as outlined above in order to collect and/or generate new primary empirical data on the instruments and tools of SSCM. This served as a basis for evaluating the workings, limits and potential of such tools. All three contributions were motivated by a research goal of providing new insights based on empirical data. Demonstrating current SSCM practices, the data first had to be generated (defined, conceived, delineated) in two cases (contributions B2 and B3) before it could be captured / collected as part of the research process. The data collection for the three contributions is summarised below.

**Table 1.** Summary of Data Generation and Collection Across all Research Contributions

| First Contribution (B1): Supplier Sustainability Self-Assessment Questionnaires | Second Contribution (B2): Supplier Sustainability Audits | Third Contribution (B3): Supply Chain Transparency for MT-SSCM |
|---|---|---|
| • Obtain access and clearance to conduct research at FC<br>• Compare questionnaire content to ensure comparability of SAQ data<br>• Extract dataset for internal questionnaire (ISQ) from FC database; second SAQ dataset downloaded from external service provider's portal<br>• Supplier questionnaire responses converted to excel in order to enable qualitative analysis<br>• Multiple-case study design enabled cross-case synthesis – 'theoretical replication' (Yin 2018) | • Exploratory research approach necessitated broad, illustrative data<br>• Eight SI/As identified, each with own audit standard, from various industries<br>• Audit process documents downloaded, converted to Excel<br>• Audit protocols downloaded / accessed, converted to Excel<br>• Audit activity / frequency data collected from SI/As<br>• Audit service provider data collected from SI/As<br>• Comparison of content conducted in Excel | • Abductive logic sought to match real-world data with TfS Framework<br>• MT-SC data generated in real-world SC transparency project<br>• Transparency data generated by measuring known number of suppliers in MT-SC before and after intervention<br>• Descriptive process data generated also via participant observation (author accompanied audit of supplier) and qualitative analysis of transparency process |

In the following subsection, a high-level summarisation of the dissertation's findings is presented before these are discussed in Section A4.

## 3.3 Major Research Results and Findings

The dissertation's three research contributions were empirical and qualitative in nature, and accordingly generated a lot of rich, descriptive data. In the following sub-sections, the major findings of the research contributions are presented. For more detailed and broader findings, please consult the respective 'findings' chapter in each of the published articles (B1, B2 and B3). This section summarises the key findings that were compiled, and in the next section (A4) these compiled findings are discussed and reflected upon within the context of SSCM.

**Table 2.** Summary of Research Contributions' Findings

| First Contribution (B1): Supplier Sustainability Self-Assessment Questionnaires | Second Contribution (B2): Supplier Sustainability Audits | Third Contribution (B3): Supply Chain Transparency for MT-SSCM |
|---|---|---|
| • Over 20,000 FC internal supplier questionnaires (ISQ) and over 5,000 SAQs analysed<br>• Average supplier scores much higher for internal supplier tick-box questionnaire (89%) than validated, industry-aligned and shared SAQ (65%)<br>• For SAQ differentiated results concerning sustainability areas; for ISQ considered non-representative due to improbably high avg. scores<br>• Average scores based on supplier's location returned unexpected results: suppliers in developing countries 'outperformed' those is developed countries<br>• Supplier fatigue addressed by standardised nature of SAQ | • Eight SI/As selected from sample, as comparable in terms of having a common audit standard and ability to share audit results within SI/A<br>• Audit activity confirmed to be increasing: approx. 10,000 in 2010 and over 60,000 in 2019 among surveyed SSAS<br>• Particular increase in activity between 2017 – 2019<br>• High degree of SSAS overlap, particularly in regard to audit process and steps (almost identical) and audit sustainability categories (13 common major sustainability categories identified)<br>• At granular level, audit protocols differed, demonstrating heterogeneity & barriers to standardisation | • SC transparency can be operationalised by comparing snapshots of known SC actors<br>• Research found that supply chain mapping audits, tracing material flows are a means for FCs to improve SC transparency<br>• Based on Tier-1 estimate 28 sub-suppliers in a critical, high risk SC were assumed. After intervention minimum of 79 sub-suppliers identified (+182%)<br>• Both FC and Tier-1 supplier underestimated SC complexity<br>• SC transparency identified as precondition for extending SSCM activities in MT-SCs<br>• SC Transparency can contribute to increased SC collaboration and improved SC governance |

### 3.3.1 Self-Assessment Questionnaires (B1)

As introduced above, the first research contribution involved a case-study of two types of supplier sustainability questionnaires and over 25,000 supplier responses to these questionnaires. Thus, it analysed two datasets, which included over 20,000 supplier responses to an older internal supplier questionnaire (ISQ) and over 5,000 responses to a self-assessment questionnaire (SAQ), which has been aligned across the industry and is deployed by ten OEMs. The ISQ returned much higher average supplier sustainability scores: two-thirds of all suppliers attained scores between 90 and 100%. The ISQ was a mandatory requirement for many suppliers as part of standard procurement process, but it was not shared with other FCs, nor was it embedded in a process of validation, corrective action and continual improvement. In contrast, the industry-aligned SAQ returned supplier sustainability scores that were more differentiated, both in terms of total score as well as the different sustainability areas that constituted the questionnaire (Environmental, Social, Compliance, Sub-Suppliers, Health and Safety). The SAQ questionnaire was not mandatory, but was imbedded in a process that included the external validation of all responses and enabled suppliers to share their completed SAQs with multiple FCs. The average scores per instrument were 89% for the ISQ and 65% for the SAQ.

The research also revealed unexpected results in terms of average scores relating to the suppliers' geographic locations (Jia et al. 2018b; Silvestre 2015; Jayasinghe and Hunter 2020; Zailani et al. 2012). In the ISQ results, the top ten country average scores were very high, ranging from 86% (Germany) to 98% (China). The top ten SAQ country average scores ranged from 60% (United Kingdom) to 73% (Mexico). The lack of score differentiation found in ISQ responses affected the usefulness of the tool in terms of realistic sustainability performance monitoring or generating sustainability risk data. Because the ISQ total scores were so high, the FC under analysis could not distinguish which risk profiles were prevalent, regardless of whether they were based on sustainability area or the supplier's geographic location. The SAQ as a tool returned supplier sustainability performance results that was more differentiated. The research contribution found that the questionnaire design and process (including validation, potential for resubmission and ability to

be shared with multiple purchasing FCs) could enable more differentiated (and probably realistic) sustainability performance results.

### 3.3.2 Major Findings Supplier Sustainability Audit Standards (B2)

The second contribution (B2) centred on a central research assumption, which was that supplier sustainability audit activity is increasing. The research confirmed this proposition. By identifying and gathering data from eight private, voluntary, multi-brand sustainability initiatives / associations (SI/As), representing FCs across a broad range of industries, the research was able to provide empirical evidence of an increase in audit activity. The research found that the number of audits conducted according to the common audit standards that were surveyed increased from around 10,000 in 2010 to over 60,000 in 2019, with over half of them conducted between 2017 and 2019. This six-fold increase stands in contrast to the SI/As' stated aims of reducing audit fatigue (and thereby, one assumes, audit numbers) through the creation of common audit standards.

The research found a high degree of overlap with regard to audit process and the corresponding audit steps foreseen by the SI/As' audit standards. More pertinently, the SSAS were found to overlap with regard to the sustainability topics they covered, with 13 common sustainability categories identified. More than half of these categories were found in all audit standards, while the remaining categories were found in at least three quarters of the SSAS. Although the general findings seemed to confirm that SSAS are highly similar and that there is initial potential for cross-recognition and standardisation, a deeper, more granular analysis of audit protocols revealed much less homogeneity at the level of audit questions. In summary, the research found that in spite of the potential for cross-recognition and standardisation in terms of the audit process and the categories they cover, there was greater divergence and less-overlap – in terms of the detailed content that was covered – than was initially apparent.

### 3.3.3 Main Findings: Transparency for Multi-Tier SSCM (B3)

The third research contribution provided empirical insights into the operationalisation of MT-SC transparency for SSCM. In general, this was achieved by quantifying the numbers of known SC actors in an entire multi-tier, raw material supply chain, of an automotive OEM FC, tracking up the SC

to the corresponding refiners, traders and mines. These findings were achieved by measuring snapshots before and after SC transparency instruments and tools had been applied to the SC. The research began with a baseline MT-SC map provided to AFC by its first-tier supplier. This constituted a total of 28 sub-suppliers below the direct tier-1 supplier. After an intensive process of tier-for-tier supply chain auditing and mapping that was commissioned by the FC and its first-tier supplier, profound mid- and upstream supply chain complexity was uncovered. This resulted in a total of at least 79 sub-suppliers (an increase of 182%). The research found that such significant MT-SC complexity had been underestimated by both FC and first-tier supplier alike.

The case-study research found that transparency is a necessary precondition for implementing MT-SSCM. Furthermore, the process of achieving multi-tier supply chain transparency was found to be an iterative one, dependent on collaboration with experts and tier-one suppliers, and potentially contributing to improved MT-SC collaboration and governance. This lends support to the framework suggested by Garcia-Torres et al. (2019). In the following section, the dissertation's cumulative findings are discussed in detail and mapped within the research framework introduced in A2.

# 4. Discussion

This dissertation frames its findings by referencing three major facets of SSCM that were proposed by Roy et al. (2018) in their framework, namely: SSCM adoption, implementation and extension, and sees the successive adoption of SSCM as part of a process or journey, not a once-off state (in alignment with Silvestre 2015) as depicted in Figure 4. The tools and instruments analysed in each contribution can be used by a FC after it has proclaimed its intentions regarding sustainability (including to its SC) and formulated its requirements and expectations of its suppliers. While codes of conduct are useful for adopting SSCM, assessment tools such as self-assessment questionnaires and audits are often the first manifestations of practised / implemented SSCM.

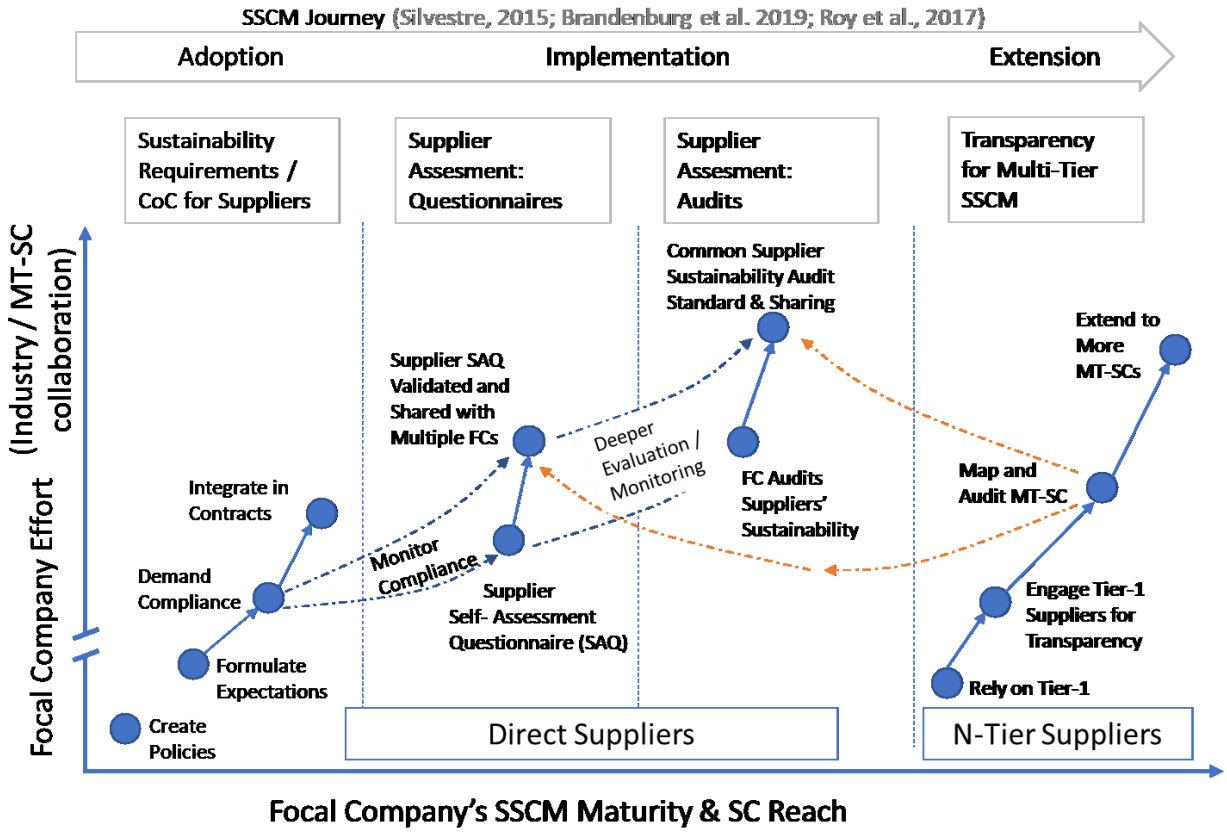


**Figure 4.** Discussion of Dissertation Findings within SSCM Framework

As the first contribution (B1) found, merely having a questionnaire in place ('dear supplier, how sustainable are you?') does not guarantee that actual sustainability performance is really being captured, let alone actively being managed in SCs. This research also demonstrated that if FCs work to make the self-assessment tool more accurate and effective, then differences in supplier sustainability performance can be detected. Audits, which in the second research contribution (B2) were found to be an intensive assessment instrument gaining in global application, are proposed to be a more mature assessment tool. In contrast to self-assessment questionnaires, audits represent an external supplier sustainability assessment that is conducted in order for a FC to assess realities on the ground at their suppliers' facilities, monitor conformance in greater depth, and to capture supplier sustainability performance data. Combined, the two tools analysed in B1 and B2 can help strengthen the FC adoption of SSCM by providing broad and in-depth sustainability performance data from their direct suppliers, which helps to inform and improve SSCM practice. Nonetheless, as the findings also demonstrate, quite different sustainability performances may be measured depending

on the audit standard applied and/or the design and configuration of the self-assessment questionnaire.

Putting aside issues of measurement / accuracy, the application and implementation of such tools to the direct supply base do not satisfy stakeholder expectations regarding FC responsibility for entire, critical supply chains (Hartmann and Moeller 2014; Jia et al. 2018a; Rebs et al. 2019; Villena 2019). In particular with regard to some raw materials, grave sustainability issues can occur in the upstream supply chain, and FCs are expected to assess and mitigate related risks and problems (Sauer and Seuring 2017; Young et al. 2019). While sustainability self-assessment questionnaires and audits could be (adapted and) extended to the upstream SC, such as raw material producers, this first requires FCs to achieve supply chain transparency in order to know where the raw materials in their products come from (Young et al. 2019) and which SC actors to monitor and assess in the SC. The necessity of SC transparency as a prerequisite (Bastian and Zentes 2013) for the extension of SSCM and that of the corresponding SSCM tools and instruments to the entire SC, is depicted in Figure 4.

Hence, the third research contribution (B3) focussed on emerging developments in multi-tier SSCM (Garcia-Torres et al. 2019; Tachizawa and Wong 2014) in order to first understand how MT-SC transparency can be achieved so that FCs can move beyond the 'visible horizon' (Busse et al. 2017) and monitor, assess and manage the sustainability of sub-suppliers. The research contribution demonstrates how applying transparency instruments such as mapping audits can increase MT-SC transparency so that it enables due-diligence and sustainability assessment (also indicated by the orange feedback arrows in Figure 4). Furthermore, all contributions provided support for the argument proposed by Beske-Janssen et al. (2015), which is that measuring sustainability in the supply chain (direct suppliers or sub-suppliers) increases transparency and further contributes to supply chain collaboration and governance, while also providing preliminary support for the enabling cycle proposed by Garcia-Torres et al. (2019). These reinforcing outcomes support the extension and adoption of SSCM throughout MT-SCs (Sauer and Seuring 2018b; Canzaniello et al. 2017; Lechler et al. 2019).

The dissertation's main findings indicate that SSCM instruments and tools are key contributors to *how* companies adopt, implement and extend sustainability management in their SCs. The findings partially fill various knowledge gaps that have perhaps instead been assumed in academic considerations of how SSCM is implemented in practice. Importantly, the findings point to potential serious blind spots confronting FCs caused by poorly-designed instruments and processes that may provide a false sense of sufficient SSCM. Certainly, the research demonstrates that effectiveness depends on how the tools are designed, embedded in procurement processes and anchored within institutions. Unique, company-specific tools are likely to lead to supplier assessment fatigue (Newitt 2012; Jayasinghe and Hunter 2020), which can have negative effects on the reliability and / or accuracy of the instruments (Locke et al. 2013). Beyond the tools and instruments surveyed in the three research contributions, there are other SSCM tools, such as Product Life Cycle Assessments (which focus less on the company level of the organisations in the SC, and more on the environmental and/or social footprint of a product); Blockchain solutions for tracking and/or tracing raw materials, and collecting and safely communicating sustainability information about each partner in the SC; a geographical and filter-based risk assessment (such as Maplecroft); supplier sensitisation and development programmes (training); philanthropy / local community projects; and incentivisation tools (Kogg and Mont 2012; Singh and Trivedi 2016; Kühnen and Hahn 2017; D'Eusanio et al. 2019; Björklund et al. 2012).

A sustainability strategy in procurement is only as effective as the implemented management systems that enable it. In turn, sustainability management systems for SCM / procurement are dependent on their constitutive instruments, tools and processes for operationalisation and success. The findings in B1 and B2 suggest that SSCM tools need to produce dependable data that is preferably externally verifiable, and that such data should be shareable and scalable to reduce the assessment fatigue of suppliers (Newitt 2012), in particular when (sub-) suppliers supply to various industries (Schoeggl et al. 2016a; Villena and Gioia 2018). If such tools are anchored into core, strategic procurement processes, then they will be taken seriously by suppliers and buyers alike (Villena 2019). Although an increasing body of research points to the financial and operational benefits of becoming more sustainable, suppliers are often under competing pressures

(Wang and Wood 2016; Zamur et al. 2017) and (especially B2B suppliers), in stark contrast to focal companies (Villena and Gioia 2018), are not exposed to constant critical pressure from a broad array of stakeholders.

As Beske-Janssen et al. (2015) explain, traditional procurement and supply chain management focussed primarily on economic factors. Correspondingly, classic SCM tools and instruments that were developed to determine cost, dependability, flexibility, quality, and speed (Gunasekaran et al. 2004) do not provide the purchasing FCs with sustainability information from their SCs that can be used to inform their SSCM. Much extant SSCM literature appears to have overlooked the critical role that tools and assessment play (Imbrogiano 2020). Whilst supplier sustainability audits have been subjected to significant scrutiny and critique from disciplines outside of SSCM (Short et al. 2016; Terwindt and Armstrong 2019; Locke 2013; LeBaron et al. 2017), these critical debates were not prominently featured in SSCM debates. Supplier SAQs on the other hand, were not found to have been investigated in any discipline, despite their prominence as a widespread instrument for generating SC sustainability data and their status as a mainstay of SSCM implementation (Müller and Bessas 2017; BSR & UNGC 2015). In general, scalability and the cost of tools and instruments remains a challenge. As long as FCs have to cover all or most costs for determining the sustainability performance in their supply chains, this will be weighed against how this data is used in order to conform with stakeholder requirements (e.g., reports) and to fulfil minimum requirements versus thorough SSCM and supporting continuous improvement of supplier sustainability performance. There are more significant 'grand challenges' confronting SSCM (Buckley et al. 2017) that nonetheless affect and are partially affected by the tools and instruments that have been surveyed. These range from incentive structures for suppliers and sub-suppliers as well as the need for political/public contributions, to global supply chain governance and monitoring (Mayer and Phillips 2017). In some cases, for more than three decades, global FCs have been pursuing global sourcing and procurement strategies to secure the lowest price. Thus, suppliers have historically been conditioned and selected for practices that were contrary to the goals of SSCM (Locke 2013; Brown 2015). It seems that without any changes being made to entrenched and dominant incentive structures in procurement, the reaction of suppliers to such instruments will depend on complex motivations. This can potentially

lead to strategies such as ignoring requirements or doing the minimum to fulfil or comply with them (Chen and Chen 2019; Grimm et al. 2016). Once suppliers understand that sustainability improvements will probably improve their business outcomes (Ağan et al. 2016), the importance of positively interacting with such instruments (e.g. to positively differentiate themselves from their competitors) will become apparent.

Finally, in many cases, SSCM tools seek to measure to what extent a supplier conforms with legislation, international norms and company requirements. Due to a prevailing neoliberal economic climate, global brands have been left to regulate themselves and voluntarily govern sustainability standards in their supply chains (Klein 2010; LeBaron et al. 2017; Mayer and Phillips 2017; Bair 2017). At the same time there has been a lack of binding, progressive legislation in many developing and producing countries (this was often seen as a disincentive for investment by MNCs), meaning that working and environmental standards have been kept low and not systematically controlled (ITUC 2020; Bair 2017; Mayer and Phillips 2017). Over the last decade there has been increasing pressure on governments in 'western' countries to implement tougher laws and regulations, which has required global brands and FCs to improve the sustainability of their supply chains. SSCM tools and instruments, if well designed and implemented to maximise effectiveness, can play an important role in increasing transparency in global supplies chains by revealing the realities in these SCs (Kashmanian 2017). By measuring companies' sustainability practices and performance in SCs, and thereby creating quantifiable, comparable data for governments and other stakeholders to orient themselves towards, businesses can be held accountable for their actions. Also, FCs that recognise that their business benefits from more sustainable supply chains can use such instruments to increase transparency with regard to their sustainability undertakings and improvements.

# 5. Relevance and Implications

This research was undertaken with an aim to improve knowledge of the instrumental workings of SSCM. Ideally all research should aim to not only generate new knowledge of relevance and consequence to its (and neighbouring) academic field(s), but also to be of timely relevance for

practitioners, actors and interested stakeholders in the corresponding field. Recalling the opening assertion by Krause et al. (2009) that FCs are only as sustainable as their supply chains, this research was designed with a practical focus and sought to connect the frameworks and theories of SSCM to its actual instrumentation and implementation by individual focal companies. The research contributions provide empirical insight into and in-depth analysis of exemplary core instruments and tools currently employed by FCs in order to manage sustainability in their global SCs. The research contributions demonstrate how these central tools and instruments are operationalised, and what processes they can be embedded in. Moreover, it shows how collecting such sustainability data and measuring sustainability performance increases SC transparency, which in turn informs and enables SSCM. Analysing these tools and instruments in an in-depth, empirical manner revealed important insights into their limits and potential, and serves as a basis for demonstrating what they can achieve and how they can be improved. In the following, the implications and relevance of this research for academia is presented, followed by its implications for focal companies and practitioners in the field of SSCM.

## 5.1 Implications for Academia

SSCM as an academic field has come a long way from its beginnings as a fledgling sub-topic of supply chain management less than 20 years ago (Lis et al. 2020; Carter et al. 2019). The research presented in this dissertation is clearly located within the applied / operational sub-categories (Dubey et al. 2017a) of this field as explicated in Figure 1 in section A2 above. Beyond the obvious practical implications regarding the design of instruments and the corresponding processes examined in detail (supplier self-assessment questionnaires, sustainability audits and supply chain mapping), the findings of this dissertation also have broader academic relevance.

One of the primary goals of the research was to draw attention to the basic tools of SSCM given the central role they play in generating and measuring sustainability in supply chain management. The dissertation contends that in SSCM both questionnaires and audits have been overlooked and/or taken for granted, and that audits were also handled as neutral instruments of measurement despite

mounting criticism in other academic disciplines (Brown 2015; Terwindt and Armstrong 2019; Locke et al. 2007; Short et al. 2016; Fransen et al. 2019). On the one hand, such SSCM instruments are fundamental to a whole sub-discipline focussing on sustainability performance in SSCM (Beske-Janssen et al. 2015; Lee and Kashmanian 2013; Ferri and Pedrini 2018; Saeed and Kersten 2020), including supplier monitoring, evaluation and development (Zimmer et al. 2016; Ağan et al. 2016; Hajmohammad and Vachon 2016; Liu et al. 2018; Meqdadi et al. 2020), and by extension, SC-wide sustainability management (Schaltegger Stefan et al. 2014; Fritz et al. 2017; Schoeggl et al. 2016b). On the other, as Imbrogiano (2020) warns, SSCM as an academic discipline risks complacency if the tools used to generate sustainability performance data are not critically assessed and understood.

Hence this dissertation recognises a need for more integrated SSCM research – not just simulations and decision theories, frameworks and literature reviews on the one hand and case studies at higher strategic levels on the other, but also a coupling of critical analysis and the evaluation of the instruments required by SSCM. Thus, the findings presented in this research should be considered in future SSCM research so that when companies are questioned on their SSCM strategies and implementation (Delphi studies, case studies, broad questionnaires etc.), attention is paid not only to what activities are purportedly undertaken or what data is considered, but also to how these reported activities are implemented (what instruments, what type of tools) and how companies generate their supplier sustainability performance data.

The 'quality' of the performance data not only suffers under a myriad of widely-defined and cited performance indicators (see, for example, Saeed and Kersten 2020) but also from the well-established phenomenon in the field of information technology referred to as: 'garbage in; garbage out.' Poorly designed or implemented SSCM measurement tools will result in poor data quality. As demonstrated in the first research contribution, poor data quality is of little use to academics in terms of differentiating sustainability practices and performance, and hence drawing relevant conclusions from the data. The questions regarding the central role played by tools in generating sustainability data become even more important once the academic focus expands to supply-chain wide sustainability management (Fritz et al. 2017), as standardisation of performance data collection is

found to facilitate data exchange for SSCM (Beske-Janssen et al. 2015). Once SC sustainability data is standardised, the potential of big-data becomes more apparent (Chiappetta Jabbour et al. 2020; Castka et al. 2020) and may be utilised by technologies such as blockchain (Paliwal et al. 2020; Kouhizadeh et al. 2020). Special attention needs to be given to underreported and/or unknown sub-SC complexity and the fact that the SC needs to be revealed / transparency achieved before data can be gathered from it. This applies especially to MT-SSCM.

Another aspect of particular importance for SSCM research, concerns supplier assessment fatigue such as audit fatigue (Khalid et al. 2020; Newitt 2012). The dissertation provides empirical insights into the scale of the instruments applied to suppliers in order to measure and manage their sustainability compliance and performance, which includes a six-fold increase in shared audits conducted. Specifically, the research produced indicative findings that, despite efforts to harmonise SSCM tools within industries (e.g., at the level of industry associations / initiatives), the number of assessments being undertaken is increasing. It is therefore important to better understand the particular pressures on and incentives for tier-1 suppliers (Leppelt et al. 2013). Tier-1 suppliers perform a 'double role' as they receive strict requirements from global FCs, which they are expected to fulfil, but also they are expected / required to implement SSCM themselves, by cascading FCs' sustainability requirements (and then monitoring / measuring performance) in their own SCs (Wilhelm et al. 2016). The dissertation presents findings that indicate that tier-1 suppliers are likely to produce desirable responses if the tools and instruments let them. These findings add weight to the concern raised by extant literature regarding the strategic choice made by some suppliers to not comply with SSCM (Zamur et al. 2017). Hence the efficacy and legitimacy of the tools employed should contribute to suppliers' perceptions of SSCM as whole (Sauer and Seuring 2018a). The apparent effectiveness of the SSCM tools and instruments will not only potentially lead to more accurate sustainability performance measurement and management, but also increase the perceived legitimacy of the FC's sustainability reporting. This is because the numbers and facts presented will then be seen as realistic / representative.

The third research contribution in this dissertation also raises questions about the perspectives and roles of mid-tier and upstream SC actors in SSCM (Meinlschmidt et al. 2018; Sauer and Seuring 2018b). While instruments such as those featured in this dissertation can and are applied to sub-suppliers, the bigger challenge is to know which SC partners are actually present in the SC. Hence this research underlines the pre-eminence of transparency as the defining pre-requisite (Bastian and Zentes 2013) for accurately determining which sub-suppliers could and should be included in MT-SSCM so that more targeted SSCM practices are enabled throughout relevant MT-SCs (Young et al. 2019). As pressure continues to increase for MT-SSCM, the perspectives of mid-tier and upstream (sub-)suppliers will need to be increasingly factored into research (Lechler et al. 2019), as these SC actors will increasingly become the recipients of such SSCM tools and processes.

## 5.2 Implications for Focal Companies and Practitioners

From the outset, this research was designed and conducted in order to be of practical value to practitioners of SSCM. Recognising the particular responsibility attributed to FCs along with the corresponding leverage and influence that these companies exercise, this research analysed the implementation of SSCM in practice from a FC perspective. This was in order to understand how various tools and instruments work and how they can be effectively operationalised and integrated into core company processes and strategy. A strategy is only as good as the systems in place and the system requires instruments and tools to inform it (Hoejmose et al. 2013). With a better understanding of the potential and limits of core SSCM tools and instruments, this research aims to contribute to better implementation and more accurate measurement and monitoring, which would in turn support decision making (Taticchi et al. 2015) and ultimately lead to more effective SSCM (Meqdadi et al. 2020). Rather than being a static state that companies either achieve or not, this dissertation follows the concept of SSCM as journey (Silvestre 2015; Roy et al. 2018) during which SSCM implementation goes through stages of maturity and increased reach.

The research specifically considers the design and implementation of core supplier assessment instruments, such as how to monitor and measure supplier sustainability conformance and

performance through both self-assessment questionnaires and sustainability audits conducted at supplier facilities. It finds that the resulting supplier performance data can significantly differ depending on how the SSCM tool is conceived, designed and implemented. A sustainability questionnaire is not necessarily going to produce the same performance data as another sustainability questionnaire, nor can it be assumed that supplier sustainability audits are completely comparable or will return the same findings. Hence, this research features the key importance of tools for better sustainability performance measurement, and, correspondingly, better management (Schaltegger Stefan et al. 2014). Indeed, the implications for companies with good tools versus those with bad ones can have wide-ranging consequences. For example, bad tools (inadvertently or not) may serve as a fig-leaf or for greenwashing purposes. Good tools, on the other hand, can provide realistic data that informs risk management and serve as the basis for sustainable supplier development. It also can provide input for improvement, innovation and new strategies.

In contrast to much of the extant literature on SSCM implementation, this dissertation focuses on concrete cases of implemented SSCM tools and instruments, either at the level of an individual FC or at that of industry associations collaborating as part of SSCM. In this manner, over 25,000 supplier sustainability responses provide a substantial snapshot and insight into response behaviour with regard to supplier self-assessment questionnaires. The limits and pitfalls of self-assessment do not represent a new problem (Spector 1994; Crane 1999) but are very likely overlooked when FCs design their own instruments (generally with limited resources). Hence, this research offers insight into SSCM implementation in practice, such as differences in supplier responses in relation to how they can contribute to a sustainability self-assessment questionnaire that is more thorough and better-designed. Therefore, this research draws attention to the need for critical reflection on how to improve supplier self-assessment (e.g., through validation and industry alignment).

By offering empirical insights and discussions on improving tools at different phases of SSCM maturity, practitioners starting out on the SSCM journey (Silvestre 2015) can orient themselves towards broadly monitoring compliance with their sustainability requirements (Lee and Kashmanian 2013; Roy et al. 2018). Companies that have long since established and communicated their

requirements and have already instituted a broad, general compliance mechanism, can conduct deeper assessments and monitor their suppliers' sustainability performance with the help of sustainability audits. The dissertation's contribution on the topic of audits analyses eight supply chain sustainability initiatives and associations that represent a broad range of industries (from pharma, to electronics, to toys). It covers over 300,000 audits conducted over a ten-year timeframe. The thorough comparison of various audit standards portrayed in this dissertation can provide focal companies with an informed reference point for understanding what major sustainability categories are covered by which standards, and what the differences are between various existing standards.

Practitioners from FCs will be well aware of the challenge of managing hundreds or thousands, if not tens of thousands of suppliers, and of the importance of the suppliers to procurement performance (Ferri and Pedrini 2018). FCs at the start of their SSCM journey first need to gain an overview of the general sustainability performance of their suppliers for the purpose of risk management, and performance comparability, before they know where to direct resources for the purposes of monitoring, supplier sensitisation, and the development and improvement of assessment processes. The research found that both self-assessment questionnaires and audits were widely used by FCs from all manner of industries (Müller and Bessas 2017). Although many procurement professionals are surely aware of the pressures on suppliers resulting from various and varying buyers' demands, there is perhaps less of an understanding of the phenomenon of supplier assessment and audit fatigue (Lindholm et al. 2016; Newitt 2012; Locke et al. 2007). As the dissertation argues, suppliers that are the subject of multiple or many individual focal company assessment tools will be motivated to treat these instruments as laborious and time-consuming compliance measures that somehow have to be passed, without engaging with the purpose of the instruments in the sense of SSCM (Locke and Samel 2018). Tools that are better designed and whose results can be shared with multiple buying customers (for example, an entire industry) reduce the repetitive, time-consuming and sometimes disruptive nature of assessments. Hence the takeaway for managers and practitioners should be on designing and implementing SSCM tools and instruments that effectively measure sustainability practice and performance, and that can also be scaled and shared so that assessment/audit fatigue is reduced.

Finally, the third research contribution should serve as a warning to practitioners that multi-tier sustainability in supply chain management (MT-SSCM) is heavily reliant on the 'visible horizon' (Busse et al. 2017), i.e. knowing which suppliers are present in the sub-supply chain. The case study demonstrates very clearly that neither the AFC nor the tier-1 supplier was able to anticipate the amount of complexity in the MT-SC. Achieving transparency is only the first step in implementing SSCM throughout the SC. Furthermore, there is an underlying necessity of transparency with regards to many aspects of sustainability for large FCs. For example, they need to be able to report and communicate to their stakeholders, to understand the status quo in their operations (including their SCs) and to improve overall SC sustainability performance. With regard to extending SSCM throughout (particularly high-risk, complex) supply chains, the dissertation pointed to transparency as a precondition for supply chain collaboration and governance. Given increasing stakeholder pressure on FCs to take responsibility for sustainability issues throughout entire SCs, it is important that FCs recognise how little information they have, that they prioritise certain supply chains and begin to improve SC transparency in order to begin measuring, monitoring and improving MT-SC sustainability.

As blockchain and other forms of supply chain digitalisation potential continue to emerge, it will become even more important that the tools and instruments employed by FCs to measure sustainability throughout the SC – which also provide the input data for such solutions – are well-understood, accurate, transparent, effective and legitimate. Only then, once a broad range of stakeholders can trust the output, will the interplay of tools and processes, coupled with standardisation, enable industry-wide collaboration and the sharing of SC sustainability data (Schoeggl et al. 2016a; Fritz et al. 2017). Hence, in conclusion, no matter where along the SSCM implementation journey companies find themselves, they are well-advised to pay critical attention to the SSCM tools and instruments they implement, as these can play a critical role in the FC's ability to manage sustainability in their global supply chains.

# 6. Conclusion

The dissertation contributes to a much deeper and empirically-grounded understanding of the core instruments and tools used by focal companies at various stages of SSCM implementation in order to measure, monitor and assess their suppliers' sustainability performance. This practical and applied dissertation focus and its tangible research outcomes were achieved through close cooperation with a large industry player in the form of a global focal company, and a research focus on the realities of SSCM as it is actually practised. Qualitative, exploratory case-study research revealed insights into the workings of supplier assessment tools, instruments and processes, which form the nuts and bolts of SSCM through its measurement of the sustainability practices and the performance of suppliers in global SCs. The research responded to identified empirical research gaps by: analysing and comparing tens of thousands of supplier responses to different types of self-assessment; uncovering actual numbers of audits conducted in multiple industries, compiling a detailed audit protocol comparison, and undertaking in-depth data analysis of over 10 audit standards and following-up with sustainability organisations in Europe, Asia, and North America; and, finally, by revealing sensitive, hitherto unknown SC complexity uncovered and analysed in MT-SSCM. The dissertation not only analysed current tools and instruments and the data that they produce, it also grappled with the phenomenon of supplier assessment fatigue and produced relevant data on the tendency towards standardisation and the cross-recognition of SSCM data.

Although the dissertation revealed important insights into widespread, core tools of SSCM, it is important to note the limitations of the current research. Two of the three research contributions were framed within the automotive industry and based on learnings from the perspective of a large multi-national German manufacturer. Automotive supplier relations are characterised by relatively long lead times until the product's start of production and (compared to the fashion industry, for example) rather long product lifecycles. Hence the general caveat concerning qualitative, case-study research and generalisability certainly applies to the subjects of this dissertation, as it is possible that SC-specifics related to the FC at hand may not apply to other FCs. While SSCM researchers have called for more data from the automotive industry, it is important to note that aspects of power relations

and supply chain structures probably have some impact on the workings of the tools and instruments analysed for this research. As automobiles continue to become more and more digitised, there will no doubt be increasing overlap among automotive and electronics supply chains (Fritz et al. 2017; Schoeggl et al. 2016a), and hence standardisation of SSCM performance measure is conceivable. But one could question the generalisability of this research's findings and conclusions for SSCM applied to distant commodities, products and industries, such as agricultural goods or building materials. Another potential limitation is the timing of the research. Not only the primary FC but the automotive industry in general, as well as the practice of SSCM find themselves in a time of disruption and rapid change. On the one hand, new digital technologies are emerging and with them the potential for collaboration and data sharing is increasing. Furthermore, companies have better understanding of sustainability issues in SCs and access to information. On the other hand, NGOs have improved access to information on local sustainability issues and scandals, and can leverage communication technologies to increase pressure on FCs. Finally, governments and international bodies are beginning to create laws, regulations and guidelines that formalise the requirements and expectations of FCs and underline the necessity and benefits of SSCM (Shavin 2019). Hence the motivations, drivers and pressures that apply to FCs is in a constant state of evolution, which conceivably also has an effect on suppliers, and the tools and instruments of SSCM.

This research primarily focussed on the implementation of SSCM by focal companies – in the form of tools, instruments and processes – as applied to suppliers – primarily tier-1, direct suppliers. Future research could continue with this focus at the level of the instruments used to measure and communicate sustainability performance and practice, but with a focus on B2B tier-1 and tier-2 supplier-buyer relationships. It would be interesting to understand the extent to which tools, such as those illuminated in this dissertation, can be implemented by suppliers, integrated into their organisations, and applied to their own suppliers. Such research could shine more light on the potential for supply-chain-wide sustainability performance measurement as well as its potential barriers and drivers. Further cases and a broader body of research on other multi-tier SC transparency approaches would provide a better base for testing models and frameworks that deal with how transparency and traceability can enable supply chain collaboration and governance. Finally, future

SSCM research would be well-advised not to treat the measurement instruments and tools that underlie the strategies and outcomes as neutral artefacts. Critical academic attention from disciplines outside of SSCM have consistently questioned the efficacy of audits in particular as well as the fig-leaf nature of private, voluntary SSCM that is driven by large companies in general. Hence, future research should focus on measuring impact and efficacy, as it would thereby contribute to empirically-informed debates on legitimacy.

This dissertation took as its starting point the hypothesis put forward by Krause et al. (2009), that a focal company is only as sustainable as its supply chain. By way of reference to the adage that 'a master is only as good as their tools,' the dissertation sought to shine light on these overlooked, crucial aspects of sustainability management in global supply chains. By better understanding these instruments, and accepting that their design and implementation can affect the sustainability performance that they are supposed to be neutrally measuring, both academics and practitioners may be able to improve the accuracy, implementation and efficacy of SSCM.

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# **B.** Published Research Contributions

In Section B the three academic contributions are presented in the form of three stand-alone, original research articles, that have been discussed in Section A "Cumulus". Chapter B, "Research Contributions," is comprised of the following three academic articles:


- **B1. Article 1:** Supplier Sustainability Self-Assessment Questionnaires……**47**
  Originally published November, 2020, as: Fraser, I. J., Müller, M., & Schwarzkopf, J. (2020). Dear supplier, how sustainable are you? *Sustainability Management Forum | NachhaltigkeitsManagementForum,* 28 (3), pp. 127-149. Springer Berlin Heidelberg. DOI:10.1007/s00550-020-00507-z

- **B2. Article 2:** Supplier Sustainability Audits……**92**
  Originally published October, 2020, as: Fraser, I. J., Schwarzkopf, J., & Müller, M. (2020). Exploring Supplier Sustainability Audit Standards: Potential for and Barriers to Standardization. *Sustainability*, 12(19), 8223. DOI:10.3390/su12198223.

- **B3. Article 3:** Supply Chain Transparency for Sustainability……**92**
  Originally published February, 2020, as: Fraser, I. J., Müller, M., & Schwarzkopf, J. (2020). Transparency for Multi-Tier Sustainable Supply Chain Management: A Case Study of a Multi-tier Transparency Approach for SSCM in the Automotive Industry. *Sustainability*, 12(5), 1814. DOI:10.3390/su12051814


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## B1. Article 1: Supplier Sustainability Self-Assessment Questionnaires

# Dear supplier, how sustainable are you?

## A multiple-case study analysis of a widespread tool for sustainable supply chain management

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### Abstract

This article analyses one of the most common tools employed by global focal companies in sustainable supply chain management (SSCM) across all industries: supplier sustainability self-assessment questionnaires. Extant research has moved beyond the questions of whether and which suppliers should be assessed. Current research is already focussing on how to share and standardise such assessment data. Despite mounting general research on SSCM, we identified that specific tools such as self-assessment questionnaires have not been empirically analysed in SSCM literature. Thus, this paper addresses the research questions of what differences there are among supplier self-assessment questionnaires and how supplier responses to such questionnaires might be influenced. Our research involves an abductive multiple-case study design and an analysis of over 25,000 responses from globally dispersed suppliers to two types of supplier sustainability self-assessment questionnaires administered and requested by a global automotive focal company.

Although the two questionnaires covered similar areas of sustainability practices and were administered to suppliers of the same focal company, the suppliers' responses demonstrated various observable differences in average sustainability scores. Social desirability bias and supplier assessment fatigue were identified as issues confronting such questionnaires. We find that questionnaire design, how the questionnaire is embedded in the focal company's processes and institutional settings are factors that potentially influence suppliers' responses and could counteract social desirability bias and supplier assessment fatigue. Based on these findings we make suggestions for improving these SSCM tools and provide recommendations for further research.

**Keywords**: Sustainable supply chain management; Supplier assessment; Self-assessment; Sustainability assessment tools; Supplier assessment fatigue; Social desirability bias

# 1. Introduction

Two decades ago, Crane (1999) titled an article “Are you ethical? Please tick yes or no.” Over 20 years later, the title is relevant to sustainable supply chain management (SSCM) research and warrants specific academic attention. Global buying companies increasingly monitor and/or evaluate the sustainability practises of their suppliers with the help of self-assessment questionnaires but these central tools have not been featured in SSCM investigations. This is a problem because, as Das (2017) argues the challenge for SSCM as an academic discipline is “how to make the broad concepts of sustainability relevant, applicable and *operationalisable* to SCM at firm level” (Das 2017, p. 1345). The problem is, how sure are we about the accuracy of such tools for conveying suppliers’ sustainability practices and performance? And how can companies trust the responses and data generated?

The last decade has seen a veritable boom in publications focussing on SSCM, the closely-related areas of responsible/green/sustainable purchasing and supplier management (Ahi and Searcy 2013; Ansari and Kant 2017; Beske-Janssen et al. 2015; Brandenburg et al. 2019; Gimenez and Tachizawa 2012; Oliveira et al. 2018; Seuring and Müller 2008; Koberg and Longoni 2019; Walker et al. 2012). This intensification of research corresponds with a continual increase in the importance of SSCM to practitioners/companies, as evidenced by the growth in activity within and among firms regarding sustainability in supply chains (Gimenez and Tachizawa 2012; Schoeggl et al. 2016a; Sancha et al. 2016; Singh and Trivedi 2016). At the same time, we note an intensification of stakeholder expectations (Seuring and Müller 2008; Li et al. 2014; Mueller and Bessas 2017) and a densification of guiding frameworks (Rasche and Gilbert 2012; Seuring and Gold 2013; Lee and Kashmanian 2013). By now, large multi-national corporations will inevitably include their approaches to supply chain sustainability in their sustainability reporting (Harms et al. 2011; Walker and Jones 2012). Nonetheless, there still appears to be a gap between theoretical academic SSCM research on the one hand, and SSCM practice on the other. Companies confront increasing expectations of their responsibility and have to devise strategies, measures, processes and tools to improve sustainability

in their supply networks as part of their broader sustainability strategies (Canzaniello et al. 2017; Ecovadis 2017; Pagell and Shevchenko 2014).

Various practical approaches and tools employed by multi-national corporations to improve sustainability in their supply chains have been identified (Lee and Kashmanian 2013). Whilst there has been illuminating analysis of the effectiveness of codes of conduct (Egels-Zandén 2014; Bartley and Egels-Zandén 2015) and to a lesser extent audits (Locke 2013; Short et al. 2016; Terwindt and Armstrong 2019), there has otherwise been little focus in SSCM literature on self-assessment as a tool for SSCM. One example is provided by Kashmanian and Moore (2014), whose research primarily focussed on company codes of conduct, which follow recommendations to companies by the United Nations Global Compact (UNGC) and Business for Social Responsibility (BSR). In summarising supplier monitoring activity, they briefly mention supplier self-assessments: "Prior to conducting audits of any kind, a company usually has suppliers perform self-assessments", which they point out are cheaper and faster in terms of identifying sustainability risk (Kashmanian and Moore 2014, pp. 13–14). Das' (2017) review of the state of SSCM research included a framework for SSCM practices, however supplier questionnaires (or similar SSCM performance measurement tools) were not covered. Thus, in this regard it appears that SSCM as an academic discipline is still challenged to be managerially relevant (Carter and Easton 2011) in the sense that it has not analysed the processes and tools that are widely in use. This is supported by Dubey et al. (2017a) who suggest a framework for bundling the numerous theoretical and practical oriented academic works in the field of SSCM (see Figure 1). One of their constructs, "Operational Performance Assessment" and the corresponding item "Audit and Assessment" (Dubey et al. 2017a, p. 339), forms the particular frame for the current paper. The tools covered by their framework are central to much focal company SSCM work, employed in multiple industries, and are sometimes the sole source of supply chain sustainability information. However, we argue that questionnaires are often taken for granted or overlooked and thus we find that they "must be further scrutinized through phenomenon-driven research" (Hahn and Ince 2016, p. 34).

This paper aims to partially address this research gap, understanding supplier sustainability questionnaires to be part of a supplier assessment process (Mueller and Bessas 2017) and thus it focuses on the following research questions:

> RQ1: What are the differences between an in-house, one-off supplier self-assessment questionnaire and an industry-wide, shared and validated supplier self-assessment?
>
> RQ2: What might the major factors influencing supplier responses to these two types of sustainability self-assessment questionnaires be?

By answering these research questions with empirical case data on these central tools for SSCM, our research we postulate various factors that may explain substantial differences in the results of suppliers' sustainability self-assessment questionnaires and make suggestions about how to improve the quality of such tools in the future. Following this introduction, we now provide a literature review of supplier assessment in SSCM, supplier self-assessment and challenges to self-assessment questionnaires, such as social desirability bias. Thereafter, we introduce the multiple-case study methodology and focus on supplier sustainability questionnaires as the unit of analysis for cross-case synthesis. We then present the case studies, describing how the data was collected and analysed. Then the results of the cases are presented, compared and synthesised. After this comparative analysis and discussion of both cases, we present our conclusions, including the implications of our findings, limitations of the research and recommendations to both practitioners and academics for areas of improvement and future research.

# 2. Literature Review

Global companies have been profiting from globally dispersed supplier networks for many decades (Gunasekaran et al. 2004; Lebaron et al. 2017; Lee and Kashmanian 2013; Petersen et al. 2000). Since the 1990s, public attention has increasingly been drawn to the negative effects of companies' practices and the perception of their responsibility for sustainability problems in global supply chains (Caniëls et al. 2013; Foerstl et al. 2010; Frostenson and Prenkert 2015; Klein 2010; Locke

2013; Seuring and Müller 2008; Wolf 2014). The emergence of SSCM can be seen as a response to this stakeholder pressure (Seuring and Müller 2008). Beske-Janssen et al. (2015) documented the remarkable growth of academic publications on the topic of SSCM. Ansari and Kant (2017) hail SSCM's rise to prominence as the "advent of a new era" (ibid, p.2524). Most SSCM literature has an implicit or explicit focus on so-called focal companies (Frostenson and Prenkert 2015), which typically exhibit the following characteristics: "(1) rule or govern the supply chain, (2) provide the direct contact to the customer, and (3) design the product or service offered" (Seuring and Müller 2008, p. 1699) and tend to be the owners/drivers of supplier sustainability assessments in their respective supply chains.

## 2.1 SSCM Assessment

The SSCM tools and processes that focal companies have at their disposal are applicable across industries (Hoejmose et al. 2013; BSR & UNGC 2015; Mueller and Bessas 2017). For example, Schoeggl et al. (2016b) note that companies in both the electronics and automotive industries are trying to address myriad sustainability issues in their broad and overlapping supply chains through sustainability assessment. As focal companies are increasingly required to assess their supply chains for sustainability risks (Lechler et al. 2019), they must first understand the status quo of SSCM in their supply chain, before they can improve it. To achieve this, they must be able to gauge progress in their suppliers' sustainability performance, which means supplier sustainability performance must be measurable and then assessed (Mokhtar et al. 2017; Reilly 2017). Thus, as Seuring and Gold (2013, p. 2) find, "managing the link to suppliers plays a key role when focal firms aim at moving toward sustainability."

Spence and Bourlakis (2009, p. 27) and Foerstl et al. (2010) have argued that supplier assessment has a positive effect on sustainability performance. Mueller (2017) proposes companies break down their SSCM processes into three steps: prevention, early warning, and reaction (see Figure 1). Companies need processes and tools to identify sustainability risks in their SCs (Foerstl et al. 2010; Hartmann and Moeller 2014; Kashmanian and Moore 2014), particularly relying on exchange with their top tier suppliers (Leppelt et al. 2013; Sancha et al. 2016; Schoeggl et al. 2016b; Seuring

and Gold 2013). One of the primary means for obtaining this sustainability information, necessary for a focal company's SSCM, is through supplier sustainability assessment (Lee and Kashmanian 2013; Schoeggl et al. 2016a). Seuring and Gold (2013) note that more research in the direction of supply chain sustainability *performance* was needed. Dubey et al. (2017b) find that assessing suppliers' sustainability performance is crucial for continuous improvement. Among other things it helps to quantify sustainability performance and thereby contributes to the successful implementation of SSCM (Das 2017). Mueller and Bessas (2017) found that of fourteen sector-based initiatives analysed, twelve of them involved focal companies employed a type of supplier sustainability assessment in the form of questionnaires and/or audits. Canzaniello et al. (2017) found that companies join industry associations ('strategic alliances') to improve the equivocality of supplier assessments and hence improve the ability to share supplier assessment data. Given the growth of SSCM literature, it is surprising that there is little literature that focuses on the 'how to?' of assessing suppliers' sustainability. Furthermore, there is still a particular lack of research dealing with the operative and applied active assessment of suppliers' sustainability practises.

## 2.2 Supplier Self-Assessment in SSCM

As illustrated in Figure 1, Dubey et al. propose that supplier assessments are tools within "performance assessment" and constitute one of 18 SSCM items (2017a, p. 339). We propose that this item warrants more academic attention. Questionnaires are a common example of how companies gather sustainability data and assess their suppliers' sustainability performance (see, for example: BSR & UNGC 2015; Ecovadis 2017). Other tools for operative sustainability performance assessment include code of conduct monitoring, audits, certification, sustainable labelling, creating minimum standards, tracking and tracing systems and multi-tier transparency initiatives (Dubey et al. 2017a; Fraser et al. 2020; Kashmanian and Moore 2014; Mueller and Bessas 2017).

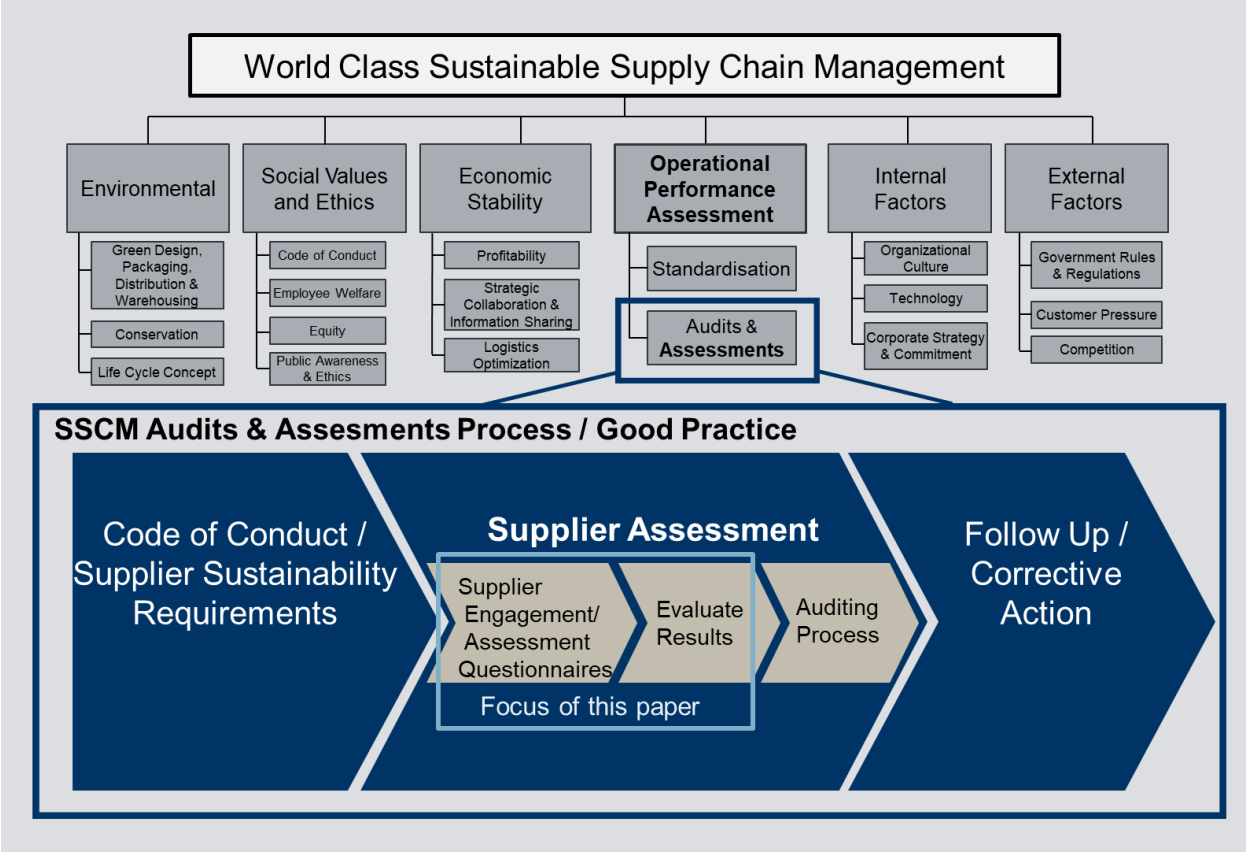


**Figure 1:** Position of our research in existing frameworks[1]

Despite the lack of apparent academic focus on questionnaires as an integral tool of SSCM, they can be found around the world in all types of industries (BSR & UNGC 2015) and settings, ranging from the building and construction industries, universities and government departments to large manufacturers, food and beverage retailers and financial institutions. A number of industry initiatives, such as the automotive industry's AIAG and DRIVE Sustainability, the electronic industry's EICC[2], the toy industry's Ethical Toy Programme (IETP), or the chemistry industry's Together for Sustainability, continue to further develop common and standardized sustainability questionnaires that are given to first tier suppliers[3]. However, widespread use of such tools does not preclude challenges involved

[1] Authors' own depiction, adapted – with permission – from Dubey et al. (2017) and Mueller and Bessas (2017).

[2] Since October 2017 rebranded as the Responsible Business Alliance: http://www.responsiblebusiness.org/

[3] Also, more online or platform service providers are responding to the demand for supply chain sustainability assessment, i.e. Sedex (www.sedexglobal.com), Ecovadis (www.ecovadis.com) and NQC Ltd. (https://auto.nqc.com/).

with employing self-assessment as a tool, which is why we look at potential problems in self-assessment as applied to supplier sustainability management.

## 2.3 Challenges in Supplier Self-Assessment

Much has been written on the subject of questionnaire design, with research spanning half a century and continuing into the present (e.g.: Bradburn et al. 2004; Dalal and Hakel 2016; Jenkins and Dillman 2012; Krosnick 2018; Schwarz et al. 1991; Tourangeau 1984; Wright and Barnard 1975). In short, respondent's reactions and responses to questionnaires are affected by: the language used, the questionnaire mode, the way the questions are constructed, the self-assessment process that the questionnaire is embedded in and the visual/spatial construction of the questionnaire (Jenkins and Dillman 2012). Despite much cognitive and organisational research into questionnaires, there remains much to be discovered and improved (Vannette and Krosnick 2018). It follows that SSCM should heed the lessons learned in other academic disciplines and pay particular attention to the tools used to gather sustainability information from the supply chain. One major problem that emerges from self-assessment is social desirability bias.

Walker and Jones (2012) note that despite much progress in the field of sustainable procurement, there are methodological challenges that apply to all corporate social responsibility-related fields (i.e. sustainable procurement, SSCM, green SCM). When respondents are asked to answer questions about sustainability, they "are often compelled to give a positive impression of their own and their organisation's activities" (Walker et al. 2012, p. 202). This is not caused by explicit external pressure but rather due to social desirability bias, one of the main problems encountered when direct responses from individuals are sought on moral topics. Whilst van der Vaart and van Donk (2008) critically assess various subjective interpretations of supplier relationships and the dependence on individual assessment of supply chain integration, they do not address the issue of social desirability bias.

In other fields, such as social psychology and organisation behaviour, this bias and the inherent methodological limits of self-report questionnaires have been widely discussed (Dalal and Hakel

2016; Joinson 1999; Rolstad et al. 2011; Scherpenzeel and Saris 1997; Sjöström et al. 2009; Spector 1994), but this debate is barely found in operations research on inter-firm relations, let alone in SCM. One exception is the work of Roxas and Lindsay (2012), which addresses the issue of social desirability bias in small firms and the differences in 'accurate' sustainability reporting. They found that purely self-administered questionnaires led to less accurate reporting and overly positive self-assessment of sustainability. These results confirm the findings of Angus-Leppan et al. (2010) in which respondents were inclined to characterize beliefs and ideal states in an overly positive manner, hindering their ability to realistically disclose sustainability management practices. In all buyer-supplier interactions involving self-assessment questionnaires, individuals' innate biases very probably have an impact on the resulting sustainability performance. Leppelt et al. (2013) take care to address these issues of misreporting and bias in the data for their research into business relationships and SSCM, but so far little work has been done on ensuring the same when designing sustainability self-assessments questionnaires for suppliers.

Beyond the risk of social desirability bias, we should consider the problem of supplier assessment fatigue (Ecovadis 2017; Jiang et al. 2013; Kashmanian and Moore 2014; Newitt 2012; Zamur et al. 2017). Focal companies have responded to the pressure to implement supplier sustainability assessments (BSR and UNGC, 2015). Thus, their suppliers receive various sustainability questionnaires and requests for certification and audits, often receiving similar requests from multiple customers (Davies 2012; Ecovadis 2017). This can lead to supplier "fatigue" as supplier production facilities have to incur various compliance cost burdens (Newitt 2012). Initiatives such as Together for Sustainability and Drive Sustainability recognised this burden and identified it as a driver for standardisation (Drive Sustainability 2017; TFS - Together for Sustainability 2016). Jiang et al. (2013) took supplier survey fatigue as a starting point for their research into the challenges and opportunities for supplier disclosure to their customers in SSCM. Grewatsch and Kleindienst (2017) show how cognitive frames affect organizational capabilities, with a particular focus on corporate sustainability capabilities. Accordingly, similar to individuals, companies can take on cognitive identities that then affect the individuals within them (ibid), which could influence an individual's responses. It follows that when individuals are responding to self-assessments on behalf of

companies we must ask ourselves to what extent an individual is responding in a socially desirable manner and how this affects the company's sustainability results in a SSCM context.

In the literature we find several potentially significant factors that could affect supplier assessments and self-assessment questionnaires, and importantly the results they produce: social desirability bias (and the supplying company's cognitive frame), questionnaire design and process, supplier assessment fatigue, and the focal company's institutional setting. We also assume that country differences would be a factor in performance variance (see, for example, Jia et al. 2018b). The proposed influencing factors and the relation of these factors to one another in the supplier sustainability assessment process can be seen in Figure 2.

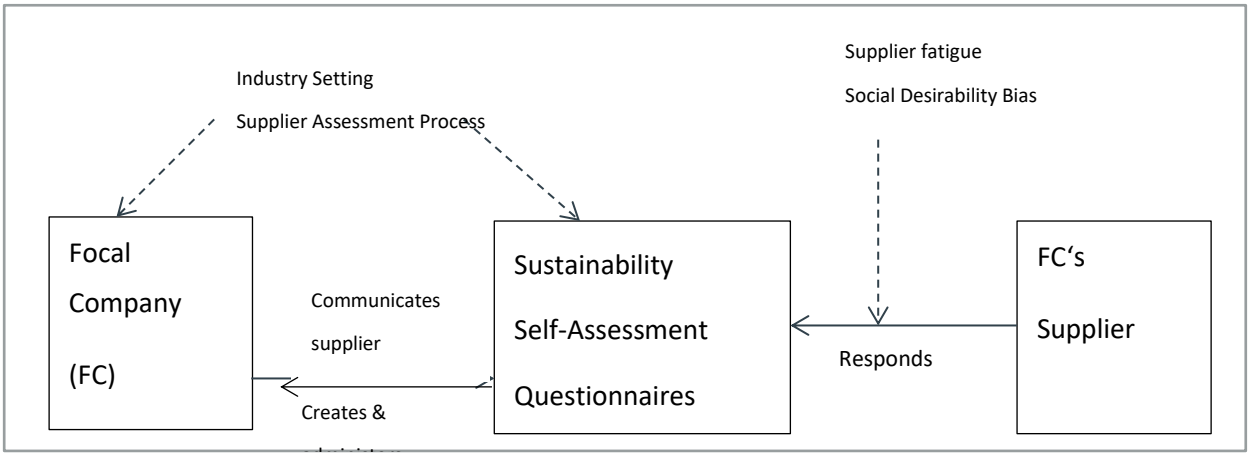


**Figure 2:** Research Model demonstrating process and potential variables affecting supplier responses

We have established a need for empirical analysis of supplier sustainability self-assessment questionnaires to investigate what the critical factors are and how they potentially influence supplier responses. In the following section we introduce the multiple-case study design and our abductive method, before describing two case studies focusing on supplier sustainability questionnaires that we conducted to address this research gap.

# 3. Method and Multiple-Case Study Design

From the literature it emerges that supplier self-assessment questionnaires play an important role in SSCM but have received little critical academic attention. Hence, we decided to research two available cases of such self-assessment questionnaires and to compare and contrast them in terms

of the processes associated with them and the results they generate. Yin (2018) notes that case study research, which seeks to understand complex phenomena in their real-world contexts, is well suited to questions of inquiry that seek to understand 'how' and 'why' things occur. Our research involved an empirical inquiry into how suppliers respond to sustainability self-assessment questionnaires and why they might potentially respond in certain ways. Ultimately, the research design, involving multiples cases, allowed us to not only focus on specific variables and results but also the potential for cross-case synthesis. This synthesis involves uncovering within-case patterns and comparing these across the cases in order to determine literal replication (same or similar results in different cases) or theoretical replication (despite case similarities, divergence of outcomes due to predictable factors) (Yin 2018, pp. 174-194).

## 3.1 Research Method: Design, Approach and Unit of Analysis

We pursued our research based on a qualitative, abductive research design (Helmreich 2007; Ketokivi and Mantere 2010; Timmermans and Tavory 2012). After reviewing the extant literature, we began collecting and analysing our data. We then noted emerging themes and generated conceptualisations and then returned to the literature and repeated this abductive process in several iterations (Biggs 2011; Hahn and Ince 2016; Timmermans and Tavory 2012). In this manner the case studies can serve to improve extant knowledge with the insights gathered from the idiosyncrasies of the empirical context (Ketokivi and Choi 2014; Stuart et al. 2002). The organisational *context* for both case studies was a global automotive focal company "AFC" (henceforth referred to as AFC). The *unit of analysis* was the sustainability self-assessment questionnaire, administered to this company's suppliers. The *subjects* of this research, AFC's suppliers, responded to one or both sustainability questionnaire/s requested by AFC. Thus, our research involved a multiple case-study design wherein the same unit of analysis, the supplier sustainability questionnaire, formed the basis of two case studies (Yin 2018). As detailed in subsection 3.3. below, the questionnaires were similarly structured (indeed, experience gained with the first questionnaire informed the development of the second questionnaire) and fulfilled the same monitoring purposes as part of AFC's sustainable supply chain activities. By analysing two cases involving a large amount of supplier response data gathered over a

timeframe of five years, we aimed to identify meta-level potential causal factors that could lead to new understandings for academia and practice.

## 3.2 Case Studies: Background and Setting

Despite the widespread use of supplier sustainability questionnaires in practice and their central place in the canon of SSCM tools and processes (Lee and Kashmanian 2013; Mueller and Bessas 2017), there has been very little academic inquiry into these tools. Consequently, we explored this topic by analysing case data on two supplier sustainability questionnaires and assessment approaches administered by AFC. Whilst each case concerns a different questionnaire, both questionnaires fulfilled a very similar purpose as part of SSCM monitoring. Case A concerns the original, internally-developed supplier sustainability questionnaire (ISQ) and Case B refers to the more recent, industry-wide developed supplier self-assessment questionnaire (SAQ) on sustainability that AFC gathered from some of its suppliers.

### 3.2.1 – CASE A: Internal Supplier Questionnaire (ISQ)

AFC began assessing its suppliers on sustainability in 2006. It created a supplier questionnaire to monitor its suppliers' compliance with AFC's sustainability requirements for business partners. The questionnaire was piloted in 2006 and developed over the ensuing years. In 2012, after years of manual processing, AFC began recording all supplier responses to the ISQ in a central database. Completion of the ISQ was mandatory for those suppliers concerned (defined as over a certain amount of turnover, high-risk, or as a measure/response to concrete suspicions of infringement) in the timeframe under consideration (2012 – 2017). The ISQ was technologically integrated into the central business partner platform and the completed ISQs could be checked by AFC's buyers in the supplier database.

**Case A: ISQ design and integration in AFC's processes**

The ISQ was designed to cover major areas of AFC's sustainability requirements for suppliers. It is divided into five major sustainability areas, with each area containing between two and nine questions (see Figure 3). All questions required a "yes" or "no" answer. The total score for each ISQ

was generated by dividing the number of correct responses (points) by the total number of questions (24). All but one question in the ISQ, required a 'yes' in order to score a point. The ISQ process had been technologically integrated into supplier onboarding processes since 2012. The supplier received a task as part of this process and reminders to complete the ISQ. In certain cases, suppliers were contacted regarding their responses, which led, in some cases, to suppliers submitting updated ISQs.

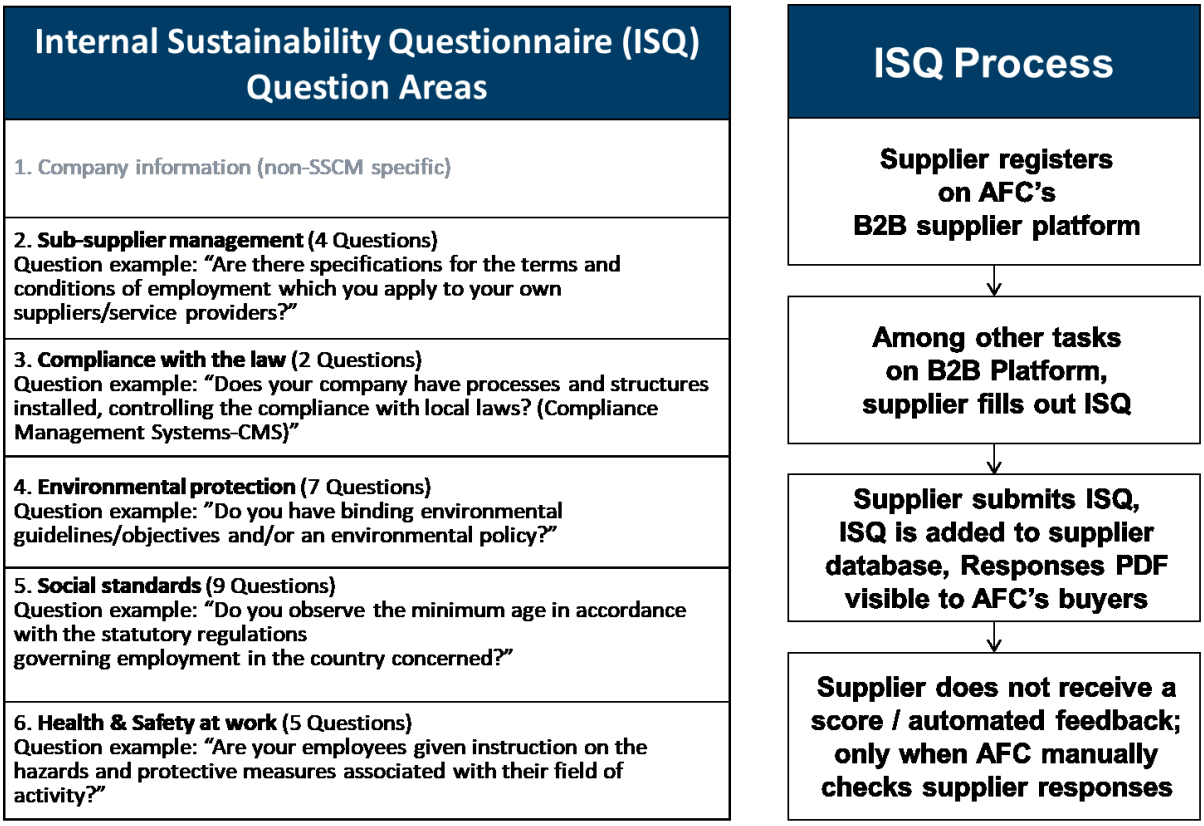


**Figure 3**: ISQ questionnaire design (sustainability areas & example questions) and ISQ process

### 3.2.2 – CASE B: European Automotive Industry Self-Assessment Questionnaire (SAQ):

In 2013, an Automotive Original Equipment Manufacturer (OEM) working group for sustainability in global supply chains was officially launched (CSR Europe 2013). Based on their respective experiences with sustainability questionnaires, combined with their suppliers' feedback that suppliers were receiving too many individual supplier sustainability questionnaires from OEMs, the working group created a common Self-Assessment Questionnaire (SAQ) on sustainability for

suppliers, which was publicly launched in April 2014 (CSR Europe 2014a; Drive Sustainability 2017). The SAQ built upon the Automotive Industry Guiding Principles to Enhance Sustainability Performance in the Supply Chain, which was co-launched by CSR Europe and the Automotive Industry Action Group (AIAG) in March 2014 (CSR Europe 2014b).

**Case B: SAQ 2.0 Design and integration in AFC's processes**

The SAQ evolved from previous experience with supplier sustainability questionnaires and aimed to strike a balance between detailed questions addressing core suppliers' sustainability practices without being overburdening. Thus questions did not just ask whether a supplier had capacity, a sustainability policy or a certified management system, or was undertaking certain measures, but also required evidence for these claims. To remove the processing burden from participating OEMs and to ensure that supplier data was not shared with other OEMs against a supplier's will, the administration was undertaken by the third-party service provider, under the anti-trust oversight of CSR Europe. Each OEM could choose to what extent and how the SAQ was integrated into internal procurement processes and systems. AFC chose to participate in the SAQ sharing platform solution. Suppliers were invited (see Figure 4) as part of campaigns run together with the service provider, individually or in waves organised by AFC. A supplier was asked to register their supply location on the platform, fill out contact and location details, and answer the sustainability questions. The supplier was then checked by the third-party platform provider. Often the responsible person for completing the SAQ had to gather information, certificates, links and other evidence in the process of filling out the online questionnaire[4]. Once completed, the supplier could choose which OEMs to share their SAQ with. Thereafter the SAQ was validated by the platform provider, to check if the attached evidence supported the responses. Finally, a percentage score was given based on the responses. To begin with, this score could only be seen by the OEMs with whom the supplier had chosen to share the SAQ; the supplier only saw a coloured 'award' (red, amber or green). As of early 2017 the suppliers could also see their percentage score.

[4] The SAQ could be filled out, if necessary over an extended period of time, such that responses already given could be saved to work on later.

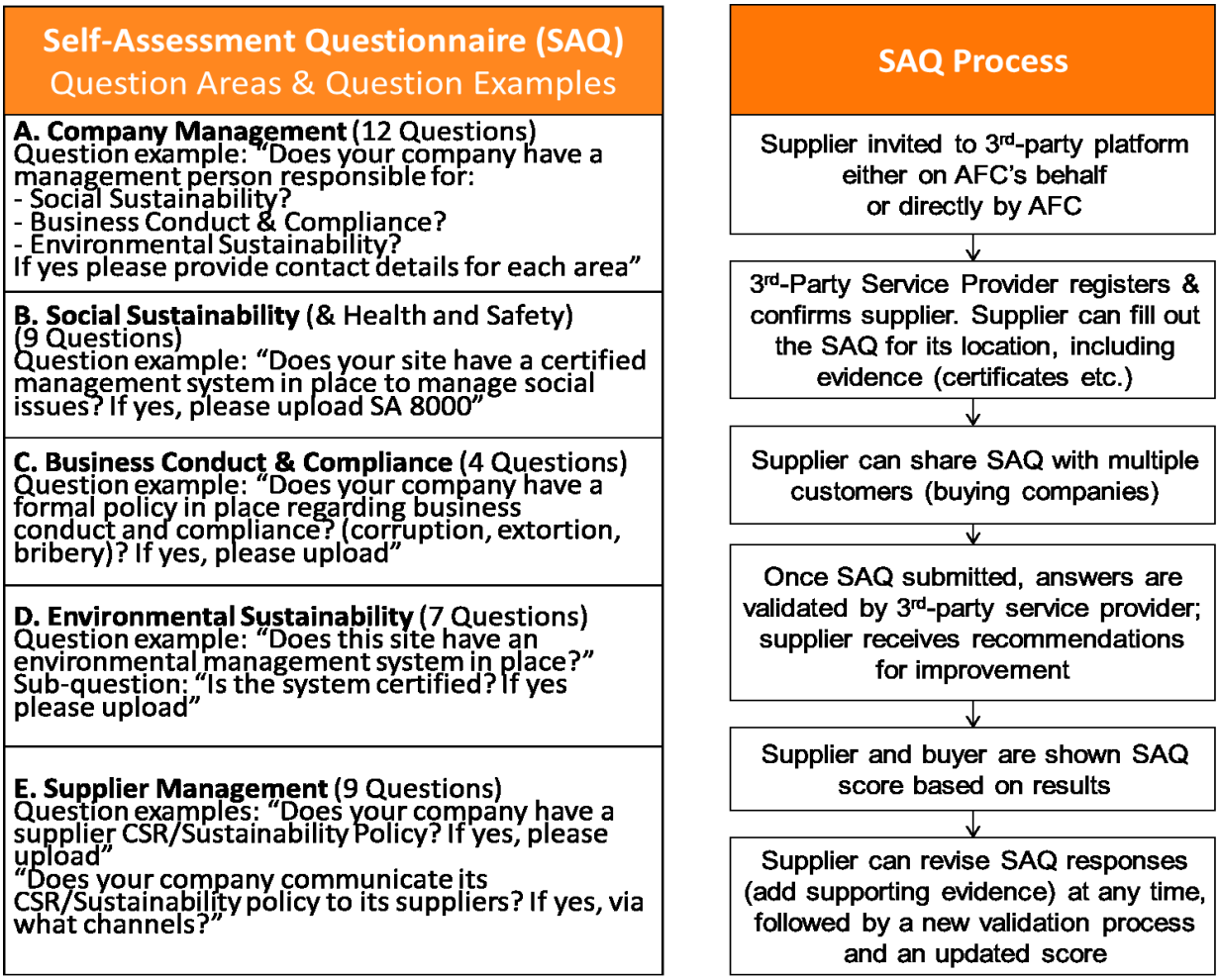


**Figure 4:** SAQ questionnaire design (sustainability areas & example questions) and SAQ process

AFC began inviting a small number of supplier locations in 2014 to test the SAQ. Increasingly, AFC began to onboard its most critical and production-essential suppliers. By 2017 AFC had plans to integrate the SAQ into its procurement processes and systems, so that buyers could see the SAQ results for potential and existing suppliers. The SAQ also informed AFC's risk management and more suppliers were successively invited via strategic campaigns.

Apart from a small number of non-weighted questions and sub-questions, each 'mandatory' question resulted in an equal percentage contribution to the total score. Service provider suppliers that were not production site locations did not have to answer as many questions as production locations, but still received a score out of 100%. However, all suppliers invited to fill out the SAQ by AFC were suppliers of parts and components for production (not service providers). Importantly, at no point in the timeframe under consideration was the SAQ mandatory for suppliers. They were

strongly encouraged by the procurement department, but by no means did all invitees register on the platform. Furthermore, not all of those who did register completed a SAQ and not all who completed it shared their SAQ with AFC.

## 3.3 Methods: Research Procedure

Two members of our research team were able to interact with AFC at different times over a timeframe from 2012 until 2018. Therefore, the data collection, data extraction and data analysis were conducted in a collaborative manner, allowing the researchers to make observations over time that supported the raw data in the form of the suppliers' questionnaires. Both case studies were carried out by the same researcher, who was based at the automotive focal company throughout the research, with access to both databases and all material required. The data informing both cases primarily consists of empirical data in the form of direct supplier questionnaire responses, as well as supporting participant observation carried out by the researcher who was entrusted with analysing both the questionnaire data itself as well as the processes of data collection.

### 3.3.1 – CASE A: ISQ Data Collection

AFC's ISQ database contained over 20,000 supplier sustainability responses. The dataset contains every response recorded in the timeframe from January 2012 until December 2017. Each supplier location's responses were collated in the database. The data were extracted on a single day in January 2018, representing a snapshot of all collected responses up to the end of 2017. The database portrayed each supplier location's responses to individual questions, grouped into sustainability areas, and also contained information on the country location. By means of a unique identifier duplication could be ruled out.

### 3.3.2 – CASE B: SAQ Data Collection

The SAQ data was administered, processed and validated by the platform provider. Therefore, AFC's supplier SAQ data were extracted from the service provider's secure platform. Between 2014 and the end of 2017 there were 8,093 of AFC's supplier locations registered on the platform. The final

SAQ dataset, forming the basis of Case B, involved 5,431 completed SAQ responses. The other 2,662 SAQs had not been completed and thus had no score for analysis. A supplier could return to their SAQ and update their responses, resulting in new validation and (potentially) a new score. Our dataset only contains the most recent score for each location as the final score. The database contained country location information and separated each supplier's response to individual questions. By means of a unique identifier number SAQ duplication could be ruled out with high certainty. The platform provider undertook regular data quality checks to ensure supplier data was current.

### 3.3.3 – Cross-Case Synthesis: Comparison and analysis

We had the unique opportunity to access two large questionnaire datasets at a time when AFC was shifting its strategy towards more shared supplier assessment. This window of opportunity combined with personal access to AFC's systems and processes meant that a thorough analysis of each case could be undertaken. By analysing total score distributions, and then further sorting response scores into sustainability areas as well as filtering total scores according to countries, we could synthesise the two cases and begin to compare the case data. Various findings arose and by applying abductive logic we proposed a number of variables for better explaining supplier responses to these SSCM tools.

# 4. Results

In the following we present the results of the two questionnaires that constitute the unit of analysis of each cases study. The results depict the distribution of the overall supplier scores for each case, the average scores for sustainability areas in the questionnaires and the countries with the largest number of supplier locations and the average questionnaire scores at a country level.

## 4.1 CASE A: Internal Sustainability Questionnaire (ISQ)

In total there were 23,473 ISQ responses collected. If an ISQ was resubmitted, the latest response replaced the previous entry in the database, so that all responses were unique. 9,224 locations scored a perfect score (24 out of 24 possible points), representing nearly 40% of all ISQs.

Scores ranged from 17% to 100% but the *average score was 89%*. Figure 5 depicts the frequency distribution of the supplier locations' ISQ scores per decile. It is very evident that ISQ scores between 90% and 100% were the most frequent: the majority (64%) of all supplying locations achieved a sustainability score in this decile. Nearly 90% of ISQ scores were in the top three deciles. Conversely, less than two per cent of all supplier locations had scores of less than 50%.

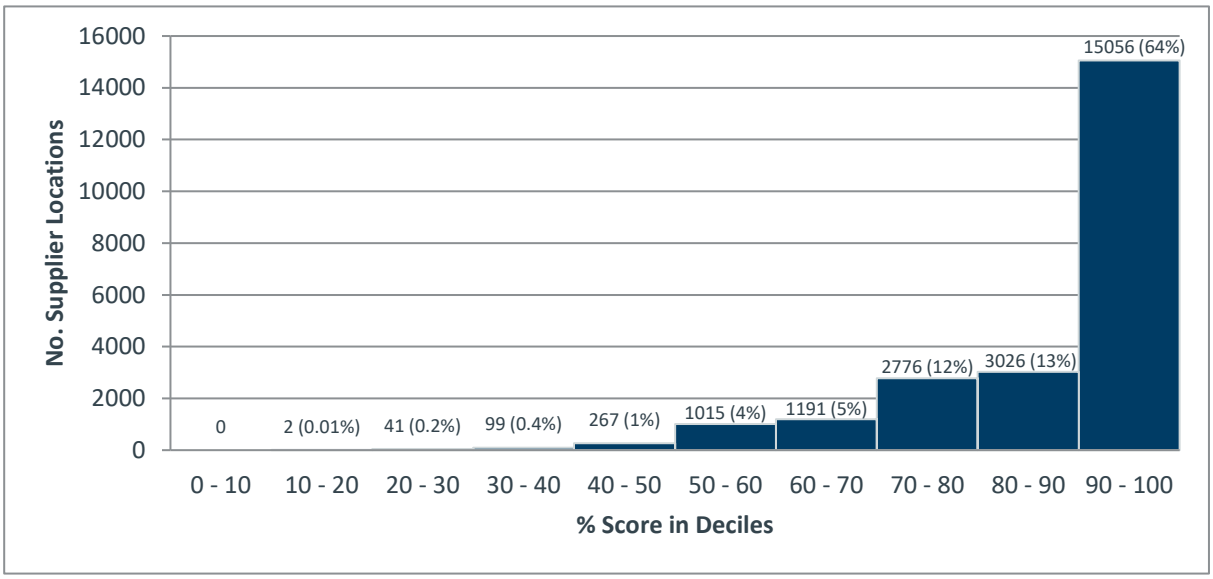


**Figure 5**: Supplier locations' ISQ % Scores, distributed by score decile

**Table 1:** Averages scores by ISQ sustainability area

| Average Total ISQ Score | Sub-suppliers | Compliance | Environment | Social Standards | Safety & Health in workspace |
|---|---|---|---|---|---|
| 89% | 82% | 94% | 79% | 96% | 92% |

The ISQ was divided into 5 sustainability areas. We analysed the average scores by sustainability area, which ranged from average scores of 79% for Environment to 96% for Social Standards (see Table 1). These high sustainability area scores are understandable considering the average score across all ISQs (89%) and that 40% of all ISQs collected had scores of 100%.

**Table 2:** ISQ distribution & average scores by top 10 countries

| | Supplier Location Country | No. Supplier Locations | % of all ISQs | Average score % |
|---|---|---|---|---|
| 1. | Germany | 12,331 | 52.5% | 86% |
| 2. | Mexico | 1,110 | 4.7% | 92% |
| 3. | Brazil | 995 | 4.2% | 94% |

| | | | | |
|---|---|---|---|---|
| 4. | USA | 915 | 3.9% | 90% |
| 5. | Spain | 811 | 3.5% | 95% |
| 6. | Czech Republic | 739 | 3.1% | 93% |
| 7. | China | 728 | 3.1% | 98% |
| 8. | Italy | 671 | 2.9% | 91% |
| 9. | United Kingdom | 527 | 2.2% | 90% |
| 10. | Poland | 510 | 2.2% | 93% |
| | **Total Top 10** | **19,337** | **82%** | **92%** |
| | All suppliers ISQ | 23,473 | 100% | 89% |

ISQs were collected from supplier locations from 80 countries. Half of all ISQs came from supplier locations in Germany, wherein the average ISQ score was 86%. Overall, 80% of ISQs came from supplier locations based in just 10 countries. Table 2 shows that there was not much variation in average ISQ scores across countries[5]: Germany had the lowest, 86% and China the highest average score, 98%. We now turn to the results of the second questionnaire, the industry-wide self-assessment questionnaire, that constitutes Case B.

## 4.2 CASE B: Sustainability self-Assessment Questionnaire (SAQ)

The results considered in this research are the score that each supplier location last achieved. Only four locations achieved a perfect score (100%), whereas 90 supplier locations submitted a SAQ but received a score of 0%. Thus, the range of SAQ scores was from zero to 100 percent, with an average score of 65%. The distribution of SAQ scores per decile can be seen in Figure 6.

[5] The next ten countries only accounted for 11% of all ISQ responses and had an average ISQ score of 92%, with average scores ranging from 89% (Austria) to 94% (Slovakia, Portugal and Sweden)

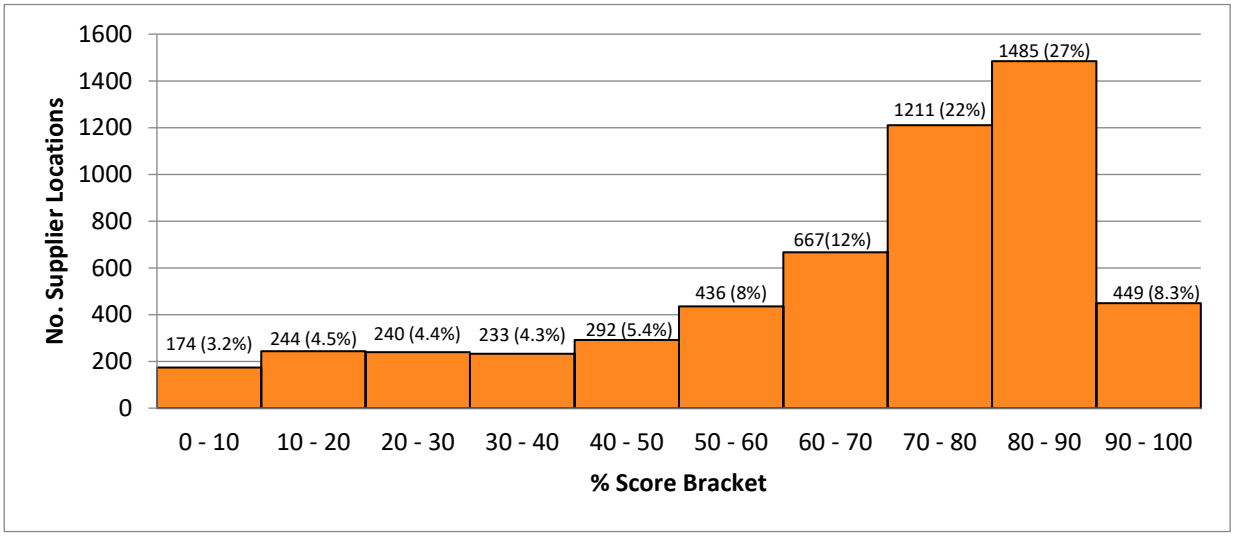


**Figure 6:** Distribution of supplier locations' SAQ % scores, by score decile

We observe that over half of all supplier locations (58%) in the sample achieved a SAQ score in the top three score deciles. Conversely, 42% of all supplier locations got SAQ scores in the lower seven deciles, with more suppliers achieving scores between 50 and 70% and an otherwise fairly even distribution across the score deciles zero to 50%.

The SAQ was divided into five sustainability areas. We analysed the average scores by sustainability area across all supplier locations, which ranged from an average score of 52% for social sustainability to 72% for environmental sustainability (see Table 3).

**Table 3:** Average SAQ scores by sustainability area

| Average Total SAQ Score | Supplier Management | Business Conduct and Compliance | Environmental Sustainability | Social Sustainability | Company Management |
|---|---|---|---|---|---|
| 65% | 54% | 67% | 72% | 52% | 70% |

These sustainability area scores indicate that AFC's suppliers achieved higher scores in the areas of environmental sustainability, company management and business conduct and compliance, but only achieved mediocre scores for social sustainability and supplier sustainability management.

**Table 4:** SAQ distribution & average scores for top 20 countries

| | Supplier Location Country | No. Supplier Locations | % of all SAQs | Average score % |
|---|---|---|---|---|
| 1. | Germany | 1,927 | 35.5% | 62% |
| 2. | Sweden | 317 | 5.8% | 62% |
| 3. | Mexico | 268 | 4.9% | 73% |
| 4. | Italy | 235 | 4.3% | 61% |

| | | | | |
|---|---|---|---|---|
| 5. | Czech Republic | 231 | 4.3% | 70% |
| 6. | Spain | 220 | 4.1% | 67% |
| 7. | Poland | 196 | 3.6% | 72% |
| 8. | Brazil | 173 | 3.2% | 65% |
| 9. | United Kingdom | 164 | 3.0% | 60% |
| 10. | France | 155 | 2.9% | 70% |
| | **Total Top 10** | **3,886** | **72%** | **66%** |
| 11. | China | 136 | 2,5% | 73% |
| 12. | Hungary | 124 | 2,3% | 70% |
| 13. | Austria | 115 | 2,1% | 69% |
| 14. | United States | 114 | 2,1% | 72% |
| 15. | India | 106 | 2,0% | 64% |
| 16. | Slovakia | 103 | 1,9% | 72% |
| 17. | Turkey | 84 | 1,5% | 68% |
| 18. | Romania | 75 | 1,4% | 77% |
| 19. | Netherlands | 66 | 1,2% | 56% |
| 20. | Denmark | 52 | 1,0% | 51% |
| | **Total / Average Top 20** | **4,861** | **90%** | **66.7%** |
| | All Suppliers' SAQs | 5,431 | 100% | 65% |

SAQ data was collected from supplier locations in 70 different countries. Germany-based supplier locations constituted over a third of all responses and the top ten supplier location countries accounted for over two-thirds (72%) of all SAQ responses in total (see Table 4). Among the top ten countries, average SAQ scores ranged from 60% (United Kingdom) to 73% in Mexico, indicating low average score variance among countries. When considering the top 20 countries, it is interesting to see that the highest average score was found among suppliers in Romania (77%), whereas the lowest average SAQ country score was in Denmark[6]. In the following we discuss these results and findings from each case, and then synthesise cross-case patterns of similarity and divergence.

[6] Also, unexpectedly, China and Turkey both registered country average scores of 73%; higher than the averages for all western-European countries

# 5. Discussion

The academic benefit of conducting multiple-case study research lies in finding like cases, with the same unit of analysis (in this case: sustainability questionnaires for suppliers). These can either predict similar findings across multiple-cases, resulting in 'literal replication', or point to like cases that predict contrasting results but for anticipatable reasons, so-called 'theoretical replication' (Yin 2018, p. 57). If either of the results for a particular questionnaire presented above were to be analysed alone, the question might arise, how realistic are these results? Whilst analysing the results of the two cases it became apparent that the meta-results differed in important ways. Although different questionnaires, due to their similar content and purpose a meta-level comparison of the amassed data provided us with insights into supplier sustainability questionnaires as a SSCM tool. Furthermore, both questionnaires served as monitors of suppliers' (reported) sustainability compliance and an assessment of supplier sustainability practices. In general, we found cause for scepticism about how representative the ISQ results are of sustainability performance and that the SAQ is probably a more accurate SSCM tool. In the following, we present our cross-case synthesised findings.

## 5.1 Findings: Distribution of average supplier scores

As presented in 4.1 and 4.2, it is worth recalling and synthesising the score distributions of the two questionnaires to make the major finding of our research clear. The SAQ returned a visibly more diverse set of supplier responses/scores than the ISQ. The ISQ responses resulted in very high scores (average 89%) and accordingly a high concentration of high-scores (nearly 90% of all supplier locations responses returned scores between 70% and 100%, recall Figure 5). The extremely high average ISQ scores and the corresponding lack of differentiation among suppliers' performance meant that deeper analysis of the ISQ results and drawing meaningful conclusions were rendered superfluous. The SAQ responses returned greater variation in scores. The average score was lower (65%) with 42% of supplier responses generating scores between zero and 70%. The SAQ results demonstrated a somewhat top-heavy distribution of scores, with nearly half of all supplier locations

achieving scores between 70% and 90% (recall Figure 6). Still, due to the broader spread of scores (contrast Figure 5 and 6), it was possible to differentiate more among supplier responses, also when considering other aspects such as questionnaire sustainability area and country results.

## 5.2 Findings: Sustainability area scores

Both questionnaires contained different sustainability areas, meaning that supplier location responses could be looked at thematically. Table 1 (section 4.1.4) and Table 3 (section 4.2.4) depict the average scores drawn from the responses based on each sustainability section in the respective questionnaires. The ISQ returned slightly less varied responses when considering average scores by sustainability area and much higher average area scores in total. The highest average ISQ section scores were for social standards (96%) and the lowest for environmental protection (79%). However, given justifiable scepticism about ISQ results in general, we focus on SAQ section results. SAQ sustainability section average scores were significantly lower and ranged from 52% for social sustainability to 72% for environmental sustainability[7].

The SAQ sustainability section results coincide with general literature findings, namely that it is harder to quantify social sustainability and harder for firms to measure and improve performance in this area (Beske et al. 2014; Dubey et al. 2017a; Fish 2015). Thus, suppliers were more likely to achieve higher environmental sustainability scores in the SAQ thanks to ISO 14001 certification and certified management systems etc. Unlike the ISQ, the SAQ points not only to social sustainability as a SSCM area deserving continued attention (Hutchins and Sutherland 2008; Ferri and Pedrini 2018) but also to sub-supplier sustainability (Fraser et al. 2020). These findings correspond well with current problems for practitioners around achieving transparency in SCs (BSR and UNGC 2015; Schwarzkopf et al. 2018), addressing SSCM risks in raw materials SCs and how to pass on requirements beyond tier one suppliers (BSR and UNGC 2015; Drive Sustainability 2017; Sauer and Seuring 2017; Jia et al.

[7] Interestingly, the highest average section score for the ISQ (social standards) was the lowest average scoring section in the SAQ (52%). Conversely the lowest ISQ section average scores were for environmental protection (79%), whereas this was the section with the highest average scores (72%) for the SAQ.

2018a). The SAQ responses demonstrate interesting and differentiated findings about supplier sustainability practices.

## 5.3 Finding: Score differences based on location

ISQ responses were gathered from supplying locations in 80 countries and SAQ responses from 70 different countries. Eight of the top ten countries were the same for ISQ and SAQ responses. The top ten supplier locations countries constituted over 80% of all ISQ responses and over 70% of all SAQ responses. ISQ country results were not diverse, due to the limited range and very high average-scores. All countries from which we analysed three or more ISQ responses achieved an average score of *over* 85%. When we consider countries, for which we received three or more SAQs, the country average SAQ scores range from 36% to 85% indicating much more diverse responses and corresponding sustainability performance. Our results included an over-representation of Germany-based supplier locations, both for the ISQ and SAQ.

ISQ results, while demonstrating generally high scores, also demonstrated some counter-intuitive results. Supplier locations based in OECD countries such as Germany (86%) and the United Kingdom (90%) would normally achieve higher average sustainability scores than those supplier locations based in countries such as China (98%) and Brazil (94%). The country responses for countries 10-20 continued to challenge common-sense wisdom: Russia and South Africa (92%) and India (93%) achieved higher average ISQ sustainability scores than supplier locations based in Austria (89%), the USA (90%) and Italy (91%). Thus, ISQ results can be questioned as not being indicative or representative of country sustainability practices and performance[8].

SAQ responses, however, also returned country results that were contrary to our expectations. For example: Mexico (73%), China (73%) and Brazil (65%) achieved higher average SAQ scores than

[8] For example, supplier locations based in developing countries like Iran and Botswana (score 100%), Philippines (99%), Indonesia (98%), Thailand (97%), Tunisia and Morocco (96%) and India (93%) paint a high-scoring picture for these countries when looking at ISQ responses.

Germany (62%), Sweden (62%) and the United Kingdom (60%)[9]. As described, these suppliers had to upload evidence to support their SAQ responses, which means that there is little basis for questioning the accuracy of the individual location scores, and therefore the aggregated scores. However, self-selection bias could account for some of the unexpected higher country-score averages. The SAQ was not mandatory for AFC's supplying locations in the timeframe under examination. Several thousand supplying locations had registered on the platform between 2014 and 2017 but did not complete or share their SAQ with AFC. Some suppliers began to fill out the SAQ and then stopped, possibly realising that completing it would probably return a low score. Other suppliers, upon realising that the SAQ was not mandatory, might not have wanted to disclose their porous sustainability practices. One can similarly surmise that suppliers who were confident of achieving higher scores would be more likely to complete and share a SAQ. German and Swedish suppliers were prioritised for various reasons by AFC. Possibly these country results are more statistically representative in general. These supplying locations might have been more likely, due to historic and strategic partnerships, to feel compelled to complete and share their SAQ with their customer AFC.

The country responses showed the SAQ responses are probably *not* representative of general sustainability risks indicated by the respective social economic development level of those countries, prominent examples being China, Mexico, Turkey and Romania outperforming Denmark, Germany and Sweden. With nearly 2000 data-points, the results for German suppliers could possibly be considered representative, but all other countries (from which we gathered less than 320 SAQs each) cannot plausibly be considered representative of sustainability performance at country level.

[9] Furthermore, countries such as the United Arab Emirates (81%), Timor-Leste (74%), Nicaragua (79%), the Philippines (85%) and Indonesia (83%) all demonstrated perhaps unexpectedly high SAQ average scores, but the sample size for these countries was very small (one to three supplier locations) and thus should not be considered representative for general sustainability performance in these countries.

# 6. Conclusions, Limitations and Relevance for SSCM

We began our research asking ourselves what the salient differences are between two types of suppliers' sustainability self-assessment questionnaires. With access to a large amount of data from two different types of questionnaires (designed to fulfil the *same* SSCM *purpose* and constituting the *same type of tool*), we wondered how suppliers might respond to them, how these responses might differ, and if so, why this might occur. We proposed that responses to self-assessment questionnaires could be influenced by: supplier assessment fatigue, a supplier employee's social desirability bias (and the supplying company's cognitive frame), questionnaire design and how it is embedded in company processes, the focal company's institutional setting and potentially by country differences. We conclude our article with major conclusions resulting from our cross-case comparison and findings before illuminating limitations to our research and making recommendations for future research. Finally, we highlight the relevance of this research for SSCM academics and practitioners.

## 6.1 Main Conclusions on self-assessment questionnaires for SSCM

In response to a demonstrated research gap and directed by our two research questions, this research demonstrated how such supplier sustainability self-assessment tools can differ, both in terms of their questionnaire structure and the institutional setting and company processes that they necessitate. It then sought to explain why supplier responses might differ, depending on the supplier self-assessment tool. In the following we expound on the role and importance of questionnaire design, assessment process and institutional setting, concluding that more diverse, realistic supplier assessment tools are essential for SSCM.

### 6.1.1 Addressing SDB and cognitive frame: questionnaire design & process

We found that both questionnaire design and the process seemed to influence the responses and could potentially limit social desirability bias and address negative cognitive framing. In other disciplines much attention has been paid to questionnaires (such as the order of questions, leading vs. open questions etc.) and their design (Bradburn et al. 2004; Dalal and Hakel 2016; Jenkins and Dillman 2012; Tourangeau 1984). In our case studies we clearly observed that the ISQ's 'leading

questions' (that were noticeably looking for one type of socially desirable response) were overwhelmingly responded to in the expected manner. Apart from one question that required a "no" answer, it could be inferred that those filling out the ISQ were aware that "yes" was the desired response. SSCM tools are designed to assess suppliers, but those responding to such questionnaires are still individuals, who are subject to psychological tendencies such as social desirability bias. The ISQ can thus be defined as a form of self-report.

By contrast, the SAQ can only be defined as semi-self-report due to the validation that took place after responding. Suppliers were aware of the process and design of the questionnaire and that their answers would be validated. The final score, therefore, did not necessarily represent the initial self-reported responses, as those responses that could not be supported had to be revised. SSCM questionnaires and other assessment tools and methods must be designed with social desirability bias and supplier assessment fatigue in mind. Our cases demonstrated how both questionnaire design and assessment process can potentially reduce the tendency to respond in a socially desirable manner. Standardising SSCM tools and enabling results sharing among an industry can reduce the fatigue of those suppliers responding to multiple buying focal companies. Moreover, we observed that the SAQ and the supplier results served as the basis for dialogue between AFC and its suppliers for further supplier development. As the SAQ could be revisited by the supplier, it enabled continued supplier sustainability development and potentially created a different impression on those completing the questionnaire.

### 6.1.2 Addressing supplier assessment fatigue: SSCM processes & institutional setting

AFC (presumably like many focal companies) began their SSCM journey by developing their own solutions to new requirements and reacting to emerging challenges and sustainability expectations. In this context, larger companies might initially develop their own supplier sustainability assessment tools. However, given overlapping supply chains, particularly when it comes to multi-tier, globally dispersed supplier networks (Schoeggl et al. 2016a), large tier-1 suppliers probably receive numerous and similar sustainability questionnaires from their (focal company) customers. If not, supplier location may wonder what the purpose of such a questionnaire is and may

not have the competencies or human resources easily available to respond to the questionnaire[10]. In both cases the questionnaire may be regarded as an annoying 'must do' that is essentially about ticking boxes for compliance. If the supplier has the impression that the questionnaire is a one-off matter, along the lines of "are you ethical – please tick yes or no" (Crane 1999), then much less importance will probably be attached to understanding the topics and making sure that policies, process and competencies are in place to ensure more sustainable practices. The responses made in the ISQ were self-reported and only checked through manual intervention by AFC on a case-by-case basis. While we could not gather exact data from suppliers on how many self-assessments they had undertaken for different focal companies, we generated SSCM process findings that could point to supplier assessment fatigue as an explanatory factor. A potential example of this is the surprising number of suppliers (over 250) who responded "yes" to an ISQ question which asked whether involuntary labour had been used. This anomaly was discovered by AFC and suppliers were confronted about their responses. Then a so-called ad-hoc case was opened, and suppliers received a list of measures that had to be addressed as part of a monitored due diligence process. Suppliers explained that their response must have been a mistake. We infer that the ISQ was possibly seen as a tick-the-box measure that was necessary to proceed with registration on the business partner portal. If suppliers believed that no follow up would occur, then they may have rushed through the questionnaire, ticking 'yes' without slowing down to understand the questions.

On the other hand, if the supplier understands the questionnaire to represent an entire industry's sustainability expectations, and that multiple buyers could be analysing the results of the questionnaire, the importance attached to the questionnaire could be much higher. By contrast, the SAQ process may have given more of an impression of supplier development, rather than a quick, one-off compliance check. This is because once suppliers completed their SAQ, the SAQ platform and process generates an automated catalogue of recommended improvements (based on the gaps stemming from the suppliers' responses). This allows for continued interaction between suppliers

[10] Indeed, the researchers were confronted time and again with suppliers who genuinely wondered why they 'had' to fill out such questionnaires and what it might be good for.

and focal companies across the industry, to address the gaps, risks and issues identified (Foerstl et al. 2015). Whilst in some cases suppliers reported that the SAQ was first filled out by an administrative person in the company with little knowledge of sustainability practices, once feedback came from buyers regarding the low score, the responses were corrected, and the performance improved. CSR Europe and the SAQ platform service provider both confirmed that numerous SAQs were being shared with up to five focal companies. Furthermore, conversations with individual suppliers demonstrated that they were glad that they only had to fill out one SAQ (compared to earlier years) and for the option to share it with multiple buying focal companies.

We therefore conclude that SSCM tools, particularly supplier assessments and questionnaires, must make better use of institutional (and industry) settings, to maximise standardisation and the perceived importance of the tool, and thereby its potential sustainability impact. One way to achieve this is for industry players to collaborate and cooperate, agreeing on common sustainability standards and the tools to measure compliance with these standards (Mueller and Bessas 2017). Suppliers, like focal companies, have limited resources and more standardisation reduces their burden while simultaneously making it clear that the tool is to be taken seriously.

### 6.1.3 Differentiation in SSCM responses desirable

Our research demonstrated that the aspects detailed above (industry setting, assessment tool standardisation, questionnaire design and process integration) can lead to more differentiated supplier responses. We conclude that more differentiation among supplier sustainability responses is of much more utility for SSCM. If all scores are the same, how should companies make sustainability-risk based decisions, prioritise supplier development, and select sites for more in-depth monitoring such as sustainability audits? Companies around the world are at very different stages when it comes to sensitisation for sustainability and the place it may have in their company (procurement) strategies. If the SSCM assessment tools return a homogeneous response landscape, then one must question the design of these tools and processes surrounding them. We found that more differentiation (such as in the SAQ results) allowed for meaningful further analysis of sub-areas of the questionnaire, directing AFC's attention to sub-supplier management and social sustainability

as areas requiring further development. One plausible explanation for the higher scores in some areas, is that SAQs were resubmitted by suppliers, often after being engaged by different OEMs at different times (including AFC), potentially regarding certain topics (for example energy management), to improve their SAQ performance in this area. As well as highlighting differentiated supplier performance and responses in regard to sustainability areas, our findings also covered thousands of suppliers in different country settings.

Country (or regional) differences are a continuing topic in SSCM, as their socio-economic conditions are a major factor in supply chain networks (Beske et al. 2008; Locke 2013). However, our results showed the need for caution. As depicted in 5.1.3, our findings could not be considered representative for most of the countries. But this raises questions about the extent to which questionnaires are able to generate responses that can be generalised to the country level, and whether country-based risk factors can be transferred to individual suppliers. Both a well-run factory, with good environmental social and environmental performance in a developing country, as well as a supplier in a highly developed country, barely conforming with minimal legal requirements (or even acting in contravention of them) are conceivable. Many focal companies have conducted country risk analyses, so it is plausible that sustainability trainings for suppliers in such countries partially explain the surprisingly high average SAQ scores for certain countries.

The two case studies help confirm our initial propositions that supplier sustainability questionnaire responses would be affected by social desirability bias, questionnaire design and process, supplier fatigue, and the focal company's institutional setting. In addition, they help confirm that similar questionnaires can generate very differing responses. A self-assessment questionnaire that undergoes validation and whose results can be shared with multiple focal companies elicited responses that (with a higher degree of probability) are more realistic. If SSCM tools generate favourable responses, one must either conclude that the supplier locations were all very sustainable, or that the questionnaire did not fulfil its role as a tool to accurately capture suppliers' sustainability practices. Such a concentration of positive responses renders any analysis nearly useless, as one cannot differentiate and determine which responses genuinely represent 'good' sustainability

practises and which responded in a socially desirable manner. The SAQ produced more balanced results, that probably more accurately depicts sustainability practices and provided AFC a basis for further SSCM actions and decisions.

## 6.2 Limitations and Recommendations for Further Research

There were several limitations that potentially affected our research, one methodological limitation and a number relating to the questionnaire processes and the supplier sampling. We recognise the methodological limitations of comparing two different tools. However, various case study research has involved comparing differing interventions (policy, management approaches, systems and process) to address the same problem across cases (Yin 1989, 2018; Eisenhardt 1991; Cavaye 1996). In this vein, we argue that the two different questionnaires are comparable, because they were designed to fulfil the same task – monitoring supplier conformance with sustainability requirements and documenting their activities.

Regarding the questionnaire process, one limitation may have been the degree of obligation on suppliers to complete the two questionnaires. The ISQ was mandatory for suppliers concerned and was an integral part of AFC's supplier onboarding process. The SAQ was never strictly mandatory in the timeframe under consideration (although the preferred tool by 2017) and thus if suppliers refused to complete or share the SAQ with AFC, there were no hard / straightforward consequences. As mentioned in 5.1.3, the SAQ responses probably reflect a degree of positive self-selection bias, as those suppliers with better performance were more likely to share their SAQs. However, assuming this bias had a significant effect, it would mean that more representative SAQ results would then on average be even lower, with those supplier locations 'required' to fill out the SAQ bringing down the average score.

A further limitation relates to the supplier country differences and potential cultural differences. A third of all SAQs and over half of all ISQs collected came from supplier locations in Germany. Interestingly, in both cases the German average scores were not as high as expected, particularly compared to other countries. With over 12,000 ISQs and nearly 2,000 SAQs these country

samples represented two large datasets for Germany-based suppliers and yet the average scores were significantly different (ISQ: 86%; SAQ: 62%). Due to the unreliability about the accuracy of the ISQ scores it would be worth focussing our attention on the SAQ scores. Unfortunately, the next largest country samples only involved a few hundred suppliers and thus cross-country comparisons are not fruitful. As Zamur et al. (2017) have recently shown in their research, there is preliminary support for their hypotheses that cultural and institutional background can influence the perception of suppliers' managers of their customers' sustainability requirements and the probability that they will be motivated to comply with them. As part of our research to manage and gather supplier's responses, it also became clear that language difficulties meant that some suppliers understood that "yes" was the desired response, but not necessarily the content of the questions. Another important, potentially limiting factor on our results was company size. The SAQ requires formalised certifications (e.g. ISO 14001) and internationally certified management systems that are complex and expensive. For smaller suppliers such 'sustainability investments' represent a larger personnel and financial burden. Another limitation may be the timing of our research, as the SAQ (a tool employed by DRIVE sustainability) is finding increasing usage both within AFC and across the group of participating companies.

Finally, this research postulates probable explanations for suppliers' responses to an SSCM self-assessment tool. These conclusions are based on thorough, qualitative analysis of a large number of questionnaire responses and observations of the management of the questionnaires over a five-year period at AFC. However, the research did not follow-up with suppliers to ask them for explanations of their responses. Future research should focus on suppliers' perspectives on such SSCM assessment tools in order to make the processes and tools even more effective in terms of improving SSCM transparency and performance.

## 6.3 Relevance of this research for SSCM

Our research aimed to critically examine an under-researched and yet centrally, operationally important component of established SSCM. By analysing two cases of sustainability self-assessment

questionnaires, we could show that the setting in which such a tool is placed is important. Companies are well advised to consider psychological and organisational behaviour aspects surrounding the design of questionnaires before using them blindly as instruments that should inform SSCM strategy. Standardised questionnaire processes (at industry level, for example) reduce the burden on suppliers and potentially increase the chance of accurate results, as the supplier anticipates the validation and importance of their responses. If supplier sustainability assessment tools have a higher probability of returning more realistic and differentiated responses, then more reliable sustainability data can be generated. This more representative supplier data can lead to more focussed supply chain sustainability strategies and improved supply chain risk management, based on real data rather than estimations. The unexpected emergence of the Covid-19 pandemic and the serious disruptions it caused to global supply chains brought wider public attention to the vulnerability and centrality of SCs to our global economy. Sustainable supply chain management can continue to gain in significance through these recent developments as companies and consumers try to better understand where their products come from and how to make supply chains more resilient. Well designed and implemented SAQs, such as those case-studied in this research, could expand their scope, to include further aspects to better prepare for future pandemics and contribute to more sustainable supply chains.

Future research on SSCM assessment could focus more on country comparisons of sustainability performance, changes in supplier sustainability performance over time, cultural differences regarding sustainability disclosure, and testing the correlations of sustainability self-assessment questionnaire results with sustainability audit results. Given the increased interest in sharing assessment data among SC actors, research should also be directed towards how inter-industry assessment data can be exchanged (e.g. between the mining extraction sector, the automobile industry and the chemistry industry). Then companies can surpass questionnaires of the ilk “Are you ethical? Please tick yes or no” (Crane 1999).

**Conflict of Interest**

On behalf of all authors, the corresponding author confirms that there is no conflict of interest.

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# Appendix B1: A – Side by Side Comparison of Two Questionnaires

| Internal Sustainability Questionnaire (ISQ) | Self-Assessment Questionnaire (SAQ) |
|---|---|
| 1 Company Information<br><br>(Not a part of ISQ – general company questions not contained in ISQ) | A Company Management<br>1. Does your company have a management person responsible for<br>1a. Social Sustainability *****<br>1b. Business Conduct & Compliance *****<br>1c. Environmental Sustainability *****<br>2. Does your company publish a corporate social responsibility report / sustainability report? *****<br>2a. Is your most recent report 3rd party assured ? *****<br>2b. Are the operations of all your company sites included in that report?<br>3. Does your company have a Code of Conduct in place? *****<br>3a. Is the Code of Conduct enforced at this site?<br>4. Do you organise training sessions to enhance the understanding of Corporate Social Responsibility/Sustainability at your site?<br>4a. On which of the following topics do you organise training sessions:<br>- Code of Conduct<br>- Social Issues<br>- Anti-Corruption & Ethics<br>- Health & Safety<br>- Environmental Management<br>5. Have employees from your site participated in external Corporate Social Responsibility/ Sustainability training?<br>5a. Who organised the training:<br>- An OEM *****<br>- The Automotive Industry Action Group *****<br>- European Working Group on SC Sust. *****<br>- Other<br>6. Does your company participate in any voluntary CSR/sustainability initiatives? ***** |
| 2 SUB-SUPPLIERS<br>2.1 Does your company have its own suppliers / service providers?<br>2.2 Are there specifications for environmental protection which you apply to your own suppliers/service providers?<br>2.3 Are there specifications for the terms and conditions of employment which you apply to your own suppliers/service providers? | E Supplier Management<br>20. Does your company have a supplier CSR/ Sustainability Policy? *****<br>20a. Which areas are covered by this policy?<br>- Respect for human rights<br>- No forced or compulsory labour<br>- No human trafficking<br>- No child labour<br>- Working conditions<br>- Remuneration |

| | |
|---|---|
| 2.4 Are there specifications on health and safety issues which you apply to your own suppliers/service providers? | - Non-discrimination<br>- Freedom of association<br>- Collective bargaining<br>- Anti-corruption and bribery<br>- Healthy and safety<br>- Environment<br>20b. Which supplier category is covered by your CSR/Sustainability policy?<br>- Direct procurement suppliers<br>- Indirect procurement suppliers<br>21. Does your company communicate its CSR / Sustainability policy to its suppliers?<br>21.a How is the supplier sustainability policy communicated?<br>- During supply meetings<br>- In contractual terms<br>- Brochures, magazines, newsletter, webpage<br>22. Which processes do you have in place to ensure that your Supplier Sustainability Policy is efficiently implemented by your suppliers? *****<br>- Self-assessment questionnaire<br>- Audits conducted by the company<br>- Supply meetings<br>- Audits conducted by an external 3rd party auditor<br>- Other (please specify)<br>- None |
| 3 COMPLIANCE WITH THE LAW | C Business Conduct and Compliance |
| 3.1 Does your company have processes and structures installed, controllingthe compliance with local laws? (Compliance Management Systems-CMS-)<br>3.2 When will you have installed a Compliance Management System-CMS? | 13. Does your company have a formal policy in place regarding business conduct and compliance? (corruption, extortion, bribery) *****<br>13a. Are the following areas covered by this policy or the related processes & procedures?<br>- Corruption, including extortion<br>- Bribery<br>14. Does your company have a formal policy in place regarding Competition Law Compliance? *****<br>14a. Does this site have a documented business conduct & ethics management system in place? ***** |
| **4 ENVIRONMENTAL PROTECTION** | D Environmental Sustainability |
| 4.1 Creation and application of environmental management system<br>4.1.1 Have you set up a certified environmental management system?<br>4.1.2 If yes –> Stop; If no –> following questions:<br>4.1.3 Is an environmental management system without certification in use? | 15. Does your company have a formal environmental policy, which includes a commitment to legal compliance, continuous measurement andcontinuous improvements in environmental performance? *****<br>15a. Are the following areas covered by this policy or the related processes and working procedures?<br>- Energy consumption<br>- Water Usage |

4.1.4 Does your organisation have a contact person with responsibility for environmental protection?

4.1.5 Do you have binding environmental guidelines/objectives and/or an environmental policy?

4.1.6 Did you define responsibilities in respect of environmental protections of your company?

4.1.7 Does a record exist of compliance with statutory and company regulations on environment protection?

4.1.8 Are your employees informed and qualified in respect of environmental protection

- Air Emissions
- Waste Management
- Restricted substances & chemical handling
- Other areas, please specifiy

15b. Does your company have annual objectives and activities accordingly in the areas covered by your environmental policy? *****

16. Does this site have an environmental management system in place? *****

16a. Is the system certified? *

If no –> 16aa. Have internal environmental audits been conducted at this site? *****

17. Do other production sites/locations have a certified environmental management system? *****

18. Does your facility use restricted substances or chemicals for your production? If yes –> 18a.

18a. Does your facility have work procedures to manage the use of restricted substances and chemicals? *****

18b. Has the management system used for managing the usage of restricted substances or chemicals been certified? *****

19. Do you upload your material data to the International Material Data System (IMDS)?

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## 5 SOCIAL STANDARDS

5.1 Contact Person

5.1.1 Does your organisation have a contact person that is responsible for social standards?

5.2 Freedom of association

5.2.1 Do you grant your employees the right to form and/or join trade unions or employee-elected representative bodies in accordance with national statutory regulations?

5.2.2 Where this right is limited by local laws, are there alternative forms of co-determination for employees in your organisation

5.3 Discrimination

5.3.1 Do you guarantee equal opportunity and treatment - regardless of ethnic origin, skin colour, gender, religion, nationality, sexual orientation, social origin or political views as long as these views are based on the democratic principle and tolerance towards those who hold different views?

5.4 Forced labour / child labour

5.4.1 Do you use forced or compulsory labour, or involuntary work performed by detainees?

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## B Social Sustainability

7. For which of the following social issues does your company have a policy in place? *****
   - Respect for human rights
   - No forced or compulsory labour
   - No human trafficking
   - No child labour
   - Working conditions
   - Wages & Benefits
   - Non-discrimination
   - Freedom of association
   - Collective bargaining

8. Does your site have a certified management system in place to manage the above mentioned social issues? *****
   - No, on none of the above
   - Yes (please upload SA8000 Social Management System) *****
   - No, but have internal documented procedures and policies *****

9. Have social audits/assessments been conducted at this site? *****
   - No
   - Yes, internal audits
   - Yes, external 3rd party audits *****

5.4.2 Do you observe the minimum age in accordance with the statutory regulations governing employment in the country concerned?

5.5 Remuneration

5.5.1 Are the remuneration paid and benefits provided at least equivalent to the national standard or minimum standard of the relevant national sector?

5.6 Working hours

5.6.1 Are the working hours at least in line with the national statutory guidelines or standards of the relevant national sector?

5.7 Employee information

5.7.1 Are your employees informed and qualified in respect of social standards?

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## 6 HEALTH AND SAFETY AT WORK

6.1 Are health and safety duties and responsibilities clearly regulated in your organisation?

6.2 Are hazards evaluated in your organisation, and are the resulting protective measures developed and implemented and is their effectiveness monitored?

6.3 Are precautionary medical examinations carried out in your organisation?

6.4 Does your company have an internally organised first aid facility?

6.5 Are your employees given instruction on the hazards and protective measures associated with their field of activity?

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10. Does your company have a written health & safety policy in place, which complies with industry, national and international standards? *****

10a. Have specific activities on health & safety been organised at this site during the last year? *****

11. Does this site have a health & safety management system in place? *****

11a. Is the system certified? *****

If no –> 11aa. Have internal H&S audits been conducted at this site? *****

12. Do other production sites/locations have a certified health and safety management system? *****

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**F Special Areas**

23. Is the 3TG (tantalum, tin, gold or tungsten) necessary to the production of your company's products and contained in the finished product that your company manufactures or contracts to manufacture?

## B2. Article 2: Sustainability Audit Standards

# Exploring Supplier Sustainability Audit Standards

## Potential for and Barriers to Standardization

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### Abstract

Global focal companies are increasingly required and expected to monitor the sustainability risks and activities in their supply chains, which has resulted in increasing supplier sustainability audit activity and growth in the number of sustainability initiatives/associations. While common, shared audit standards were originally conceived to reduce audit fatigue; with overlapping and converging supply chains there could be a need for cross-recognition or standardisation of supplier audit standards. This research aims to provide empirically grounded insight into sustainability audit activity, audit processes and standards for suppliers and the extent to which they overlap. Audit standards employed by eight multi-brand, voluntary sustainability initiatives/associations, focusing on supply chain sustainability (SMETA, PSCI, ICTI, FWF, ASI, JAC, amforiBSCI and RBA) were inductively analysed. This research compares the audit processes and standards, detecting common audit categories, analysing points of overlap and difference. We find empirical evidence of significant growth in supplier sustainability audit activity. We also find overlap among the standards in terms of audit process and steps, as well as at the level of audit focus categories. Deeper analysis reveals large differences at the granular level in terms of questions asked to assess specific topics. We conclude that there is potential for standardisation and cross-recognition but that significant barriers to agreement at the level of audit questions and how topics are evaluated remain. This research provides a first empirical overview of this important tool and its application in various industries for sustainable supply chain management.

**Keywords:** SSCM; supplier sustainability audits; ethical audits; sustainability alliances; industry initiatives; supplier audit fatigue

# 1. Introduction

Given that the global supply chains of multinational Focal Companies (FCs) constitute over 80% of trade worldwide [1], it is not surprising that influential FCs are increasingly held accountable for the (lack of) sustainability in their supply chains [2–4]. A mounting body of literature has focused on the importance of the purchasing/procurement function in FCs [5–8] and the strategic necessity of incorporating sustainability into supply chain management (SSCM) [2,3,9–12]. Supply chain sustainability expectations of influential global FCs have been steadily increasing [13–16]. As a result, FCs are expected to take responsibility for improving sustainability in their supply chains [17], by: formulating extensive sustainability requirements, analysing sustainability risks, measuring, monitoring and improving the sustainability performance of their suppliers and communicating about their SSCM activities [1,18–20].The most common first response by firms to such sustainability expectations of their supply chain management (SCM) has been to formulate codes of conduct for their suppliers [21,22]. However, FCs are also required to determine their suppliers' compliance with such codes and monitor suppliers' efforts to improve sustainability in their supply chains [6,23–28].

By 2020 there has been a proliferation of different private, voluntary, corporate sustainability initiatives/associations [29–31] that have developed their own common audit standards. Member companies commission supplier sustainability audits that are carried out against these standards. Companies join such 'strategic alliances' [31–33] for a number of reasons, including to pool resources, increase the scope and reach of their SCM sustainability activities, share sustainability risk management efforts, reduce the redundancy and costs and correspondingly improve the efficiency of such activities [30,34–38]. In the context of SSCM, such initiatives also point to the urgent need to redress supplier assessment fatigue, and specifically audit fatigue [27,36,38–41]. Qualitative, empirical research on the practices and activities of these private strategic alliances for supply chain sustainability are lacking. Based on our evaluation of current SSCM developments, we surmise that the number of supplier sustainability audits is increasing worldwide. We further propose that numerous emerging supplier sustainability audit standards (SSAS), developed by and conducted for the FC members of voluntary sustainability initiatives and associations (SI/As), are potentially similar,

both in terms of the audit process and the sustainability topics that they cover. Therefore, such audit standards could potentially be mutually recognised, not just within a SI/A but among different SI/As and thus various industries, and we can postulate about the potential of and limits to standardisation. The objective of this research is to explore and better understand the phenomenon of SSAS, including its prevalence. The researchers aimed to collect and generate empirical data on these audit standards in order to qualitatively analyse and compare them, to determine potential for cross-recognition and standardisation.

Many FCs have broad, complex supply chains that can involve many hundreds, multiple thousands or even tens of thousands of suppliers [14,42–44], meaning that suppliers can often supply parts or provide services to multiple industries. For example, the electronics industry increasingly overlaps with automotive [45] but also toy and children's entertainment industries [46]. Once suppliers are in business with multiple FCs that are members of different SI/As, each with their own audit standard, the chance of suppliers being audited against various, differing audit standards increases. Given a continual growth in SSCM activities [1,17,47–49], it is likely that audit activity will continue to proliferate and hence that more and more suppliers will be audited [50]. Furthermore, voluntary, private industry initiatives, raw material sustainability groups, corporate strategic alliances for supply chain sustainability (and so forth) continue to proliferate and each often employs its own sustainability standards and audits [30,50,51]. This could plausibly lead to an emerging situation of significantly overlapping audit activity and a new type of 'audit fatigue.' No longer caused by the audit requirements of individual global companies, but rather by overlapping, differing SI/A audit standards.

Thus, our research begins by exploring what different supplier sustainability audit standards (SSAS) there are. In this paper we identify eight different SSAS, each from a different industry initiative/sustainability association and analyse them in detail to understand what the supplier audits entail and what aspects of sustainability they cover. We then compare the scope and processes of the SSAS, to better understand the extent to which they overlap and what barriers there are to

standardising SSAS, thus reducing supplier assessment fatigue and competition among SI/As. This leads to our research questions:

> RQ1: What are main audit process characteristics of supplier audits developed by multi-brand sustainability initiatives/associations and to what extent are they similar?
>
> RQ2: What are the main sustainability aspects covered by SSAS developed by SI/As and to what extent does the content of their audit standards overlap?

This research was undertaken based upon the central motivating research proposition that supplier sustainability audit standards (SSAS) are similar both in terms of process and structure, and that therefore, mutual recognition (not just within an industry initiative / corporate association) but also among SSAS should be practicable. In order to test this central proposition, we need to answer the research questions detailed above. In the next section we begin by presenting background information and a summary of literature on the development of audits as SSCM evaluation tools and on private sustainability initiatives and associations. We also clarify the term supplier sustainability audit, as this constitutes the unit of analysis for the present research. This is followed by a description of our empirical research approach, outlining which SSAS form the basis of our analysis and how the data was collected, compared and analysed. Thereafter we present our findings, outlining the similarities and differences among the SSAS in our sample. Finally, we discuss the significant similarities found but also the problematic differences at the level of the individual audit protocols/questions, depicting barriers that need to be overcome for supplier sustainability audit standardisation to become a practicable reality.

## 2. Literature Review

Multi-national companies have profited from globally dispersed supply chains (SCs) for some decades [27,52,53]. However, particularly in the last decade, sustained critical attention and increasing stakeholder pressure have focused public attention on the negative effects FCs have had by pursuing low-price purchasing strategies and critics underline the responsibility that FCs have to

improve the sustainability in their SCs [2,7,13,16,54–56]. The emergence of SSCM, which began as a fringe sub-topic of supply chain management [57] can be seen as a response to this stakeholder pressure [2]. The remarkable growth and massive research activity in SSCM attest to the continued academic significance of the topic [3,10,15,58–60], which has also become a seemingly indispensable part of FCs' sustainability activities [2,6,61]. Roy et al. [15] take stock of the approaching overwhelming amount of literature on SSCM and develop a thematic landscape schematisation of SSCM research since 2000, in which they prescribe understanding SSCM as a process that begins with adoption, then implementation and extension, and continues with maintenance and then analyses of outcomes. By contrast, Dubey et al. [58] put forward a schematic categorisation, dividing SSCM into six major areas, each covering multiple SSCM aspects and activities (such as supplier codes of conduct, audits and assessments). Companies often begin with a supplier code of conduct, in which they stipulate their expectations of their suppliers in terms of minimal standards [22,38,62]. Thereafter, companies increasingly begin to apply monitoring mechanisms and tools to be able to prove whether suppliers were adhering to those stipulated standards [1,22] and as a means of sustainability risk management [2,7,63] and supply chain governance [18,24,64]. In the following section we summarise extant literature on supplier assessments in more detail, particularly audits, explaining our choice of the term supplier sustainability audit, narrowing in on the phenomenon of supplier audit fatigue and then finally the emergence of private, voluntary corporate sustainability initiatives and associations for supply chain sustainability. This provides more context for the inductive research at hand, making the gap in empirical understanding evident and the necessity for our research questions clearer.

## 2.1 Supplier Assessment for SSCM

A number of standard SSCM tools have been identified, which FCs employ to ensure minimum standards, identify and minimise risk and improve sustainability in their supply chains [7,18,25,31,58,62,65]. The most common, easily-implemented tool is the code of conduct for suppliers [22,66], followed by supplier self-assessment questionnaires and then by more resource-intensive supplier audits [1,13,67,68]. A code of conduct outlines a company's expectations of its

suppliers' sustainability compliance. Self-assessments and audits can be employed to verify compliance with such codes as well as for sustainability risk management [7,63], to identify, analyse and manage sustainability risks and activities within the FC's supply chains. While pure self-assessment relies on the self-reported estimation of the supplier, audits are normally commissioned by a third party or a downstream SC actor (usually the FC) to determine the sustainability performance of the supplier and whether the supplier conforms with environmental and social sustainability requirements [1,20]. Because many FCs began by administering their own supplier sustainability assessments [40,69], many suppliers were subjected to a broad array of similar but different sustainability audits. Before moving on to explore the issue of supplier audit fatigue and the emergence of SI/As for SSCM, we briefly clarify the term supplier sustainability audit, which constitutes the primary focus and unit of analysis of the present research.

### 2.1.1 Clarification of Terminology: Supplier Sustainability Audits (SSAs)

The term sustainability audits can entail the following types of audits: CSR Audit, Social Audit, Ethical Audit, Environmental Audit, etc., as well as addressing a supplier of an FC. Although we note the use of the term 'ethical audit,' including references to audits of suppliers' sustainable behaviour [39,46,51], we consider that term too broad and open to too much interpretation. For example, ethical audits have been proposed as audits that evaluate a company's latent and manifest alignment in its operations with ethical values [70]. Hence for this research, we prefer the term *supplier sustainability audit* (SSA), which makes it clear that the audits are not optional, voluntary audits (such as SA 8000, ISO 45001 etc.) that an organisation decides to undertake itself, but rather are audits requested, commissioned and demanded by FCs. SSAs encompass audits of the suppliers' operations (headquarters and/or production facilities) with the aim of evaluating the supplier's sustainability practices and compliance with sustainability requirement, including an assessment of both social and environmental aspects of sustainability.

## 2.2 Supplier Audit Fatigue

Given the noteworthy increase in the focus on SC sustainability and companies' general preference for a voluntary approach to sustainability self-regulation [27,71,72], it is not surprising that there has been a corresponding increase in audit activity, voluntarily commissioned by focal companies [1,38–40,73,74]. The multiplicity of standards and assessments that confront supplier factories can lead to "audit fatigue" [27,38,40,41]. To gain an appreciation of the vast amount of supplier sustainability audit activity occurring, consider that an ethical trade service provider, Sedex, reported having conducted nearly 300,000 audits by 2018 [75]. From an FC perspective it can be a very demanding task to assess the sustainability activities of *all* direct suppliers in their supply base. Thus, FCs in various different industries join SI/As focused on SC sustainability, in order to pool resources, and implement common supplier sustainability assessment tools and systems [31,76]. Doing so removes the double disincentive of 1) high investment costs in sustainability activities and 2) being the 'only' FC with such demanding expectations of their suppliers [37,38]. Initially such strategic alliances of companies with similar goals led to process standardisation and efficiencies, reducing audit fatigue [38,69], so that suppliers no longer had to respond to the same type of assessment issued by competing purchasing FCs [22,36,37,73]. SI/As not only developed and share their own common audit standard, but also share audit results or even conduct common audit assessments [i.e.: 19,36,46,68,73,77,78].

## 2.3 Private Sustainability Initiatives and Associations for SSCM

In 2011, the OECD first released guidelines for multinational enterprises, in which they suggest that FCs engage and encourage their suppliers to improve their sustainability performance [19,20]. Already at that time, the OECD recognised the potential for 'conflicting requirements' that could overlap whereby a supplier is exposed to audits and other SSCM practices of multiple FCs [79]. The OECD guidance also encourages participation in cooperative arrangements among companies, e.g. in a common industry, to advance SSCM by coordinating tasks, including independent audits [12,79]. And indeed, private supply chain initiatives and associations were founded in response to pressure

for increased sustainability compliance and monitoring and to fill a gap for such coordinated services [34,80]. Furthermore, they serve as a platform for FCs to exchange good practice regarding standards, processes, tools and approaches to sustainability in supply chain management such as sustainability audits [30,62,65,76,79]. Fransen et al. note that the majority of activity defining "appropriate business practices are taking place in collaboratively developed and governed CSR standards" [81]. They further indicate recent work done to compile a database of multi-stakeholder initiatives (for more detail, see M.S.I. Integrity 2017 [29]) and differentiate between different varieties of international CSR standards, private initiatives and associations, based on characteristics such as: composition between civil society, private firms and government, geographic focus on producing countries or buyer countries and degree of formalisation [81].

We note that there has been much focus on multi-stakeholder initiatives [29,37,38,73,82] and that various stakeholders are sceptical of business-driven standards and initiatives [39]. Canzaniello et al. [31] analyse intra-industry multi-brand strategic alliances and note that these are now focusing on collaborating to address supply chain sustainability risks. In a recent analysis of the German context, Mueller and Bessas find that "companies increasingly found or join industry initiatives (*Brancheninitiativen*) to achieve sustainability in supply chain management" [30]. Such initiatives can be considered strategic alliances [32,33] that involve a formal association of companies (often within a branch/industry) and that use their pooled knowledge and resources to develop common tools for assessing and evaluating supplier sustainability [30,71,83], including standards for supplier sustainability audits. Such initiatives have the potential to achieve consensus around sustainability standards in their respective industry's supply chains and thereby to sensitise suppliers in those respective industries [36]. Despite a seemingly common purpose, Mueller and Bessas find multi-brand supply chain sustainability initiatives and associations to be rather heterogeneous and to demonstrate widely varying focuses for their activities, including a range of instruments and tools [30].

Previous research had focused in depth on one or two initiatives/associations (e.g.: 36,37,73,84), normally with a specific industry focus or a high-level survey of what initiatives,

associations and standards there are (e.g. Newitt [38]). Thus, our research aims to shine light on numerous emerging multi-brand SI/As for supply chain sustainability, to determine the current state of affairs with regard to their audit standards and activity, and then to explore the potential for aligning/standardising such audit standards. As Terwindt and Armstrong [50] convincingly argue, supplier sustainability audits are very much part of the current SSCM reality that has firmly established itself. Hence the onus is on academia to understand this phenomenon and seek to improve it. We began our exploratory research on SSAS by identifying a wide range of examples of such multi-brand, private SI/As that represent activities within and across multiple industries. We wanted to find illustrative examples of *shared* audit standards that are being employed by private company alliances for sustainable supply chains. The research then involved capturing the number of audits conducted over the last decade and the audit processes entailed in these shared audits. Furthermore, we intended to create a dataset including the structure of each audit standard (including the categories the audits address and specific content of the audit standards and audit protocols in the form of questions). In the following section, we describe the methods employed to identify the standards included in our sample and explain how the data was collected and analysed.

# 3. Data and Methods

In this section we outline our qualitative, inductive and exploratory research methods [85–88]. This includes how the exploratory research was approached, how the sustainability initiatives and associations (SI/As) with common sustainability audit standards for their suppliers were selected, how the audit data from the identified SSAS was collected and finally how it was collated, analysed and compared.

## 3.1 Research Approach

Our survey of the extant literature revealed no empirical insights into audit activity, neither an analysis or comparison of audits being employed as part of SSCM, nor a discussion about the implications of parallel audit standards. Discussing exploration as one of three purposes for

qualitative research, Yin [88] notes that explorative research fulfils a number of functions while pursuing various research goals. These include an exploration of under-researched phenomena of interest, an account of how to explore the issue, as well as generating findings that may serve as the basis for more refined research. Our research began in late 2017 with a perceived increasing number of industry initiatives and corporate associations that have developed and aligned their own audit standards for monitoring supplier sustainability. The initial underlying assumption motivating this research was that if there are similar (or divergent/competing) overlapping audits, increasing in number and frequency, being conducted by a broad range of voluntary, multi-brand SI/As, such audit standards could be cross-recognised or eventually standardised to reduce duplication of effort and supplier audit fatigue. Before this proposition could be addressed, the researchers needed to gain a deeper qualitative understanding of what SI/As there are that focus on supply chain sustainability and also employ a common audit standard, conduct audits and share the audit results amongst members. The unit of analysis for this research is the supplier sustainability audit standard (SSAS). Initial SSAS data (such as audit process steps, audit standard structure, sustainability categories focused on and detailed composition down to the level of questions asked) were collected in the form of audit protocol/question catalogues, and analysed and compared in early 2018. The research took an iterative approach to collecting, analysing and generating data, whilst expanding the empirical sample [89].

This research employed an iterative 'purposeful sampling' approach [86,89], aiming to identify an array of standards that would provide rich, empirical data from a range of industries. The initial focus and research on the first few discovered SSAS (belonging to the SI/As: SMETA, ICTI, PSCI and FWF) helped attune the researchers to what to search for and how to collect further data. Once data had been collected and collated for all eight SSAS (see Table 1 below), text analysis, coding and detailed analysis of the audit standard data began in late 2019 and continued into 2020. Finally, in 2020 the researchers contacted various SI/As to gain access to older annual reports, ascertain missing audit number data and for final clarification of findings.

## 3.2 Data Collection

The research on initiatives and associations began in late 2017. The primary exploratory criteria for including SI/As were: publicly available audit protocols and audit process information; different industry representation; private, voluntary organisations (not primarily multi-stakeholder); and an audit standard that was actually being used and shared among members. Data from the following SI/As were downloaded in early 2018: SMETA, PSCI, ICTI and FWF. The sample was then expanded later in 2018 to include the audit protocols of: ASI, JAC, amfori BSCI and RBA. The intensive data collation and initial analyses began in 2018. All audit standards (SSAS) included in our sample were publicly available via the internet. The content of each audit standard / protocol was copy and pasted or transcribed into various excel tables, in order to compile master lists and a master table, to enable side-by-side comparison of their structure and content. Examples of the audit standard documentation and protocols as well as the tables created to compare and contrast the data can be found in the supplementary material.

Once a SSAS had been identified, initially screened for relevance and determined to be included in the sample, the search for different SSAS continued. Once a representative standard had been identified for a particular industry/branch focused association, no more effort was made to find further SSAS in the same industry. Rather, the focus was on other industries to generate a sample that was as broad as possible and hence as indicative as possible of SSAS irrespective of industry affiliation. Consequently, this research involved a comparative analysis of the SSAS of eight identified sustainable supply chain initiatives and associations. The SSAS that comprised our final sample can be found in Table 1.

**Table 1.** Research sample of sustainability initiatives/associations & supplier audit standards (SSAS)

| **Name of SI/A (&SSAS)** | **Acronym** | **(SI/A) type [31]: Multi-brand vs. Multi-Stakeholder; Intra-industry vs. Cross-Industry; Horizontal vs. Vertical vs. Mixed** | **SSAS Documents Accessed / Downloaded** |
|---|---|---|---|
| Sedex (SMETA) | Sedex Members' Ethical Trade Audit | Multi-brand; Cross-industry; Mixed; | July 2018 |
| ICTI (IETP) | Interntl. Council of Toy Industries ICTI Ethical Toy Program | Industry Focus: Toy manufacturing; multi-brand/multi-stakeholder; intra-industry; Mixed | July 2018 |
| PSCI | Pharmaceutical Supply | Industry Specific: Pharmaceuticals; Multi-brand; Intra-industry; Horizontal | July 2018 |

| | | | |
|---|---|---|---|
| | Chain Initiative | | |
| FWF | Fair Wear Foundation | Multi-stakeholder; Intra-Industry: Apparel; Horizontal | July 2018 |
| ASI | Aluminium Stewardship Initiative | Industry (Raw Material) Specific; multi-brand & multi-stakeholder; Mixed | Sept. 2018 |
| RBA (VAP) | Responsible Business Alliance Validated Audit Program | Multi-brand; Formerly intra-industry – Electronics – now increasingly cross-industry, from horizontal to increasingly mixed (smelters / component processing). | July 2018 |
| JAC | Joint Audit Cooperation | Multi-brand; Intra-Industry (Telecom); Horizontal | Sept. 2018 |
| amfori BSCI | Business Social Compliance Initiative | Multi-brand; cross-industry; Horizontal | Nov. 2018 |

Although 11 industry initiatives and associations were initially identified, the actual audit protocols could only be accessed in nine cases. The final sample only includes eight SI/As because after further investigation, it became apparent that GSCP audit standard was more of an ideal for member companies to orient themselves toward, and not a standard that had been broadly audited against. Also, audit numbers could not be disclosed. The chemical industry's Together for Sustainability (TfS) was not included in the comparison because we could not find publicly available information on the audit questions included in their common standard. The conflict free smelter initiative (CFSI, later expanded to become the responsible minerals initiative - RMI) was initially considered, but due to the varying audit types, depending on supply chain role (i.e. whether the auditee is a manufacturer, traders, or processor etc.) could not be considered as one standard and were not comparable with the other unitary SSAS.

The data collected for this research was not intended to be used to create a complete or comprehensive database of all multi-brand SSAS but rather to enable a comparison of SSAS from a broad as possible range of different industries and from associations with different focuses to explore potential differences and similarities in terms of their potential for mutual recognition and standardisation.

## 3.3 Data Comparison and Analysis

As described in section 3.1 and evident in Table 1, data collection occurred in a number of phases. This was also applied to the analysis and comparison of the SSAS data that was collected in an exploratory and iterative manner. Once the SSAS audit process and audit composition data could

be accessed, it was downloaded. This information was converted into Excel format to enable a disaggregation and then itemisation of individual process steps and audit questions. Once the data had been tabularised and juxtaposed, the SSAS could be better compared. The first comparison involved a comparison and analysis of the audit phases and audit process steps of each SSAS. This was followed by an analysis of each SSAS to determine the major categories that comprised the audits, to understand how each of the audits were structured. Once this had been determined, the ensuing categorisations were employed to compare the SSAS in a structured manner. With comparable categorisations we could show the degree to which the SSAS overlapped and resembled each other at a higher level. Further analysis involved determining the number of individual questions to be answered or checked by the auditor on a certain topic as well as specific questions within a main category, to ascertain the potential for cross-recognition among SSAS and perhaps standardisation. In the following section we present our findings based on the explorative research.

# 4. Findings

Our exploration of various SI/As and the ensuing in-depth analyses of the audit processes and comparison of the content of the eight identified SSAS uncovered a lot of information. Not only could we understand and compare the standards' audit processes, but also the sustainability categories they focused on and the questions asked as part of such shared audits. To get a sense of how much audit activity is occurring (and to test our initial proposition that SI/A audits are increasing) and the scope of SI/A's activities, we compiled data on the number of shared audits conducted yearly by each SI/A (see Table 2).

**Table 2.** Annual Audits conducted by each multi-brand SSA initiative.

| Sust. Initative / Association | Total 2010–2019 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sedex SMETA | 156,697 | 7,893 | 9,182 | 10,291 | 12,499 | 14,644 | 14,749 | 16,045 | 19,738 | 25,476 | 26,180 |
| ICTI - IETP | 29,626 | 2,454 | 3,507 | 2,550 | 2057 | 2,887 | 2,761 | 3,756 | 3,721 | 3,123 | 2,810 |
| PSCI | 984 | | | | 91 | | | 83 | 148 | 270 | 392 |
| FWF | 1,588 | 8 | 79 | 120 | 175 | 161 | 187 | 220 | 230 | 212 | 196 |
| ASI | 80 | - | - | - | - | - | - | - | - | 16 | 64 |
| RBA | 4,186 | 97 | 157 | 348 | 422 | 512 | 504 | 538 | 786 | 822 | 1,007 |
| JAC | 539 | 21 | 18 | 35 | 37 | 37 | 61 | 68 | 89 | 89 | 84 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| amfori BSCI | 124,265 | 0 | 0 | 35 | 215 | 9409 | 16,060 | 20,034 | 22,194 | 26,081 | 30,237 |
| **Total** | **318,972** | 10,488 | 12,958 | 13,394 | 15,420 | 27,665 | 34,338 | 40,744 | 46,906 | 56,089 | 60,970 |

In general, as Table 2 depicts, we observe a significant increase in audit numbers (and by inference activity) over the previous ten years, with a total of around 10,000 audits reported in 2010, and over 60,000 audits conducted against the same respective common audit standards by 2019. Some SSAS first began auditing in the last five years but many have been conducting audits since at least 2010. The degrees of transparency surrounding reporting of core facts such as numbers of audits conducted were also highly variable. Some SI/As (IETP, FWF) were highly responsive to our official requests for information, either producing audit statistics on demand and/or directing our attention to old annual reports, not easily found online. Other SI/As only produced audit numbers after repeated inquiry (Sedex, PSCI, JAC, amfori BSCI). Exploring and collecting data on the actual audits conducted and shared helped us to refine our sample; for example, it became clear that the Consumer Goods Forum's Global GSCP (Global Social Compliance Programme) audit standard was more of a reference or best practice benchmark, and not a standard that was being recurrently audited against, the results of which were shared among members.

Furthermore, all initiatives apart from the Fair Wear Foundation (who conduct their own, intensive audits) employed the services of third-party auditors. Hence, we analysed the number, concentration and overlap of auditing companies that were commissioned to audit suppliers according to the corresponding SSAS. Our research shows that there is significant variance among the SSAS, with SMETA currently working with around 60 different auditing companies (as of April 2020), whereas the other SI/AS contracted between 4 and 13 auditing companies, as depicted in Table 3.

**Table 3.** Number of auditing companies contracted to audit according to SSAS.

| SMETA. | IETP | PSCI | FWF | ASI | RBA | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|
| 60 | 4 | 12 | internal auditors | 13 | 12 | 4 | 13 |

The most frequently contracted auditing service provider was SGS (used by seven of the eight SI/As) followed by Intertek and TÜV Rheinland (who both audit against five SSAS) and Bureau Veritas Certification, ELEVATE and UL – Responsible Sourcing Inc. (each contracted by four SI/As). For a full depiction of which SI/As worked with which audit companies, please consult Appendix B.

In the following, in subsection 4.1, we detail the overlaps in the audit process prescribed by each of the initiatives and associations. We then present the findings of our comparison of the audit protocols in subsection 4.2, wherein we identify the SSA main categories (such as “no child labour and underage worker protection” and “working hours”) and compare their frequency, in order to determine the level of structural overlap among the audit standards. Finally, in subsection 4.3, the article focusses more specifically on the level of audit subcategories, which entail the detailed individual audit questions within an audit main category.

## 4.1 Comparison of Audit Processes for Supplier Sustainability Audit Standards

Analogue to the process of analysis applied to the data, we begin by presenting our findings on the SSAS process. We were able to access the audit process information from eight of the SI/As identified for this research. The majority of the SI/As published their audit process online and these were publicly available. The ICTI Ethical Toy Program (IETP) provided detailed responses to our request for information on common audit process, pointing out that the process differs depending on whether an audit is announced or not. Five common main audit stages were identified: 1. Pre-Audit Planning, 2. Audit Preparation, 3. Audit Execution, 4. Audit Report & Corrective Action Plan (CAP) and 5. Follow-Up, Audit Closure. Stage 3. ‘Audit Execution’ was the most extensive stage across all SSAS analysed and we identified six audit steps within this phase that were nearly covered by all standards (see stages 3.1–3.6 in Table 4). The SSAS covered in our research demonstrated a high degree of homogeneity, as evident in the small number of exceptions where there was not 100% overlap among the SSAS in Table 4.

**Table 4**. Audit process phase-overlap among SSAS.

| Identified Audit Process Stages / Steps: | Found in how many SSAS: | SMETA | IETP | PSCI | FWF | ASI | RBA | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|---|---|
| 1. Pre-Audit Planning | 7 | x | o | x | x | x | o | _ | x |
| 2. Audit Preparation | 8 | x | x | x | o | x | x | x | x |
| 3. Audit Execution | 8 | x | x | x | x | x | x | x | x |
| 3.1 Opening Meeting | 8 | • | • | • | • | • | • | • | • |
| 3.2 Site Tour | 8 | • | • | • | • | • | • | • | • |
| 3.3 Interviews | 8 | • | • | • | • | • | • | • | • |
| 3.4 Document Review | 8 | • | • | • | • | • | • | • | • |
| 3.5 Pre-Closing Meeting | 7 | • | • | • | • | • | • | _ | • |
| 3.6 Closing Meeting | 8 | • | • | • | • | • | • | • | • |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4. Audit Report & CAP | 8 | x | x | x | x | x | x | x | x |
| 5. Follow-Up, Audit Closure | 8 | x | x | x | x | o | x | x | x |

X = phase covered by SSAS; · = step covered by SSAS; o = phase briefly mentioned; __ = not covered.

These findings address our first research question, as they clearly demonstrate that, in terms of audit process phases and steps (prescribed and carried out in thousands of audits around the world) for various industries, the SSAS do overlap to a large extent.

## 4.2 Common Audit Main Categories Among Supplier Sustainability Audit Standards

By extracting the written structures and indexes of the SSAs and collating and juxtaposing them, we found a high level of overlap among the eight SSAS analysed. Thirteen main, common sustainability categories were identified, as displayed in Table 5 below. Of the 13 main categories identified, seven categories were found in all SSAS (marked bold in the table), including: 2. Freely chosen employment, 3. Child labour and protection of underage workers, 4. Fair remuneration, 5. Working hours, 6. No discrimination, 8. Freedom of association and 11. Facility safety systems. Six further main categories were identified that were identified in at least three quarters of the SSAS, but not all. The second column (Count) in Table 5 tallies the number of initiatives/associations that included these categories in their audit standard. The data revealed that, similar to audit processes (refer to section 4.1 above), the SSAS we analysed demonstrated a high degree of overlap, in terms of their structure, main categories and overarching content.

**Table 5.** Main sustainability categories identified and extent of coverage in SSAs.

| Identified Main Categories: | Frequency Count of Categories: | SMETA | IETP | PSCI | FWF | ASI | RBA | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|---|---|
| 1. Management Systems | 7 | x | - | x | x | x | x | x | x |
| **2. Freely Chosen Employment** | **8** | x | x | x | x | x | x | x | x |
| **3. Child Labour & Young Workers** | **8** | x | x | x | x | x | **X** | x | **X** |
| **4. Fair Remuneration** | **8** | x | x | x | x | x | x | x | x |
| **5. Working Hours** | **8** | x | x | x | x | o | x | x | x |
| **6. No Discrimination** | **8** | x | x | x | **X** | x | **X** | x | **X** |
| 7. Business Ethics | 7 | o | o | x | – | o | **X** | **X** | **X** |
| **8. Freedom of Association** | **8** | x | x | x | **X** | X | **X** | x | **X** |
| 9. Discipline, Discrimination Grievances | 7 | x | x | | X | o | x | o | x |
| 10. Fire & Emergency | 6 | | x | x | x | – | x | x | x |
| **11. Facility Safety Systems** | **8** | x | x | x | x | X | **X** | x | x |
| 12. Environment | 7 | x | x | x | | x | **X** | x | X |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 13. Employment Practices | 6 | **X** | x | – | x | | x | x | **X** |

Category in Bold = covered by all standards. X = SSAS covered topic in detail; x = SSAS includes category; o = SSAS briefly mentions category; – = SSAS only covers similar/neighbouring topic; [Empty] = Category not covered by SSAS.

However, upon closer inspection, it became clear that some SSAS covered certain main topics in great detail (i.e. with ten or more audit questions solely addressing the specific sustainability issue) and their audit protocols contained many questions to evaluate a supplier's conformance and activity within this category. Other SSAS explicitly mentioned the category as an area of focus but only documented a few questions to be asked about the issue. A few SSAS either did not cover the topic at all or only mentioned neighbouring topics. The extent of coverage is indicated by the symbols in each cell in Table 5 (please refer to the legend). Once we had collated the audit protocols / audits structures and juxtaposed them for clearer comparison, it became apparent that the SSAS covered the categories to differing degrees. The findings presented here in section 4.2 provide an answer to our second research question ("What are the main sustainability aspects covered by SSAS and to what extent does the content of their audit standards overlap?") by identifying 13 common audit focus categories and confirming that there appears to be a lot of overlap, at least at the structural level of the standards. While the exploratory findings at this aggregated level of comparison are a good indication of audit standard similarity, they certainly do not provide enough information to confirm or refute our initial research proposition, that SSAS could be cross-recognised or potentially standardised.

## 4.3 Analysis of Sub-Categories Among Supplier Sustainability Audit Standards (SSAS)

The preceding sections demonstrated the structural overlaps at the level of sustainability categories identified across most or all SSAS. But how much overlap was there at the detailed level of individual questions, asked as part of each SSAS? Compiling manageable tables from multiple-hundred-page audit protocols was a challenge for this research. In order to present the findings on the limits to the overlaps, a much more granular level of detail is required. We selected two common audit main categories (identified in 4.2) that feature in all eight SSAS, and compared audit focus areas at the sub-category level (within the category) to demonstrate overlap and differences among the

sampled audit standards at a finer level. A more detailed impression of the granular differences and similarities can be gained by consulting the supplementary material. We demonstrate findings from two main categories that were found to be included in all SSAS, namely 'working hours' and 'child labour and young workers.' Due to considerations of article length, a further detailed analysis of the main category, 'fire and emergency' (included in six of the nine SSAS), can be found in Appendix C.

### 4.3.1 Comparison of Findings for Audit Standard Category: Child Labour & Young Workers

Child labour is one of the most prominent and publicly decried social sustainability / human rights issues [90], hence, unsurprisingly, this main category was covered by all SSAS in our sample. A closer look at the number of questions that each audit standard contained on the issue, however, revealed a much more differentiated picture. We found that three quarters of the SSAS analysed had 10 or less audit questions covering the issue of child labour / young workers as tallied in the third column of Table 6. On the other hand, the audit standard employed by amfori BSCI contained more questions (over 80) within the child labour and young workers category than all other standards combined.

**Table 6.** Number of audit questions on child labour & underage workers per SSAS

| Audit Main Category: Child Labour & Young Workers | | |
|---|---|---|
| **SSAS** | **Section(s) and reference within respective SSAS:** | **Nr. of Questions in SSAS** |
| SMETA | 4. Child Labour Shall Not Be Used (p. 31–32) | 5 |
| IETP | Section 3: Employment Practices (p. 3–5);<br>Section 4: Special Protections (p. 6) | 7 |
| PSCI | Labor (pp. 11–14) | 3 |
| FWF | Labour standards – No exploitation of child labour<br>(A6: p. 55–56, B4: 68–69, C6: 86, D2: 93) | 10 |
| ASI | C. Social – 10. Labour Rights (p. 16f) | 4 |
| RBA | A. Labor – A2) Young Workers (pp. 14–21) | 23 |
| JAC | A – Labour Requirements – 2. Child Labour (p. 3f) | 4 |
| Amfori BSCI | 2.8. Perf. Area 8: No Child Labour (p. 142–147)<br>2.9. Perf. Area 9: Special Protection for Young Workers<br>(pp. 148–152) | 86 |

Not only did we discover quantitative variance in the focus of the audits (represented by the number of questions dedicated to a certain main category or sub-category), we also discovered significant variance in the wording of the audit headings and questions. In the examples evident in Table 7 it becomes clear that a range of policies are being focused on by the audits and that different audit standards can ask different questions. Some SSAS want to confirm that no child labour occurs

at the supplier site, while others deal with the contextual complexities that accompany the phenomenon of child labour (e.g. prevalence of migratory workers, lack of education opportunities, need to supplement family income, etc.). Differing age limits and cut-offs are named and some SSAS include the neighbouring topic of young workers, whereas others solely focus on child labour.

**Table 7.** Extracts from SSAS documentation, example questions on Child Labour policies.

| Audit Main Category: Child Labour and Young Workers<br>Sub-category Focus: Child Labour and Young Workers Policies & Checks | | |
|---|---|---|
| **SSAS / Nr. of Questions in Category** | **Sub-category:** | **Example question(s) from Audit Documentation:** |
| **SMETA** /<br>5 Questions on Child Labour & Young Workers | General: 4. Child Labour Shall not be used | "Policy: No Child Labour Employed<br>Check: 4.A Legal age of employment? 4.B Age of youngest worker found? 4.C Children present but not working? 4.D % under 18's at site (of total workers)? 4.E. Workers under 18 subject to hazardous materials?" |
| **IETP** /<br>7 Questions on Child Labour & Young Worker | 3.1 Policy;<br>3.3 Underage workers;<br>4.1 Young Workers | "Policy: Does the factory have a written minimum working age policy in line with legal and IETP requirements?<br>Are the contents of the policy made available and effectively communicated to all workers?<br>Checks:<br>3.3. Are underage workers prohibited in the factory?<br>Does the factory have no cases of historical underage workers?<br>4.1. If young workers are present, are they working on allowable assignments, as specified by legal and IETP requirements? Does the factory keep a list of appropriate assignments for young workers?" |
| **PSCI** /<br>3 Questions on Child Labour & Young Workers | Labour Policy;<br>Child Labor and Young Workers | "Policy: Does the facility have a policy (or statement of commitment) regarding labor practices? Labor policy: Does the policy cover: … Prohibition of child labor, … etc., Please provide a link to the policy on your web site, or alternatively attach a copy of the policy.<br>Checks: Does the facility ensure that no child labor takes place in their operations? Please list the documents reviewed. Does the facility ensure that workers under age 18 are not involved in hazardous or strenuous or physically demanding work?" |
| **FWF** /<br>10 Questions on Child Labour & Young Workers | Labour Standards (Sub-Sections: A6, B4, C6, D2) – no exploitation of child labour | "Policy: What is the employment practice and policy of the enterprise regarding age? Since when is this policy in place<br>What is the practice and policy regarding hazardous work (which is not allowed under the age of 18)?<br>Check: How does management check the age of applicants? Is proof of age document kept in the records? Does the management allow juvenile workers (16 to 18 years) the opportunity to apply for a position in the factory? If yes, are there any schemes available to support such workers?<br>In case child labour is found: 1) How many children are found working in the factory? 2) Do they work in specific departments? Are their wages lower than adult workers working in the same department? What document proving your age do you submit when applying for a job in this factory?<br>Have you seen child labour in any other section of this industry? E.g. in the subcontracted jobs?<br>C6. Labour standards -- No exploitation of child labour<br>In case child labour is found, check whether children are working in specific departments or/and are paid lower than adult workers hired for the same job?<br>D2. Labour standards -- No exploitation of child labour<br>Are apparently young workers present? Do you get the impression that some workers are fleeing or kept out of sight? If so, find out why this has happened." |
| **ASI** /<br>4 Questions on Child Labour & Young Workers | Sub-section 10.2: Child Labour | No Policy Question;<br>"Check: The Entity shall neither use nor support the use of Child Labour as defined in ILO Conventions C138 and C182, and shall comply with related national and international law: A basic minimum working age of 15 years. Not engaging in or supporting Hazardous Child Labour.<br>Not engaging in or supporting Worst Forms of Child Labour." |
| **RBA** /<br>23 Questions on Child Labour & Young Workers | A2 Sub-section Young Workers | "Policy: A2.1-Workers are not below minimum age.<br>Checks: Records: a) Personnel file sample shows all workers are above minimum age or above company policy minimum age (whichever is greater). The worker roster shows all |

| | | |
|---|---|---|
| | | workers are above minimum age or above company policy minimum age (whichever is greater). Auditors need to ensure that sample covers all types of workers/employees.<br>Policy: A2.2-An adequate and effective policy and process is established to ensure that workers below the legal minimum working age are not hired either directly or indirectly via labor agencies/contractors.<br>Checks: There is a reliable ID verification system to control the workers' access into the facility. Auditee does not refuse the worker's job application after the "child" worker's age meets legal requirements. Underage assistance:<br>There is a procedure to assist underage children found working for the Auditee that is designed to provide for the welfare of the child. Inspect and cross-reference to verify the validity at least two types of official ID*. Reliable ID verification system to control the workers' access into the facility e.g. finger printing or ID card with owner's photograph to prevent under-age workers entering the facility by using another person's ID. ID types for verification and cross-reference." |
| **JAC** /<br>4 Questions on Child Labour & Young Workers | Sub-section A2.: Child Labour | "Policy: Child Labour (1) is strictly prohibited. No person is employed who is below the legal minimum age for employment.<br>Check: Where no local legislation exists to define the minimum legal age, no person is employed below the minimum age which is the age of completion of compulsory schooling, or not less than 15 years (or not less than 14 years, in countries where educational facilities are insufficiently developed) in accordance with international conventions.<br>Policy: Children under the age of 18 shall not be employed for any hazardous work or work that is inconsistent with their individual development.<br>Check: Where no local law exists to define working hours and working conditions for children under the age of 18, the Supplier should not employ them for work that is hazardous, unsafe or unhealthy such as among others: work with dangerous machinery, equipment and tools, or work which involves the manual handling or transport of heavy loads, work in an unhealthy environment that may, for example, expose children to hazardous substances, agents or processes, or to temperatures, noise levels or vibrations damaging to their health" |
| **Amfori BSCI** /<br>86 Questions on Child Labour & Young Workers | 2.8 No Child Labour &<br>2.9 Special Protection for Young Workers | "8.1 Policy: Auditee does not engage in illegal child labour directly or indirectly. If child labour is found during the audit, immediate actions (defined in SSAS) shall be taken by the auditor at that very moment.<br>Check: The auditee has taken the necessary measures to:<br>- Understand what child labour is, building the awareness of supervisors and recruitment staff. - Identify likelihood of child labour in its industry or region (some industries have a higher risk of child labour than others). - Not engage child labour indirectly (e.g. using recruitment agencies, allowing migrant/seasonal workers to use their own children to support them at work). The auditee keeps accurate records of: - Migrant and/or seasonal workers' children's names, ages, school schedules and information on their schools. - Age and identity cards of workers engaged via recruitment agencies. - Agencies' recruitment procedures to avoid engagement of children or illegal workers (among others). - The auditee keeps contact details of the stakeholder(s) to be involved in the solution of child labour cases<br>8.3 Policy: The auditee has adequate policies and procedures in writing toward protecting children from any kind of exploitation.<br>Check: If procedure outlines: Necessary steps to ensure children are protected from exploitation; How to deal with the case of child labour in the most responsible and humane way. Business based in a region where family poverty driving force behind child labour? Any child labour programme or projects run in the area by government, NGOs or others? Any trade union which could provide support in cases of child labour? Any educational or vocational training facility nearby or in the regional vicinity? Are there available contact details and/or schedules? Can the education or social welfare authorities provide assistance? Is there financial compensation available for children to stop working so they can go to school?" |

### 4.3.2 Comparison of Results for Audit Standard Main Category Working Hours

Working hours can be seen as an indicator of the general working conditions at a worksite and excessive working hours can potentially be a quantitative indicator for more complex sustainability issues [13,91]. Thus, as with the main category "Child Labour" above, we found that all SSAS addressed this topic. However, the distribution of focus was equally split into three SSAS groups: audit

standards with a minor focus on the issue (six or less questions on the issue), SSAS with a moderate focus (between 10 and 20 audit questions) and SSAS that focused in detail on the category, containing over 20 questions to assess the topic (see Table 8 for more details). As detailed in the case of Child Labour (section 4.3.1 above), we again find that the RBA and amfori BSCI standards are the most exhaustive in terms of questions focused on working hours, but that the Fair Wear Association also had a significant of focus on this topic within their standard.

**Table 8.** Number of audit questions on working hours per SSAS.

| Audit Main Category: Working Hours | | |
|---|---|---|
| **SSAS** | **Section(s) and reference within respective SSAS:** | **# Questions** |
| SMETA | 6: Working Hours are not Excessive (pp. 37–41) | 15 |
| IETP | Section 5: Working Hours (pp. 7–10)<br>Section 8: Forced & Prison Labor (pp. 17–19) | 13 |
| PSCI | Labour (pp. 11–14) | 3 |
| FWF | Labour standards – No excessive working hours (A6 p. 59f, B4: 73, C6: 89, D2: 93) | 21 |
| ASI | C. Social – 10.8 Working Time (p. 16f) | 1 |
| RBA | A. Labour – A3) Working Hours (pp. 22–29) | 32 |
| JAC | A – Labour Requirements – 4. Working Hours (p. 4) | 6 |
| Amfori BSCI | 2.6. Performance Area 6: Decent Working Hours (pp. 114–118) | 30 |

A closer, comparative look at the detailed questions on working hours revealed interesting findings. There is much focus on maximum work allowed in a week / average workload over a defined period (month / year), with nearly all audit standards explicitly referring to a 48-hour or maximally accepted 60-hour working week. However, only five of the SSAS analysed appeared to require auditors to check if and how working hours were being recorded, measured and collected. In Table 9 we present the SSAS' questions used to determine how suppliers deal with the issue of excessive working hours, overtime and breaks, including what methods are used to track time worked.

**Table 9.** Extracts from SSAS documentation, example questions on Working Hours

| Main Category: Working Hours;<br>Sub-Category Focus: Recording / Documenting Excessive Working Hours | | |
|---|---|---|
| **SSAS / Nr. of Questions in Category:** | **Sub-Category:** | **Example question(s) from Audit Documentation:** |
| **SMETA** /<br>15 Questions | 6: Working Hours are not Excessive (p. 37–41);<br>Working hours' analysis | "Systems & Processes to determine working hours are not excessive:<br>A. What timekeeping systems are used: time card etc.? B. Is sample size same as in wages section? … F: Are workers provided with at least 1 day off in every 7-day-period, or 2 in 14-day-period: (Please select applicable: 1 in 7 days, 2 in 14 days, No; Is this allowed by local law?; Maximum no. of days worked without a day off (in sample). Overtime Hours worked: I: Actual overtime hours worked in sample (State per day/week/month): Highest OT hours: __? J: Combined hours (standard/contracted plus= total 60) found?" |

| | | |
|---|---|---|
| **ICTI** / 15 Questions | Section 5: Working Hours (p. 7–10) | "5.2 Documentation: Are all hours worked documented? Are all hours worked documented? Are all hours worked documented? Are workers aware of, and able to verify, their working hours in their time records?<br>5.3 Working Hours: Are maximum weekly working hours within IETP requirements?<br>5.4 Breaks: Are workers aware of, and able to verify, their working hours in their time records?" |
| **PSCI** / 3 Questions | Section: Labour | "Does the total number of weekly working hours (including overtime) per employee not exceed 60 hours (as required per ILO standard on maximum working time of 60 hours per week) or less if defined so by local law?" |
| **FWF** / 21 Questions | Labour standards -- No excessive working hours (A6 p. 59f, B4: 73, C6: 89, D2: 93) | "A6. Labour standards -- No excessive working hours:<br>What are the normal working hours, normal working week, for men and women? Management asked to explain the enterprise's overtime policy. Specific questions: What are the usual low and high season periods? How were they over the last year? How often does overtime occur? Which workers work overtime? What are the causes of overtime work; can the FWF member enterprise help to reduce overtime? Is this documented? Is there a documented working time register? B6. Labour Standards:<br>What are the normal working hours, normal working week, holidays? Is this documented?<br>What are the usual low and high season periods? How were they over the last year?<br>How much overtime has the interviewee recently made. Try to get a picture as precise as possible, so that the records inspector can crosscheck it. Check for possible gender discrimination if overtime premium payments are paid. Who allocates overtime shifts? Do piece-rate workers make overtime because otherwise they cannot reach their production targets? Is there gender discrimination in the type of payment system – for example are most women on piece work while men are more likely to be able to earn premium rates for overtime?" |
| **ASI** / 1 Question | 10.8 Working Time | "The Entity shall comply with Applicable Law and industry standards on Working Time (including Overtime working hours), public holidays and paid annual leave." |
| **RBA** / 32 Questions | A. Labor -- A3) Working Hours (p. 22-29) | "A3.1 Hours worked in a workweek over the last 12 months does not exceed 60 hours. Check Records: a) Mandatory sample size of individual time records as well as summary reports, show the number of hours worked - including overtime - per worker per week should not exceed 60 hours.<br>A3.3 Adequate and effective policy and system/procedures are established to determine, communicate, record, manage and control working hours including overtime, including reliable and detailed records of workers' regular and overtime working hours. Check Policy: a) Adequate and effective working hours/days off policies and procedures are in place to i) Accurately determine ii) Record iii) Manage iv) Control working hours including overtime and days off.<br>b) If non-conformance is detected, documented corrective action should be implemented and progress against the corrective action documented. Additional Records Checks:<br>a) Review the company's time records and system for recording time worked to determine that time is recorded accurately and completely. Additionally check: b) All workers have a time record. c) Each time record is accurate and can be cross-referenced with leave records, production records, maintenance, procurement or other relevant records. d) Regular working time and overtime recording. e) Adequate detail to allow for daily, weekly and monthly working time and overtime analysis.<br>Recording devices: Time Recording Devices are present and all are in working order." |
| **JAC** / 6 Questions | 4. Working Hours | "The Supplier shall ensure that normal working hours and overtime of individual employees do not exceed the maximum of limits set by local law.<br>Where no local law defines a working week /overtime, Supplier expected to adopt the following: a) a normal working week in line with ILO Convention in respect of applying the principle of the 8-hours day or of the 48-hours week and b) overtime in line with limits as specified in SA8000: i) in respect of 12 hours overtime per week and ii) in respect of one day off following every six consecutive working days." |
| **amfori BSCI** / 30 Questions | 6. Decent Working Hours | "6.1 Is there satisfactory evidence that the auditee does not require more than 48 regular working hours per week, without prejudice to the exceptions recognised by the ILO? Are workers aware of the regular working hours and possible exceptions? Are exceptions documented and made available? 6.2– Is there satisfactory evidence that the auditee request of overtime is in line with the requirements of the amfori BSCI Code of Conduct?<br>6.3 - Is there satisfactory evidence that the auditee grants workers the right to resting breaks in every working day?<br>6.4– Is there satisfactory evidence that the auditee grants workers the right to at least one day off every seven days?" |

A close reading of the detailed depictions of individual audit questions and checks as stipulated by all SSAS in our comparison demonstrates a significant range of approaches both in terms of depth and breadth. After this presentation of the findings across all eight SSAS and the two exemplary in-

depth comparisons of how sub-topics were dealt with in the eight SSAS, we now turn to a discussion of these findings. We discuss how they relate to both our research questions and the guiding research proposition and what implications these findings might have for practice and academia.

# 5. Discussion

We began our research with the general observation and underlying hypothesis that supplier sustainability audits are increasing in number and scope worldwide. We noted that multi-brand, voluntary sustainability initiatives/associations (SI/As) have created their own audit standards and proposed that these audit standards are probably similar and therefore that the standardisation of such SSAS may be a possibility. In the following we begin with a discussion of our findings and how these findings relate to our assumptions, propositions and helped us to answer our research questions. Thereafter we point out the limitations of this research and make suggestions for further research before concluding the section by highlighting the relevance and implications for practice.

## 5.1 Discussion of Exploratory Findings

Our exploratory research of hundreds of pages of audit standards and protocols and numerous SI/A annual reports understandably generated an enormous amount of data. To make sense of the key findings we can categorise them into five discussion points: (5.1.1) increasing audit activity; (5.1.2) very similar audit processes; (5.1.3) broad landscape of auditing companies; (5.1.4) audit category overlap; (5.1.4) divergent audit detailed content.

### 5.1.1 Increasing (SI/A) Audit Activity

Our findings, depicted in Table 2, certainly agreed with our assumption that supplier sustainability audits (carried out for SI/As) are increasing. We discovered an apparent proliferation of audit activity happening within and across various industries, conducted by both-stakeholder driven initiatives (such as FWF) and multi-brand associations (the majority of our sample), some with a longer history (such as the toy industry and BSCI) and others much more recently (e.g.: ASI, PSCI). Larger organisations like amfori BSCI and Sedex have conducted over 100,000 supplier sustainability

audits each in the last decade. The other SI/As together accounted for around 38,000 audits in the same time frame. Our data denotes a growth in over 50,000 more audits per year in 2019, compared to the baseline in 2010. This represents a remarkable 481% growth in audit activity from 2010 to 2019 among the initiatives/associations included in this research. In surveying the SSCM literature we did not discover empirical research or data that gave a clear indication of actual supplier sustainability assessment activity; thus, these findings contribute to addressing such a gap. Many SI/As indicate that a desire to reduce redundant activity, improve efficiencies and reduce supplier audit fatigue were the reasons for coming together as an industry or association. However, given that only the eight SSAS that we explored were applied in the form of over 60,000 audits in 2019, we can only hope that these audits do not involve double auditing of suppliers according to different (competing) SSAS. Also given the trend that we have captured over the last ten years, we see support for the move toward standardisation, so that if audit activity continues to grow at such a pace, suppliers will be held up to the same standards.

### 5.1.2 Audit Process Similarity

Our first research question pertained to the main audit process characteristics and the extent to which these might overlap. Our comparative research and analysis of the standards found that SSAS *processes* are very similar. Recalling the findings in Table 4, our exploratory research revealed that eight SSAS have established nearly identical audit processes. Nearly all SSAS had the same wording when it came to audit phases and there was also a high degree of overlap when it came to the sub-phase audit steps for carrying out the audit execution itself. Common sense reassures us that most audits would need to be prepared, conducted and followed up, which is what the identified common phases conform to and such audit steps are probably neither specific to supplier audits nor sustainability audits. Hence, it is conceivable and possible that such SSA could be standardised, at least from a process perspective.

### 5.1.3 Audit Company Landscape

All SI/As included in our research, apart from FWF, do not conduct the audits themselves and thus hire external auditing companies to audit suppliers against their standards. We found some

significant overlap among the initiatives/associations in terms of the auditing companies whom they partner with (recall Table 3, see Appendix 3 for greater detail). There was particular convergence on the companies Intertek, TÜV Rheinland, Bureau Veritas Certification, ELEVATE and UL — Responsible Sourcing Inc, who were contracted by at least half of the SI/As surveyed. In terms of our research proposition and questions, we argue that — from the perspective of the service providers — the potential for alignment and standardisation is demonstrated by globally distributed and different auditing companies carrying out audits against the standards. Thus, assuming alignment among different initiatives, in terms of the focus of audits, the questions to be asked and the length of the audits necessary, we see the potential for standardisation.

### 5.1.4 Audit Standard Categories

As demonstrated in Table 5, our analysis of the eight available supplier sustainability audit protocols and documents revealed 13 main sustainability categories that were found in all, or the majority, of the SSAS. This clearly demonstrates that, at the structural level of the audit, the SSAS have a high degree of thematic overlap, which has been pointed out in the literature (see for example: 81 for a summary of proliferation of private, voluntary supply chain standards). Despite the organisational, industry, size and temporal differences among the SI/As included in our research, we found that the SSAS were focussing on remarkably similar topics at a higher level. We surmise that this sample probably reflects the spectrum of sustainability challenges and risks in global value chains [59]. It also points to a degree of convergence and emerging consensus on what constitute important sustainability risks, that need to be monitored and managed at supplier locations [63]. This discovered SSAS overlap gives the impression that our initial proposition, that SSAS are similar and could be standardised, is plausible. Had our analysis and comparison stopped at this level of analysis, we could infer that there is a lot of potential for standardisation and cross-recognition of each other's standards, as all standards were dealing with the same aspects of sustainability.

### 5.1.5 Audit Standard Detailed Content

As depicted in Table 5, different audit standards covered different categories to varying degrees of detail. This research is not evaluating which standards are better, or arguing that more

questions are necessarily a sign of quality, but rather highlighting the detailed differences between standards. While the main categories demonstrate much intersection, there were also specialist categories, such as responsible raw material sourcing, that were more pertinent to certain associations/industry initiatives (e.g. RBA, ASI). Due to constraints of length and complexity, it was not possible to compare every sub-topic and outlying question that was possibly present in only one SSAS. Hence this research is intended to be exemplary, rather than exhaustive; providing an exploratory insight into potential convergence among audit standards. Other SSAS were initially conceived as a tool for social sustainability monitoring (not environmental) and thus did not cover the ecological category in as much detail/at all. We surmise that this broad sustainability category alignment among the SSAS potentially reflects iterative processes that occurred within each initiative/association. When considering the potential for standard alignment (as currently being undertaken by the Sustainable Supply Chain Initiative — SSCI) it would be necessary to find broad agreement first among members in such multi-brand / multi-stakeholder associations, as member would presumably not agree to implement a shared audit standard that was considered inadequate or insufficient, compared to the standard they are currently used to applying. Standardisation should not cause a race to the bottom or force agreement on the lowest common denominator. Once such private/voluntary organisations agree to adopt a global, inter-operative standard, only then could the difficult process of alignment on the details begin.

### 5.1.6 Potential / Limitations of Audit Standardisation

Our more detailed analysis of the content of the audit categories revealed wide divergence in terms of the number of questions on sustainability aspects within that category, differentiated sub-categories, as well as much variance in the number and type of questions that are posed to the supplier. There are no doubt plausible explanations for why one initiative/association thought that category ‘XYZ’ could be adequately evaluated with three questions, whereas another initiative determined 40 questions to deal with the topic. Moreover, as critical literature has repeatedly pointed out, having many well-formulated questions, excellent audit statistics and documentation does not necessarily reflect audit quality, let alone guarantee effectiveness [50,72,83,92,93]. Nonetheless, this divergence in audit questions poses an array of fundamental challenges to our

major proposition of standardising such SSAS to reduce inter-industry audit fatigue. In order for audits to be able to be mutually recognised or standardised, there would have to be overarching alignment that ensures agreement on a standard audit process and more pertinently on common audit categories that comprise an acceptable audit (which our research showed), as well as the questions asked/contained in audit protocols. Furthermore, it remains to be seen whether companies/initiatives are willing to accept an audit that they have not designed themselves.

Designing a type of global audit standard that could be applied across diverse industries and supply chain stages and in all geographies would require a form of governance discussion among existing standards (and others not covered by this paper) and a long process of discussion about which categories, sub-categories and questions must be included (or excluded). Moreover, a solution would need to be designed to account for certain specialty areas, which are of key concern for particularly industries, but not relevant enough to be included in a global, general audit standard. Perhaps this would require an international, independent body (such as the UN, ILO or OECD), involving broad worker-participation and civil society representation [94] to bring in an aspect of arbitration and legitimacy for such a standardisation project. Given the lack of such overarching hybrid governance [64] on global value chains at present [71] and the how arduous such a global supplier sustainability audit standardisation process would be, it is worth critically considering whether such standardisation is realistic at present and worth pursuing in the future. This needs to be weighed up against the apparent continual increase in auditing activity and the self-fulfilling nature of more activity that could eventually see (sub-)suppliers serving various industries being audited multiple times by different initiatives/associations – for example electronics sub-suppliers that produce components for the toy, automotive and mobile devices industries [45,95].

Critical literature continues to query the effectiveness of sustainability audits [93], particularly as a stand-alone instrument [13,72,83], and challenges the legitimacy and independence of auditing companies [96,97]. Some authors note that effectiveness depends on institutional pressure and follow-up activities for audits to address problems and support their improvement [13,72,92]. In the context of our research, it can be argued that standardised and shared supplier assessment [76], such

as supplier sustainability audits, should also aim to improve their effectiveness. Standardising better audit standards would free up both suppliers' and focal companies' resources (time, budgets and personnel) by reducing redundant/overlapping audits and thereby allow both suppliers and FCs to focus more on addressing the identified gaps and other sustainability problems. Whilst noting valid concerns in critical research on audits, our research provides empirical evidence of how well-established supplier sustainability audits have become. As Terwindt and Armstrong [50] argue, such audits are here to stay, and we reveal the scope they cover and demonstrate that they are increasing in number. Therefore, it makes sense to research this phenomenon in further detail and contemplate standardising them to reduce redundant activity and increase their effectiveness as a tool for SSCM.

## 5.2 Recommendations for Further Research

Our research was exploratory in nature as no other research could be identified that compared so many common supplier sustainability audit standards, despite the key role that such audits fulfil in current SSCM strategies, approaches and toolkits. While we discovered and analysed audit standards that had been applied in over 300,000 supplier audits (recall Table 2.), the authors are cognisant of the inbuilt limitations that accompany inductive reasoning [85], namely how generalisable such findings might be. We endeavoured to counteract this by including established standards, new standards, large and smaller SI/As and including SSAS from different industries. Nonetheless, more research and more empirical data to build on and extend our findings could be useful. Much SSCM literature treats these monitoring instruments as neutral tools [58,62] taken in a positivistic sense and considers them to be self-explanatory, objective measuring devices to carry out SSCM. However, it is important to recognise the many critical voices that question the effectiveness of audits specifically [91,92] and the self-legitimising nature of private, voluntary self-regulation by companies in general, as generating a type of pseudo-legitimacy and technocratic distraction from more systemic issues [64,84,98]. Further research should aim to bridge the gap between critical literature that fundamentally questions the validity of the instruments and the private-voluntary governance that surrounds them on the one hand, and SSCM/operations/international business research which tends to approach the tools, structures and mechanisms in an apolitical manner.

We noted two cases in the extant literature, where databases have been created, to gather empirical data on the sustainability activities of companies [1] and on the array of multi-stakeholder industry initiatives for sustainability [29]. The former had a limited industry focus (food/produce, wood/timber and textiles/apparel) and the latter primarily focused on initiatives with a strong civil-society, multi-stakeholder component, but only covered a few multi-brand, voluntary initiatives such as those covered in more depth in this research. Future research could draw on all three approaches, to more comprehensively cover the overlaps among different types of initiatives. While the empirical reality of SSCM (as it is practised), is being documented, continued research should focus on long-term impact and improvement resulting from the increased audit activity. The question of auditor neutrality, auditor accountability and effectiveness must also be brought into the management and SSCM considerations [4,96]. The persistence of serious problems in the conduct and thus results of audits presents serious risks for the legitimacy of such programmes and the results that FCs report based on such audits. As Fransen et al. [81] argue, there is clear need for an integration of insights gained in global governance literature, political economy, labour relations and compliance and international business, specifically SSCM research. Researchers should also continue to undertake critical research into the actual effectiveness of audits, both in terms of genuinely reducing risk exposure and in terms of improving sustainability performance and conditions in the supply chain. This research must, however, consider that audit activity is increasing and attempt to address the reasons for why this is the case. Finally, SSCM and global value chain (GVC) governance research could and should collaborate, building on this paper by suggesting a standardised audit standard, with modular additions (for specialist areas), as well as accountability measures, and survey the potential openness and acceptance among various supply chain actors and stakeholders for such an idea.

## 5.3 Relevance for Practice

Our findings will hopefully serve as a good benchmarking reference for practitioners who want to gain insight into a cross-section of current supplier sustainability audit activity. We also anticipate that this research could be an important reference for future supply chain initiatives that are yet to design and/or align on a common audit structure. Governments, focal companies, suppliers, workers

and NGOs should continue to critically analyse the efficacy and presumed role that audits play in addressing sustainability issues in global value chains. Audits are increasing in number, despite the standardisation (and intended reduction in redundant re-auditing) and audit sharing that is occurring within multi-brand and multi-stakeholder initiatives. Fair Wear Foundation has taken note of critical inquiry into the limited effectiveness of monitoring (e.g. 73,83) and consequently endeavoured to develop a holistic and more collaborative approach to improving conditions at suppliers' factories, whilst also holding participating brands more accountable to their commitments to sustainability improvement [68]. Many other sustainability initiatives/associations (SI/As) surveyed in this research increasingly stress that audits are an important measuring tool, but that the important focus needs to be on what is done with the results of audits [46,68,78]. SSCM tools cannot be considered in a vacuum, independent of questions of accountability and governance.

Suppliers should assess the varying audit requests they are receiving and point out the overlap to the buying companies/customers requiring them to undertake such audits. Industry initiatives/sustainability associations should enter into dialog with other organisations that employ a similar audit standard (they could draw on our research to demonstrate such overlaps) and consider steps towards reducing audit fatigue among suppliers that supply to multiple industries. The SSCI is currently one vehicle for sustainability standards to undergo a benchmarking and it is plausible that this organisation could play a key role in supporting cross-initiative standardisation [99]. Further attention should be paid to developing review and effectiveness management into all supply chain audit schemes, ensuring a race to the top in terms of better standards; not a race to the bottom, in which companies pick the easiest standards with the least accountability.

# 6. Conclusions

Sustainability is increasingly becoming a central tenet of many discourses and global supply chains are no exception to this trend. Focal companies have developed numerous strategies and tools to manage sustainability risks in their supply chains. This qualitative research focused in-depth on sustainability audits as a core element of SSCM toolkits. The research contributes to literature on

SSCM, sustainability/ethical audits and sustainability initiatives by providing empirical evidence for an increasing amount of global audit activity and by describing how supplier audit standards are structured and differ. Global FCs are increasingly combining their efforts in multi-brand SI/As to pool resources, share good practices and to reduce supplier audit fatigue and redundant activities. We identified eight supplier sustainability audit standards (SSAS) from differing industries and found that supplier sustainability audit activity is increasing. Our inductive analysis of the data collected confirmed our underlying research assumption and we found very similar processes for conducting supplier sustainability audits and some convergence in the choice of service providers for such audits. Qualitative text analysis of the SSAS also demonstrated a high level of overlap in terms of the structure of the audits (sustainability issues covered as main categories). However, at a granular level, the SSAS were highly heterogenous. Thus, whilst standardisation of SSAS is conceivable, it would be much more complex than initially hypothesised. This is because audit standardisation would mean alignment of SSAS at the micro-level of the audit protocol questions, which would entail broad-ranging, granular agreement and conceivably necessitate an arbitrating governance body that could determine which aspects of which SSAS could become the one global standard. Given the evidence we found for increased global audit activity, it would be advisable to understand these critical SSCM tools in more detail, and work to make them more effective and standardisable to further reduce audit fatigue and free up supplier and FC resources for implementing continuous sustainability improvements in global supply chains rather than just monitoring supplier compliance.

**Supplementary Materials:** Working Tables Collating and Comparing Audit Protocols, and all relevant audit documents from the sustainability initiatives/associations that featured in this research. Available here: https://www.mdpi.com/2071-1050/12/19/8223/s1

**Author Contributions:** Conceptualization, J.S., M.M. & I.J.F; methodology, I.J.F.; formal analysis, I.J.F.; investigation, I.J.F.; writing—original draft preparation, I.J.F.; writing—review and editing, J.S. & M.M.; visualization, I.J.F.; supervision, J.S. & M.M.; project administration, J.S. & M.M.; funding acquisition, M.M.

All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding. The APC was funded by the University of Ulm.

**Acknowledgments:** The authors would like to expressly thank Marlene Zeitler for her invaluable contributions to the early stages of the research, for diligently scouting through hundreds of pages of audit protocols and manuals. We would also like to thank the representatives of the eight initiatives surveyed as well as representatives from the Consumer Goods Forum GSCP/SSCI for providing us with supporting information to better understand the scope and content of their activities.

**Conflicts of Interest:** "The authors declare no conflict of interest."

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## 7.1 Sustainability Initiative/Association Resources and Links

**Sedex / Sedex Members' Ethical Trade Audit (SMETA):**
General Information: https://www.sedexglobal.com/about-us/
Audit documents protocol (downloaded July, 2018):
https://www.sedexglobal.com/smeta-audit/smeta-documents/

**International Council of Toy Industries (ICTI) / ICTI Ethical Toy Programme (IETP)**
General Information: https://www.ethicaltoyprogram.org/en/who-we-are/
Audit document / protocol (downloaded July, 2018): https://prismic-io.s3.amazonaws.com/wdr-test-icti%2Fc6f5027e-af47-4eda-8ba6-49b93e94fcea_ietp+checklist+version+2018+v1.0.pdf
Annual Reports and Specific IETP information:
https://www.ethicaltoyprogram.org/en/resources/publication-library/

**Pharmaceutical Supply Chain Initiative (PSCI)**
General Information: https://pscinitiative.org/about
Audit document / protocol (downloaded July 2018): https://pscinitiative.org/resource?resource=32

**Fair Wear Foundation (FWF)**
General Information: https://www.fairwear.org/about-us
Audit document / protocol (downloaded July 2018):
https://www.fairwear.org/wp-content/uploads/2016/06/FWFauditmanual-march2012.pdf
Annual Reports and Specific FWF information:
https://www.fairwear.org/resources-and-tools/resource-documents

**Aluminium Stewardship Initiative (ASI)**
General Information: https://aluminium-stewardship.org/about-asi/
Audit document / protocol (downloaded July 2018):
https://aluminium-stewardship.org/asi-standards/asi-assurance-manual/

**Responsible Business Alliance – RBA (previously EICC)**
General Information: http://www.responsiblebusiness.org/about/rba/
Audit document / protocol (downloaded July 2018):
http://www.responsiblebusiness.org/media/docs/CodeInterpretationGuidance.pdf
Annual Reports and Specific RBA information:
https://www.responsiblebusiness.org/publications/ar2019/
https://www.responsiblebusiness.org/publications/ar2018/
https://www.responsiblebusiness.org/publications/ar2017/

**Joint Audit Cooperation (Telecommunications Industry) – JAC**
General Information: https://jac-initiative.com/about-us/
Audit document / protocol (downloaded November 2018):
https://jac-initiative.com/download/jac-audit-process/

**Amfori BSCI (Business Social Compliance Initiative)**
General Information: https://www.amfori.org/content/amfori-bsci
https://www.amfori.org/content/amfori-bsci-code-conduct-
Audit document / protocol (downloaded November 2018):
https://www.amfori.org/sites/default/files/amfori%20BSCI%20System%20Manual_ENG.pdf

# Appendix B2: A–Comparison of SSAS Categories

Table B2.1 depicts an overview of the 13 identified sustainability categories contained in the audit standards, and the respective SSAS protocol chapters that cover the related sustainability issues.

**Table B2.1.** Sustainability category coverage by supplier sustainability audit standard.

| No. | Sustainability Category | SMETA | ICTI | PSCI | FWF | ASI | RBA (EICC) | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Management System** | 0B. Management systems & code implementation | (brief mention)<br>1: Audit Process<br>7.1 Policy | A. Management Systems | A1. Basic facts; B1. General; A5, C5. Factory Management system; A3., C3. FWF Affiliate's System to monitor & remediate working conditions | 2. Policy and management<br>3. Transparency | E. Management System | E. Measurement & Continuous Improvement | 1: Social Management System and Cascade Effect |
| 2 | **Freely Chosen Employment** | 1. Freely chosen Employment | 8. Forced and Prison Labour | C. Freely Chosen Labour | A6., B4., C6., D2 Employment is freely chosen | 10.3 Forced Labour | A1) Freely Chosen Employment (1.1, 1.2, 1.5) | 3. Forced Labour | 11: No Bonded Labour |
| 3 | **Underage / Child Labour** | 4. Child Labour | 3.1 Policy, 3.2 Training; 3.3 Underage Workers; 4. Special protections (Young/ Pregnant Workers) | C. General, Child Labour and Young Workers | A6., B4., C6., D2. No exploitation of child labour | 10.2 Child Labour | A2) Young Workers | 2. Child Labour | 8: No Child Labour<br>9: Special Protection for Young Workers |
| 4 | **Fair Remuner-ation** | 5. Living Wages and Benefits<br>6: Working Hours are not Excessive | 6. Compensation | C. Wages, Benefits, and Working Hours | A6, B4, C6. Living wage A6., B6. Legally binding employment relationship; B4. Employment freely chosen; A6. No excessive work hours | 10.7 Remuneration | A4) Wages and Benefits | 5. Fair Remuneration<br>4. Working Hours | 5: Fair Remuneration<br>6: Decent Working Hours |
| 5 | **Working Hours** | 6. Working Hours | 5. Working Hours<br>8: Forced and Prison Labour | C. Wages, Benefits, and Working Hours | A6., B4., C6., D2. • No excessive working hours | 10.8 Working Time | A3) Working Hours | 4. Working Hours | 6: Decent Working Hours |
| 6 | **No Discrimination** | 7. Discrimination | 9. Discrimination | C. • Non-Discrimination and Fair Treatment | A6., B4., C6., D2. No discrimination in employment | 10.4 Non-Discrimination | A6) Non-Discrimination | 7. Discrimination | 4: No Discrimination |
| 7 | **Business Ethics** | 10C. Business Ethics | 2. Business Ethics | B. Ethics | (brief mention)<br>A2., B2., C2. Sourcing practices of the FWF affiliate | (brief coverage)<br>1. Business Integrity | D. Ethics | D – Ethics & Anti-Corruption | 13: Ethical Business Behaviour |

| No. | Sustainability Category | SMETA | ICTI | PSCI | FWF | ASI | RBA (EICC) | JAC | amfori BSCI |
|---|---|---|---|---|---|---|---|---|---|
| **8** | **Freedom of Association** | 2. Freedom of Association and Right to Collective Bargaining | 10. Grievance Mechanisms | C. • Freedom of Association | A6, B4, C6, D2.freedom of association & right to collectivebargaining; A4, B3, C4, D1 communication, consultation & grievance procedure | 10.1 Freedom of Association & Right to collective Bargaining; 10.5 Communication & engagement | A7) Freedom of Association E7) Communication E8) Worker Feedback and Participation | 8. Freedom of Association & Right to Collective Bargaining | 3: The Rights of Freedom & Association and Collective Bargaining 2: Workers Involvement & Protection |
| **9** | **Discipline, Discrimination & Grievances** | 9. Harsh or Inhumane Treatment | 7. Disciplinary Practices 9. Discrimination 9.3 Reporting Mechanism partially 10: Grievance Mechanism | No Mention // | A4., B3., C4., D1. Communication, consultation and grievance procedure (partly) | (Limited coverage) 10.6 Disciplinary practices | A5) Humane Treatment | 6. Disciplinary Practices | 4: No Discrimination -- 4.3 |
| **10** | **Fire & Emergency** | No Mention // | 12: Fire & Emergency | Health & Safety Compliance and Risk Management -- Emergency Preparedness & Response, Hazard Information | D2. Labour standards -- OHS Requirements tick list (partly) | (Limited coverage) A. Governance -- 2. Policy and Management (2.6 Emergency Response Plan) | B. Health & Safety -- B2) Emergency Preparedness | (Limited coverage) B – Health & Safety – 13. Accident and Emergencies Readiness | 7: OHS -- 2.7.6. Accident & Emergency Procedures; 2.7.9. Escape Routes & Emergency Exits |
| **11** | **Facility Safety & Hygiene** | 3. Safety and Hygienic Working Conditions | 13. Environmental, Health & Safety 11. Facilities | E. Health & Safety Compliance and Risk Management | A6., B4., C6., D2. Safe & healthy working environs, OHS Requirements | 11. Occupational health and safety | B. Health & Safety | B – Health & Safety | 7: Occupational Health and Safety |
| **12** | **Environment** | 10B2. Environment 2-Pillar; 10B4. Environment 4-Pillar | 13.12 Environmental | D. Environmental Protection | No Mention // | B. Environment | C. Environment | C- Environment | 12: Protection of the Environment |
| **13** | **Employment Practices** | 8. Regular Employment 8A. Sub-Contracting & Homeworking 10A. Entitle-ment to Work & Immigration | 3. Employment Practices | C. Freely Chosen Labour | A6., B4., C6., D2. Legally binding employment relationship | No Mention // | A1) Freely Chosen Employment (1.3, 1.4) | 1. Contract of Employment | 10: No Precarious Employment |

# Appendix B2: B –Audit Company Comparison

In Table B2.2 we present an overview of Auditing Companies contracted (as of April, 2020) by the multi-brand voluntary sustainability associations / initiatives that constitute the sample in this research:

**Table B2.2**: Auditing companies conducting supplier sustainability audits for sustainability initiatives research:

| **Auditing Companies** | **SMETA** | **ICTI** | **PSCI** | **FWF** | **ASI** | **RBA** | **JAC** | Amf.**BSCI** | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| Total auditing companies contracted: | 60 | 4 | 12 | Internal | 13 | 12 | 4 | 13 | |
| ABS Quality Evaluations Inc. | x | | | | | | | x | 2 |
| Accordia | x | | | | | | | | 1 |
| ACTE International | x | | | | | | | | 1 |
| AJA Bangladesh | x | | | | | | | | 1 |
| ALGI | x | | | | | | | x | 2 |
| APCER | | | | | | | | x | 1 |
| API Audit Limited | x | | | | | | | | 1 |
| AQM HK Limited | | | | | | | | x | 1 |
| ARCHE Advisors Inc. | x | | | | | | | | 1 |
| AUS-MEAT | x | | | | | | | | 1 |
| Benchmarks Company Ltd. | x | | | | x | | | | 2 |
| BNQ | | | | | x | | | | 1 |
| BSI (Group) | x | | x | | | x | | | 3 |
| **Bureau Veritas Certification** | x | | x | | x | | | x | **4** |
| Centre Testing International Corporation | x | | | | | | | | 1 |
| China Quality Testing Int.Corp | | | | | x | | | | 1 |
| Chola MS Risk Services | | | x | | | | | | 1 |
| Control Union Certifications | x | | | | | x | | | 2 |
| Cosultivo | | | x | | | | | | 1 |
| CSR Solutions | x | | | | | | | | 1 |
| Dekra | | | x | | | | | | 1 |
| Deloitte | | | x | | | | x | | 2 |
| DNV GL | x | | | | x | x | | | 3 |
| DQS CFS Gmbh | x | | | | x | x | | | 3 |
| Ecocert IMOswiss AG | x | | | | | | | | 1 |
| **ELEVATE** | x | x | | | | x | | x | **4** |
| Environmental Resources Management (ERM) | | | x | | | | | | 1 |
| ERM CVS | | | | | x | | | | 1 |
| Ethical Trade Services Africa | x | | | | | | | | 1 |
| EUROCERT SA | x | | | | | | | | 1 |
| Extensive Standard Technical Services Co. Ltd. | x | | | | | | | | 1 |
| FLO-Cert | x | | | | | | | | 1 |
| Globalgroup Certification Limited | x | | | | | | | | 1 |
| Goler Associates | | | x | | | | | | 1 |
| GREENMENT | | | | | | x | | | 1 |
| GSCS International Limited | x | | | | | | | | 1 |
| GUTcert (AFNOR Group) | | | | | x | | | | 1 |

| Auditing Companies | SMETA | ICTI | PSCI | FWF | ASI | RBA | JAC | Amf.BSCI | Total |
|---|---|---|---|---|---|---|---|---|---|
| Hong Kong Q.C. Center | x | | | | | | | | 1 |
| IBL Certification | x | | | | | | | | 1 |
| Insite Compliance | x | | | | | | | | 1 |
| International Associates | | | | | x | | | | 1 |
| International Compliance Group | x | | | | | | | | 1 |
| International Safety Systems | | | x | | | | | | 1 |
| **Intertek** | x | | x | | | x | x | x | 5 |
| IQC | x | | | | | | | | 1 |
| IQNet | x | | | | | | | | 1 |
| Leverage Limited | x | | | | | | | | 1 |
| LRQA | x | | | | | | | | 1 |
| Manumit87 | x | | | | | | | | 1 |
| MPS-ECAS | x | | | | | | | | 1 |
| NSF Certification | x | | | | | | | | 1 |
| Openview Service Limited | x | | | | | | | | 1 |
| Partner Africa (prev. Africa Now) | x | | | | | | | | 1 |
| Primus Auditing Ops | x | | | | | | | | 1 |
| PwC Australia | x | | | | | | | | 1 |
| QIMA Limited | x | | | | | | | x | 2 |
| Q-Inspect | x | | | | | | | | 1 |
| QMSCERT | x | | | | | | | | 1 |
| Reassurance Network | x | | | | | | | | 1 |
| RINA | x | | | | | | x | | 2 |
| SCS Global Services | x | | | | | | | | 1 |
| **SGS** | x | x | x | | x | x | x | x | 7 |
| SIPAS CR - Peru | x | | | | | | | | 1 |
| SMT Global | x | | | | | | | | 1 |
| Social Compliance Services Asia | x | x | | | | | | | 2 |
| SWEDAC Zertifizierungsgesellschaft International GmbH | | | | | x | | | | 1 |
| TÜV Austria CERT | x | | | | x | | | | 2 |
| TUV Nord Cert | x | | | | | | | x | 2 |
| **TÜV Rheinland** | x | | x | | x | x | | x | **5** |
| TÜV SUD | x | | | | | x | | x | 3 |
| **UL - Responsible Sourcing Inc.** | x | x | | | | x | | x | **4** |
| URS Verification | x | | | | | | | | 1 |
| Verisio | x | | | | | | | | 1 |
| Verité | | | | | | x | | | 1 |
| Verner Wheelock | x | | | | | | | | 1 |
| V-Trust Inspection Service | x | | | | | | | | 1 |
| Wieta | x | | | | | | | | 1 |

# Appendix B2: C – Deep Dive SSAS Category: Fire & Emergency Safety

Analogous to our analysis approach to the two main audit sustainability categories (in sections 4.1 and 4.2 of the main article) we also counted the number of questions in the SSAS that related to fire safety capacity and emergency response procedure. Similar to the findings presented in subsections 4.3.1 and

4.3.2, the SSAS demonstrated varying degrees of detailed coverage. We identify three groups: those SSAS with low coverage (between 0-9 questions on the issue), those containing 10 – 29 audit questions on the matter, and finally those audit standards that covered the topic in a high degree of detail (over 40 questions just for this category). Table B2.3 displays our findings for this category. It becomes apparent that the IETP, RBA and amfori BSCI covered this specific topic each in more detail alone than the combined number of questions of the other five standards.

**Table B2.3.** Number of audit questions on Fire and Emergency Safety per SSAS.

| Main Category: Fire Safety & Emergency Response | | |
|---|---|---|
| SSAS | Section(s) and reference within respective SSAS: | # Questions |
| SMETA | None | 0 |
| IETP | Section 12: Fire & Emergency (pp. 31–41) | 46 |
| PSCI | Health & Safety Copmpliance and Risk Management (pp. 21–33) | 15 |
| FWF | D2. Labour standards – OHS Requirements tick list (pp. 94–100) | 10 |
| ASI | A. Governance – 2. Policy and Management (p. 10f) | 1 |
| RBA | B. Health & Safety (pp. 52–97) | 75 |
| JAC | B – Health and Safety (pp. 6-9) | 9 |
| Amfori BSCI | 2.7. Performance Area 7: Occupational Health & Safety (p. 119–141) | 49 |

Comparative findings of detailed questions on fire and emergency safety: as the Rana Plaza catastrophe and many other horrendous factory fires have demonstrated, the ability for workers to be able to respond to a fire and stop it from spreading can have an immediate positive impact on social sustainability and health outcomes of workers in such emergencies. Thus, we decided to compare detailed questions within the category of fire and emergency safety on audit questions regarding the availability of fire-fighting equipment. As can be seen in Table B2.4, the particulars of how to audit for firefighting capacity are wide-ranging in the different SSAS; not just in terms of breadth and thoroughness but also in terms of how to check systems that enable firefighting.

**Table B2.4.** Extracts from SSAS documentation, example questions on Fire Safety.

| **Main Category: Fire Safety & Emergency Response**<br>**Sub-Category Focus: Capacity for Response to Fire / Fire-Fighting** | | |
|---|---|---|
| **SSAS:** | **Sub-Category:** | **Example Question(s) from Audit Documentation:** |
| IETP | Section 12: Fire & Emergency (p. 31–41); 12.5 Fire Fighting System: | "Is the fire safety system inspected by a qualified entity? Is the number of functional and appropriate fire extinguishers in line with legal requirements? Are fire extinguishers properly installed? Are fire extinguishers clear from obstruction? Are fire extinguishers fully charged and inspected monthly? Is the sprinkler and fire hydrant system functional? Is the sprinkler and fire hydrant system clear from |

| | | |
|---|---|---|
| | | obstructions? Is the sprinkler and fire hydrant system inspected monthly? Is the water supply adequate for fire hydrant or sprinkler system? Are emergency response personnel trained on the proper usage of firefighting equipment?" |
| PSCI | Health & Safety Compliance and Risk Management (pp. 21–33);<br>"Emergency Preparedness and Response" | "Are the following areas of the facility equipped with fire detection/protection systems? (Site areas, Fire/smoke detectors, Sprinkler or suppression systems): -Raw material warehouse, -Flammable liquid storage tanks, -Process areas, -Finished product warehouse<br>Does the facility ensure that an adequate amount of fire water is maintained for fire protection? Are new facilities constructed of fire resistive or non-combustible materials? Are emergency exits and evacuation routes clearly marked, kept free of obstructions (unlocked), and illuminated with emergency backup power? Are regular emergency evacuation drills conducted, and what is the frequency? Is the fire alarm system monitored 24 hours a day (including weekends and holidays) with prompt notification to emergency services (within 5 minutes)? Does the facility provide sufficient portable fire extinguishing equipment for the hazards present? Is the facility emergency response equipment (fire extinguisher, fire pumps, sprinkler systems) visually inspected monthly, comprehensively inspected annually, and documentation maintained for all inspections? |
| GSCP | 5. Health and Safety (Appendix 3, pp. 20–27);<br>5.4 Physical Employment site Inspection | "There are at least 2 unlocked/unblocked fire exits on each floor of the employment site. There are a sufficient number of fire extinguishers, fire hydrants and sprinklers to provide sufficient coverage for the whole employment site. All fire safety equipment should be appropriate and have been checked within the past year. All fire exit signage should be clearly visible and fire exits must not be blocked.<br>5.4.14 Fire Safety Precautions<br>Safeguards against fire are provided, including: fire extinguishers and / or hoses; fire and smoke detectors; emergency exits which open outwards and are unlocked / unblocked at all times; fire exit and warning signage; hazard / emergency lighting which runs in the event of a power cut or emergency; fire alarms which can be activated by detectors or workers and can be heard throughout the employment site. Fire safety equipment is regularly maintained with written documentation and that it is in good conditions." |
| FWF | D2. Labour standards–OHS Requirements tick list (p. 94–100);<br>Fire Safety | "Fire extinguishers are appropriate to the types of possible fires in the various areas of the factory, are regularly maintained and charged (check dates), and are mounted on appropriate places." |
| RBA | B. Health & Safety (p. 52–97);<br>B2.2 Adequate and effective fire detection, alarm and suppression systems are in place. | "Process: Automatic fire sprinklers (if required by law or insurance company), portable fire extinguishers, heat and smoke detection, and an alarm and notification system are inspected, tested and maintained for good state of operation on a regular basis, as required by insurance company or common practice<br>Records: a) The inspection frequency for portable fire extinguishers shall not be less than monthly. The inspection frequency for single unit smoke detectors shall not be less than semi-annually. b) Inspection for all other fire safety equipment, testing and maintenance frequency shall not be |

| | | |
|---|---|---|
| | | less than that required/recommended by the manufacturer, local code or insurance company whichever is more stringent<br><u>Fire suppression</u><br>a) Portable fire extinguishers are installed; b) Fire extinguisher inspection tags; c) automatic fire sprinklers as required by insurance company; d) Fire hose inspection tag" |
| JAC | B – Health and Safety (p. 6–9);<br>13. Accident & Emergencies Readiness | [Supplier] "Shall identify and assess potential emergency situations and events, and minimize their impact by appropriate fire detection, sufficient extinguishers" |

## B3. Article 3: Supply Chain Transparency for Sustainability

# Transparency for Multi-Tier Sustainable Supply Chain Management

## A Case Study of a Multi-Tier Transparency Approach for SSCM in the Automotive Industry

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### Abstract

Sustainability in supply chain management (SSCM) has become established in both academia and increasingly in practice. As stakeholders continue to require focal companies (FCs) to take more responsibility for their entire supply chains (SCs), this has led to the development of multi-tier SSCM (MT-SSCM). Much extant research has focused on simple supply chains from certain industries. Recently, a comprehensive traceability for sustainability (TfS) framework has been proposed, which outlines how companies could achieve MT-SSCM through traceability. Our research builds on this and responds to calls for cases from the automotive industry by abductively analysing a multi-tier supply chain (MT-SC) transparency case study. This research analyses a raw material SC that is particularly renowned for sustainability problems—the cobalt supply chain for electric vehicles—and finds that the extant literature has oversimplified the operationalisation of transparency in MT-SSCM. We compare the supply chain maps of the MT-SC before and after an auditing and mapping project to demonstrate the transparency achieved. Our findings identify challenges to the operationalisation of SC transparency and we outline how FCs might set to increase MT-SC transparency for sustainability.

**Keywords**: Sustainable supply chain management (SSCM); Supply Chain Transparency; Multi-Tier SSCM; Sustainability; Automotive Industry; Case Study Research

# 1. Introduction

The last decade has seen remarkable growth in the interest in sustainable supply chain management (SSCM). This entails how companies mitigate sustainability risks in their global supply chains (SCs), as well as how they improve their own sustainability performance by making their SCs more sustainable [1–10]. Continual advances in information and communications technology (ICT) have led to near-global connectivity. These advancements have not only made global sourcing and outsourcing [11,12] more practicable, it is also becoming easier for buyers and suppliers and sub-suppliers to pass on information [11,13]. On the other hand, critical stakeholders are more able than ever before to draw attention to the negative impacts of global firms' operations all around the globe [3,8,14–17]. At a time when consumers are increasingly wondering where and how their clothes are made and just how sustainable their potential new electric vehicle might be, given the raw materials required to make it, transparency in global supply chains is a core issue to be addressed. Just as Seuring and Beske [18] and Pagell and Shevkchenko [10] demonstrated the need for normalising sustainability in supply chain management (SCM), in the last decade, authors have increasingly recognised the central importance of extending (S)SCM beyond dyadic supplier–buyer relations [19–23] to developing multi-tier SSCM (MT-SSCM) [24–30]. In order to achieve MT-SSCM, supply chain transparency is required in order to know which parties in the supply network must be engaged [14,23,25,31,32].

Whilst numerous authors have noted that some industries (such as food, agriculture, chemicals and pharmaceuticals) have been the subject of significant research on MT-SSCM [24,32,33], in which a degree of transparency has been/could be achieved, other industries such as apparel [24,34] and automotive [35–37] struggle to encompass the entire supply chain to achieve visibility and transparency. In this context, academics have drawn attention to the particular challenges and complexities of mineral SCs for MT-SSCM [38–41]. Such raw materials go through many processing steps that can include smelting and refining, often spanning multiple continents, making transparency and tracking/tracing very difficult [42]. Furthermore, whilst focal companies (FCs) are able to leverage their contracts with direct suppliers to demand conformity with sustainability requirements, the lack of a contractual relationship with sub-suppliers adds to these challenges. The challenge of multi-tier transparency in complex SCs, confronting

both academia and practitioners [32,43,44], is, as Bastian and Zentes [32] refer to it, the 'key prerequisite' for achieving MT-SSCM.

Various authors have drawn attention to the serious sustainability challenges and risks in differing mineral supply chains [31,40,45–47]. The mining and extraction sector is an industry associated with invasive effects on the environment and hazardous working conditions [40,48–50]. Due to the many stages that some minerals go through before they reach the final consumer, traceability is a particularly difficult process [51,52]. One example of a raw material involving complex, opaque SCs is cobalt. Whilst the longest-standing focus has been on conflict minerals (tin, tantalum, tungsten and gold—the so-called "3TGs" [31,39,42,51,53]), cobalt has, for good reason, also received particular attention [54]. This attention has been directed to consumer electronics and increasingly to the automotive industry as significant downstream customers of lithium-ion batteries containing cobalt [16,55–61].

Sustained, targeted pressure on FCs related to cobalt follows a growing trend whereby companies are held accountable for negative sustainability impacts in their sub-supply chains [26,28,29,33,39,62], the so-called "chain liability effect" [15,63]. This pressure is becoming more acute because of the transition to electric mobility and a corresponding spike in demand for electric vehicle (EV) raw materials [36,54,58,60,64,65]. Although this recent activity could give the impression that the problems have only recently surfaced, knowledge on the importance of cobalt to the Congo and the precarious conditions and sever sustainability issues in the cobalt mining sector have been available for a long time (see, for example, Global Witness [66], Nordbrand and Bolme [67], Garrett and Mitchell [53], Franken et al. [49], and Garrett [68]). However, minerals SCs are simply indicative of a larger challenge facing academia and practitioners concerned with the implementation of MT-SSCM broadly across industries and product segments.

Garcia-Torres et al. (2019) point out that although traceability has been the focus of certain industries and achieved for certain products/produce, SC traceability for sustainability in general remains a distant reality. To address this gap in the literature, Garcia-Torres et al. [24] recently proposed a "traceability for sustainability (TfS)" framework, based on a comprehensive literature review of MT-SCM, SSCM, and apparel literature. The TfS framework outlines three dimensions, governance, collaboration and traceability and tracking, involved in an enabling cycle for more sustainability in multi-tier SCs [24]. Our research is motivated by a desire to apply this promising framework to a critical case to improve our understanding of how transparency can be achieved in MT-SCs for improved SC sustainability.

This case study research will attempt to answer the following research questions.

**RQ1.** What challenges do focal companies face when operationalising transparency for multi-tier (sustainable) supply chain management, in particular opaque supply chains?

**RQ2.** How might these challenges be overcome and what are the implications for the TfS model?

In answering these questions, this research aims to contribute to the research on how MT-SSCM is instigated, practised and improved. To achieve this, the current article expands on a part of the TfS framework proposed by Garcia-Torres et al. [24] and analyses how transparency can be achieved as a necessary pre-condition for traceability for sustainability in multi-tier supply chains (MT-SCs). Following a qualitative abductive logic, we begin with the TfS framework and undertake a case study of a project in which an FC sets to gain transparency in a cobalt supply chain. By providing learning from a particularly critical, complex and long supply chain, this article will demonstrate the challenges to realising MT-SC-transparency, contribute to a deepened understanding of how such a process can be operationalised in an MT-SC, in order to work towards the TfS envisioned by Garcia-Torres et al. [24]. Our qualitative research seeks to understand how the framework might look when applied in detail to a concrete case (a project to attain MT-SC transparency), thus our choice of a case study research approach (Eisenhardt, 1989; 1991).

The article continues with a review of the extant literature on SSCM, MT-SSCM, and transparency/traceability in the supply chain context, leading to the recently proposed framework for achieving MT-SSCM: Traceability for Sustainability [24]. Building on arguments presented in the literature review, the authors propose to deviate slightly from the term traceability (preferred as the overarching category by Garcia-Torres et al.), suggesting that transparency for sustainability is the optimal concept. After introducing the adjusted theoretical frame, the article describes the abductive qualitative research approach and the case study methodology. This is followed by the findings of the case study. Finally, in the discussion, identified challenges to TfS in MT-SSCM are presented, conclusions are drawn from the case and the authors propose ways for FCs to better achieve transparency for MT-SSCM. The article concludes with limitations to the research and makes recommendations for practitioners and academia for the further understanding of TfS and MT-SSCM.

## 2. Background

Responding to the opportunities presented by globalisation and in an effort to become more competitive, global companies have been profiting from globally dispersed supplier networks for a number

of decades [12,69–73]. Recurrently and increasingly, various stakeholders have directed their critical attention to the negative effects of large FCs' sourcing and procurement practices and the perception of their responsibility for sustainability problems in their global SCs [8,21,23,35,74–77]. Thus, in hindsight, it is not surprising that SCM expanded its focus to include sustainability and that sustainable supply chain management (SSCM) has become a prominent academic field in part responding to the calls for more critical attention [1,2,4,18,78].

## 2.1 Sustainability in Supply Chain Management Beyond Tier 1

Throughout the development of SSCM, many authors have focused on the barriers and drivers for implementing SSCM [3,9,29,79–81]. By early 2019, over 1500 drivers of SSCM have been identified [78]. However, one major barrier confronting FCs wanting to improve the sustainability of their SCs is the lack of SC visibility [31], hence limiting their ability to influence and improve sustainability in their sub-supply chains [15,29,73]. This corresponds to the earlier problem of SSCM research that focused on dyadic supplier–buyer relationships [19,22], whereby FC influence on sub-supply chain sustainability performance decreases with rising SC distance [22,28,29,82]. This initial dyadic focus in SSCM research is particularly interesting, given that seminal SSCM definitions include the entire supply chain [8,52]. Sauer and Seuring [28] argue that suppliers' and sub-suppliers' actions and practices are more likely to be adapted to their SC setting, rather than an FC's sustainability requirements, given the decreasing FC influence upstream in the SC.

To overcome the limited, prevailing dyadic SC focus, Mena et al. [22] conducted a multiple-case study of businesses from the food sector to propose a theory of multi-tier SCM and determined specific relational practices among SC partner in MT-SCs. The authors concluded that "more companies [will be] forging relationships across supply networks for various reasons, such as sustainability" and recommended that future research examine multi-tier SCs "in other industries with more complex and longer supply chains, such as automotive or electronics" [22]. Seeking to advance this initial MT-SC research, Tachizawa and Wong [29] conducted a structured literature review and sought to advance this initial research by moving beyond relational factors in MT-SCs to governance mechanisms, practices and contingency factors. Importantly, they added the context of sustainability, creating multi-tier SSCM (MT-**S**SCM). Hartmann and Moeller identified and clarified a primary motivator for FCs to commence MT-SSCM and found evidence for the "chain liability effect" in MT-SCs [15]. Although they recognised the "limited" possibilities for FCs to establish full SC transparency, they noted, nonetheless, that "the market will punish the focal firm [FC]

for its suppliers' behaviour…" and they recommended that "companies should work to ensure sustainable behaviour throughout the supply chain, to protect themselves from chain liability" [15]. They concluded by calling for additional research on how SCM can extend its reach to increase transparency in MT-SCs.

Grimm et al. [25,26] furthered MT-(S)SCM knowledge by focusing on the role of sub-suppliers and their interaction with FC sustainability requirements. They analysed two MT-SCs in the food industry and identified four groups of critical success factors that influence how successfully sub-suppliers will comply with sustainability standards [25]. They noted the need to obtain more data and conduct research in other industries/sectors. Building on these preceding contributions to MT-SSCM, Wilhelm et al. [33] identified the "instrumental" role of Tier-1 suppliers that have a double agency: fulfilling FCs' requirements and actively passing on such requirements to the upstream SC [33]. Their research involved FCs from the food industry and one consumer electronics FC. They concluded that their analysis demonstrates different applications of purchasing power, but that power asymmetries in SCs differ from industry to industry and that problems of (sub-)supplier opportunism can be "alleviated through increased efforts to improve supply chain transparency" [33]. In another study, based on data from seven MT-SCs in the food, apparel, packaging and consumer electronics industries, Wilhelm et al. [30] built on the FC practices identified and proposed by Tachizawa and Wong: "direct", "indirect", "work with third parties" and "don't bother" [29]. In close alignment with previous research, they discerned four MT-SC scenarios from their seven cases: open, closed, third party and "don't bother", as well as three main factors influencing FCs choice to conduct MT-SSCM: supply chain complexity, SSCM capabilities of Tier-1 suppliers and TBL/sustainability aspect in focus [30]. They recognised that different MT-(S)SCM contingencies may be present in different industries such as mining and automotive [30].

Drawing on their research into complex mineral SCs [40,41] and previous MT-SSCM frameworks, Sauer and Seuring [28] proposed a three-dimensional framework for MT-SSCM in which the sub-supplier's direct environment is taken into consideration and proposed strategies for improving MT-SSCM depending on various contingencies. In other research [41], Sauer and Seuring focused on the specific SSCM issues in mineral SCs and added to previous approaches for conducting MT-SSCM [22,25,29,33] by proposing a further strategy: the cascaded approach, whereby FCs collaborate with mid-SC actors, who act as a sort of second FC to drive sustainability requirements into the upstream SC. Due to the enormous complexity (involving hundreds and thousands of mid-tier suppliers) downstream FCs have been found to "jump the chain" [51] to engage with key upstream sub-suppliers/chokepoints and extend beyond their "visibility boundary" [31].

The primary problem that becomes apparent for companies trying to engage in MT-SSCM is knowing who their sub-suppliers are, where the raw materials originate and the sustainability conditions throughout the SC [83]. At present, the ability to trace raw materials for MT-SSCM and have total SC visibility is a utopia [24,43]. While academic and theoretical progress has been made on MT-SSCM, what is often missing is the recognition that SC transparency is a key pre-requisite before MT-SSCM can occur [32]. As Wilhelm et al. stated, managing the sustainability of sub-suppliers "is still the exception, rather than the rule" [30]. Gong and Jia et al. focused on how FCs can orchestrate their resources to achieve sustainability knowledge transfer through an MT-SC [84]. Importantly, in their case study, they transcended the triad with findings across and up to six SC tiers. They also recognised the role that supply chain mapping must play as a first step in MT-SSCM activities. Assuming that achieving transparency (and the resulting SC visibility) is the key factor for MT-SSCM [31,32,41,82,85,86], it is apparent that FCs find it exceptionally difficult to achieve transparency in their MT-SCs [87,88].

## 2.2 Transparency in Sustainable Supply Chain Management

The need for transparency in supply chains has been the focus of numerous authors [14,31,34,43,87,88]. In some industries, such as food, agriculture and consumables, supply chain transparency has received a lot of attention and made progress [3,25,32,73]. Garcia-Torres et al. [24,89] responded to the challenges outlined above by conducting a systematic literature review of SSCM and traceability, with a focus on the apparel industry as an industry demonstrative of acute sustainability issues and characterised by MT-SC transparency challenges. They proposed an ambitious framework, the enabling cycle "traceability for sustainability—TfS" that explains how FCs implement TfS to increase transparency for improved sustainability in MT-SCs. Their framework builds on previous theoretical models and proposes three main dimensions that explain the occurrence of TfS: Governance, collaboration and tracking and tracing [24], as reproduced in Figure 1 below. Garcia-Torres et al. conceive of traceability as a meta-capability that can have self-reinforcing positive effects on MT-SSCM. Hence, they posit that TfS is applicable to SSCM in all industries and may be able to positively disrupt existing SSCM and encourage more truly sustainable SCs [24].

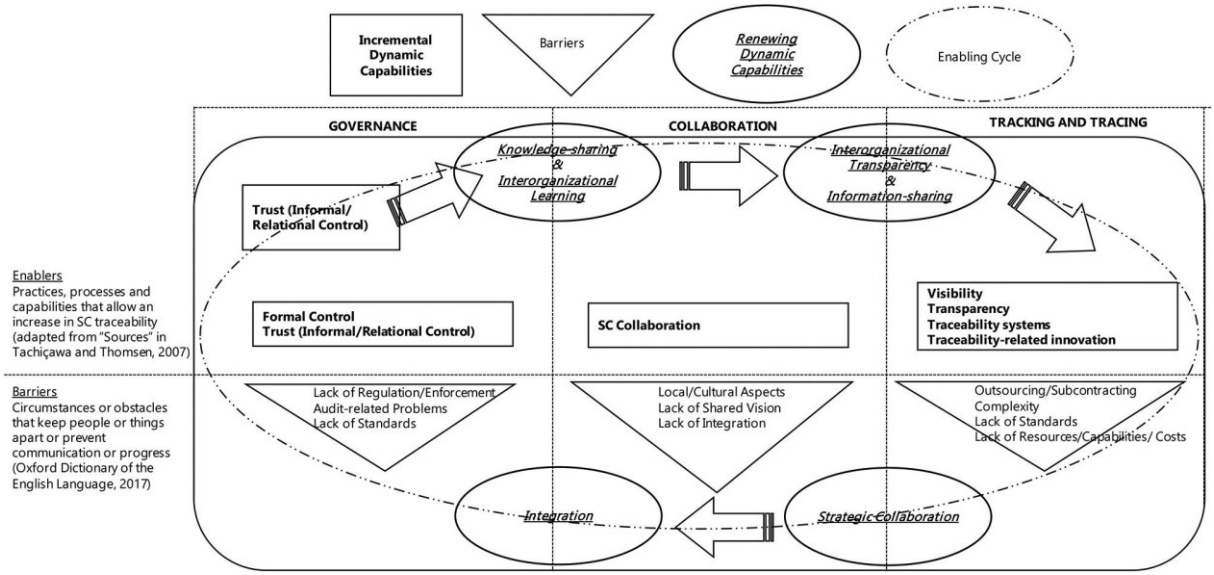


**Figure 1.** TfS cycle as proposed by Garcia-Torres et al. [24], reproduced with author's consent.

However, what is supply chain transparency? Trienekens and Wognum et al. define it as the extent to which all SC stakeholders share a common understanding of, and have common access to, product-related information that they request, without loss, noise, delay and distortion [73]. Hence the onus is on the stakeholder (whether FC, supplier, or parties affected by SC activities) to request transparency. Egel-Zandén et al. note that transparency expectations on FCs have extended into their supply chains, leading to the ascension of the concept "supply chain transparency", which they define as the "disclosure of information about supplier names, sustainability conditions at suppliers, and buyers purchasing practices" [43]. The OECD explicitly recommends that downstream companies implement a "supply chain transparency system" that enables the identification of key midstream SC actors and thereby countries of origin of all raw materials [86]. Some critical authors point out the potential for and documented misappropriation and abuse of purported supply chain transparency [45,87,88]. Notwithstanding, this research follows Gardner et al. in their neutral assessment of the term, namely that supply chain transparency alone is "neither inherently good, nor bad and that the impact of increased transparency depends … on *what information* is being made transparent, *how*, to *whom*, and for *what purpose*" [38]. Furthermore, they highlight that transparency can "demystify" highly complex SCs, allowing risks to be identified and targeted improvements to be made [38]. Thus, in alignment with the logic of Garcia-Torres et al. [24], we argue that transparency in MT-SCs should not just be transparency for transparency's sake, but rather must be *transparency* for sustainability (TfS).

## 2.3 Differentiating between Supply Chain Traceability and Transparency

Garcia-Torres et al. [24] make a compelling case for focusing on traceability as the defining activity (the "doer") in their framework for improving SSCM's reach in complex MT-SCs. Still, as Young and Dias [42] clearly portray, it is important to understand the nuances and differences between tracking and tracing in MT-SSCM. Traceability is certainly a common transparency approach for FCs (see Figure 2) that aim to achieve more transparency in their upstream SCs, by tracing back "up" the supply chain to determine the origins of their products. Gardner et al. [38] build on the SC transparency framework of Egels-Zandén et al. [43] by proposing that SC-transparency consists of six types of information: traceability, transaction, impact, policy and commitment, activity, and effectiveness information [38]. This underlines our argument that traceability is a key measure that contributes to the *overarching concept* of SC transparency. Hence, we concur that traceability is one of a number of steps/approaches to achieving transparency for sustainability in MT-SSCM. Also, practically speaking, transparency is an indisputable precondition for undertaking traceability—an FC must know who it should interact with ("who is my Tier 2?") before it can begin tracing its products or raw materials up the SC. Depending on who is instigating MT-SC transparency (i.e., focal companies, raw materials producers, mid-stream players such as refineries and smelters, or third party actors), there will be different approaches to gain transparency for sustainability (see Figure 2). Material or product tracking is most relevant for upstream SC actors (such as raw material producers) or FCs that know the source of their materials and who want to "track" the supply routes that the materials/products take, down the supply chain. By contrast, traceability is the approach for SC stakeholders to uncover the origins of a product or raw material by retracing the route taken up the supply chain. Mid-stream SC members would employ both approaches to gain full SC transparency.

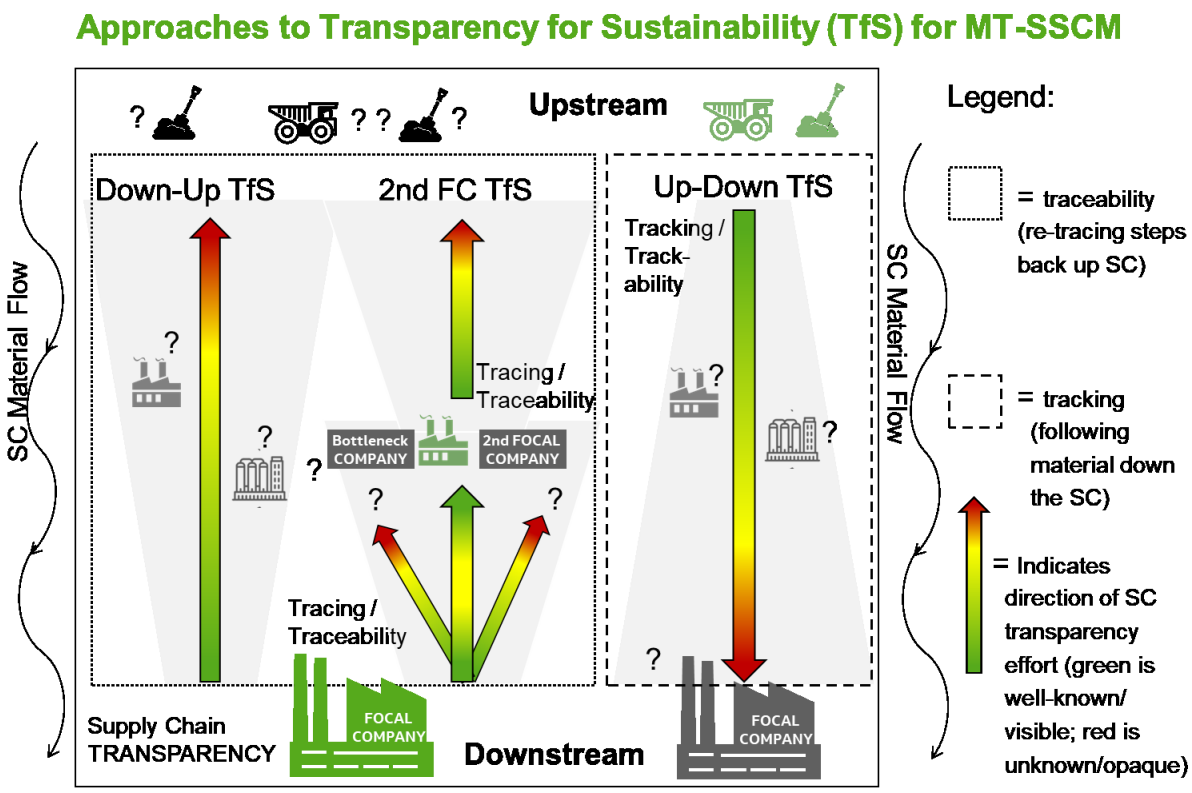


**Figure 2.** Different approaches to SC transparency (visibility, tracing & tracking)—authors' depiction, loosely based on Young and Dias [42].

In conclusion, we generally adopt the TfS framework [24]; however, we substitute the term traceability with transparency in the title, thus rebranding the model "*Transparency* for Sustainability". Garcia-Torres et al. [24] actually propose that "visibility and transparency are preconditions for effective tracking" and suggest a four-step process: (1) Integration of visibility (access to / share information); (2) Transparency becomes core element—as a practice; (3) Integration of traceability systems; and (4) Traceability related innovation—extend transparency from SC actors to non-SC actors. Thus far MT-SSCM research has been primarily focused on the food and somewhat on the chemical and pharmaceutical industries. Although the TfS [24] framework is based on an analysis of the apparel industry, it has the potential to be applied generally, independent of a specific industry. Many other MT-SSCM frameworks imply knowledge about the necessary SC triads/sub-supply chain structure [22,25,26,29,30] or treat it as an unknown field (e.g., "Tier-n space" [28]) requiring supply chain mapping for SC sustainability learning [84] or coalition with key SC chokepoint actors to cascade requirements and extend FC reach [41]. The TfS model recognises the central necessity for the discovery of the MT-SC (traceability/transparency) and frames this on the same level as SC collaboration and SC governance. Hence, our abductive research sought a challenging, qualitative case study to further analyse the potential workings of this framework.

We particularly focus on the crucial part (highlighted in Figure 3) of their TfS framework in our in-depth case study. The research contributes to moving beyond a theoretical proposition of processes, interdependencies, antecedents, drivers and barriers, to understanding how entities can operationalise transparency for sustainability in their SCs, to suggest how transparency for sustainability can be achieved in MT-SSCM.

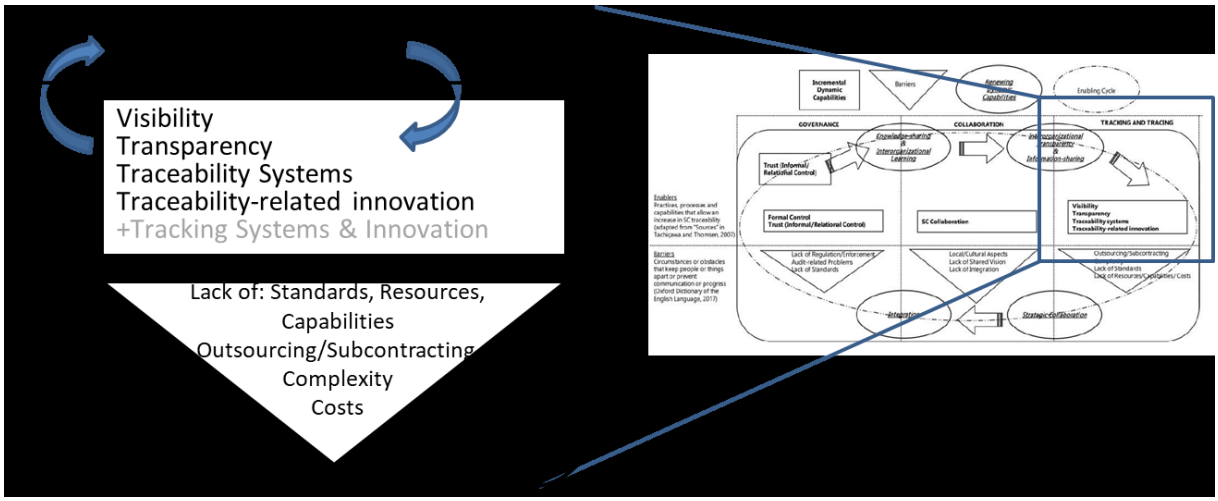


**Figure 3.** Research focus: tracking and tracing dimension of TfS cycle (reproduced with the explicit consent of the corresponding author) [24].

# 3. Methods

Noting the calls from the literature for a more in-depth understanding of how SC transparency can be achieved, this research employs a qualitative, abductive research design [90–93]. This is because abductive analysis research "specifically aims at generating novel theoretical insights that reframe empirical findings in contrast to existing theories" [93]. With a grounding in the extant MT-SSCM literature summarised in Section 2 above, we discovered and gained access to a potentially interesting case of a project attempting to attain MT-SC transparency. We qualitatively analysed this case, suspecting to encounter "surprising empirical findings" in order to return to the pre-conceptualisations we had formed based on our review of the literature. Once the case study was underway, we returned to the literature, in an iterative sense to inform our analysis of the qualitative findings [93–95]. In such a manner, abductive research seeks to supplement or improve existing research and theory, with findings obtained from empirical idiosyncrasies [96–98]. The TfS-enabling cycle framework seemed promising but optimistic when imagining its application to an opaque, high-risk SC, such as the cobalt SC in the automotive industry. Bitekine argues that research should not only explore "quantifiable aspects of … process explained by

theory but also those … aspects … that cannot be adequately quantified" [99]. For this case study, the researchers gained access to a project, in which a global focal company, hitherto "FC1" (referred to as FC1 to distinguish it from the common abbreviation FC/FCs for any/all focal companies), and one of its suppliers attempted to obtain MT-SC transparency for sustainability purposes (such as to gain visibility, capture sustainable procurement practices, evaluate OECD due diligence compliance) in a complex cobalt SC. The selected mineral supply chain demonstrates characteristics [41] that set it apart from many of the previous supply chains (e.g., food, precious stones, pharmaceuticals, and apparel) that had served as the cases upon which previous frameworks and theories of MT-SSCM have thus far been based.

## 3.1 Case Study Research Design: Single Case—Within Case Analysis

Due to the need for empirical examination of the TfS framework [24,89], we employ a case study research approach, to make participant observations [100] about the "real world phenomenon" [101] and process [102] of multi-tier SSCM. This research attempts to understand TfS in a case-context and to what extent the empirical findings correspond to the theory discussed in Section 2.2 above [103,104]. Cavaye points out that while there is a tendency towards positivism and deductive approaches among proponents of case study research (see, for example, Lee [105], Orlikowski and Baroudi [106], and Yin [100,104]) case study research may entail an unstructured, interpretive investigation of a single case [103]. Whilst numerous authors underline the importance of multi-case case study research, particularly for validating concepts [104,105,107,108], others point to the value and necessity of single-case case-study research [100,103,109,110].

As Eisenhardt explains, case studies can be useful for generating important new insights, particularly those concerning under-researched phenomena, where "current perspectives seem inadequate because they have little empirical substantiation" [108]. Cavaye [103] adds that the purpose of a single-case study can allow the researcher to understand the nuances of a phenomenon in depth. Previous research had called for an examination of the automotive industry for MT-SSCM and transparency [22,24,30,33]. With access to an illustrative FC project in the automotive industry, we decided on a single-case case study, employing within-case analysis. For this case study, the unit of analysis is the cobalt supply chain under examination.

## 3.2 Case Selection & Definition, Case Study Actors

Our case study concerned the SSCM of the automotive company “FC1” and specifically the SC mapping and auditing work of an auditing and supply chain specialist consultancy “ASPC1”, undertaken on behalf of FC1 and one of their strategic Tier-1 suppliers (hitherto “T1S”) on their common cobalt SC. Increasing climate and environmental pressure, driving the ramp-up of electric vehicle production on the one hand, coupled with the shocking conditions presented in the media around cobalt mining on the other, make the cobalt supply chain a pressing candidate for SSCM research. Add to this, the particular brand and purchasing power of automotive OEMs to require more transparency in their SCs makes an automotive OEM an ideal candidate to be selected for an in-depth MT-SC transparency case study. In this case, SC transparency was understood to include finding out if the supposed knowledge about the sub-SC was extensive and complete and to determine the capacity of sub-suppliers at each stage for contributing to and achieving SC transparency as well as responsible sourcing, due diligence and other sustainability practices. However, the establishment of MT-SC transparency, in the sense of visibility of the sub-supplier ecosystem, remained the focus of this research, as we consider it to be the prerequisite for further sustainability/SSCM activities.

The initial project that constitutes the case ran for six months. In order to map the common supply chain of FC1 and T1S for upcoming models (start of production in the following year), ASPC1 implemented its due diligence and supply chain mapping audits methodology for cobalt on the respective FC1 cobalt SC. Supply chain mapping audits go beyond a typical supplier audit. They not only focus on the supplier and the conditions and capabilities at the supplier’s direct facility but also entail an explicit focus on the supplier’s position in the supply chain and to uncover the supplier’s supply sources and validate this information (see [111] for more information). In Section 4, we outline the background and setting of the case study, as well as providing a description how transparency was achieved through SC mapping audits.

## 3.3 Data Collection

Our research involved thorough observation and analysis of a single channel of data generated through the implementation of ASPC1’s proprietary methodologies, which comprised multiple forms of qualitative data [100]. These included supply chain maps, audit responses, risk analyses, audit reports, researcher participant observation and project correspondences. ASPC1 was contracted by the multi-national automotive FC (herein referred to as FC1) and one of FC1’s Tier-1 suppliers (T1S) to apply its

methodology to the SC in question. The initial cobalt supply chain map was provided to FC1 and ASPC1 by T1S concerning the cobalt supply chain for relevant upcoming products based on T1S's MT-SC knowledge and what they were able and willing to provide at that point in time. This depiction of the MT-SC (see Figure 4) was taken as the baseline data, against which real and verified SC data was collected by ASPC1 and compared. Based on the original mapping, audits assessing the capacity for MT-SC due diligence were planned with ASPC1. One of the researchers participated in biweekly project calls, had access to project documents and correspondence, analysed ASPC1's audit reports and contributed to brainstorming about how to improve project processes.

## 3.4 Analysis

Our abductive research involved reviewing how MT-SC transparency has been understood in the literature and what approaches have been proposed. We then turned to our specific case to analyse "how" transparency for sustainability was operationalised in MT-SSCM from an FC's perspective. Hence, we set out to capture and then compare the MT-SC transparency knowledge (data) that a focal company could obtain by simply asking its Tier-1 supplier, with the transparency data gained by conducting SC mapping audits and due diligence/sustainability assessments using ASPC1's SC audit and mapping methodology. Based on the SC data, which ASPC1 enabled and uncovered for FC1 and T1S in the project, we identified and compared the disclosed/known number of SC (sub-)suppliers, to demonstrate how an FC's SC-transparency may be quantified and operationalised. Beyond this quantified data, we made observations about real-world processes, barriers and enablers that can affect aspects of MT-SSCM, such as tracking and tracing, governance and collaboration, with reference to the TfS framework. Our particular analytical focus was on the implementation process, to identify what steps precluded what results, in order to demonstrate how to make progress towards MT-SC transparency. In our analysis of the data generated by ASPC1 for FC1 and T1S, we aimed to further operationalise the TfS framework and identify additional factors that may be necessary for the proposed TfS enabling cycle to work.

# 4. Case Study

## 4.1 Setting & Project Background

As part of its SSCM strategy, FC1 is focussing on SC-transparency as a precondition for other sustainability activities in critical sub-supply chains. FC1, like numerous other focal companies that have cobalt in their final products, recognised the significant risks associated with the raw material. Critical stakeholders have increased pressure on global brands to improve their SC due diligence and address issues associated with cobalt supply. However, as FC1 did not source the raw material directly, the challenge was to improve transparency and find out where the cobalt in various parts and products came from. Thus, risk management was a driver for obtaining more transparency in such a high-risk SC. FC1 engaged in industry-wide discussions and followed the newest developments in cross-industry forums. There were various previous attempts to ascertain information about the sub-supply chain, including a pilot project involving a cobalt-specific questionnaire that was to be "cascaded" down the supply chain. Whilst this pilot made some progress (down to Tier 3 and 4 in a few instances), it was generally recognised that the methodology was not sufficient and relied heavily on the goodwill and honesty, as well as the capacity and knowledge, of suppliers about the structure of the sub-supply chain. Since 2016, FC1 had decided to engage in direct dialogue with strategic future suppliers of cobalt-containing products and carry out sustainability workshops in order to identify common areas of focus and risk and then to determine the next steps to address the identified risks.

One of the companies FC1 engaged in such a sustainability workshop was a strategic supplier, T1S. As part of this engagement, the need for more transparency in T1S's supply chains for FC1's products was determined. The culmination of several supplier sustainability engagement workshops between T1S and FC1 was an agreement to jointly commission ASPC1 to map and conduct supply chain mapping audits of the common cobalt supply chain for upcoming products.

## 4.2 Cobalt Supply Chain Mapping Project for Multi-Tier Supply Chain Transparency

Our research team had access to the planning, execution and results of a supply chain mapping and auditing project, implemented by ASPC1 for FC1 and T1S. The scope of the project was focused on establishing T1S' multi-tiered supplier ecosystem (the complete picture of the sub-supply chain, including all supply chain partners) for cobalt material in FC1's products down to the mine level. This case study

includes a description of the background, motivations and setting leading to such a supply chain transparency project, and the importance of the access to ASPC1's audit methodology to achieve the goal of the project. It also offers a description of the process of how transparency in this specific case was conceived, how the project was implemented, and to conclude, a comparison of the supply chain maps, before and after the project had been completed (representing the transparency achieved).

Supply chain mapping audits entail auditing a supplier to gain an exhaustive picture of the supplier's sources for the product concerned, in this case, cobalt. ASPC1 was selected by FC1 and T1S due to its successful implementation of supply chain mapping audits globally for other companies and the required expertise to complete the project. Both commissioning companies' management agreed to carry the cost of auditing sub-suppliers. This entailed the possibility of opening up the sub-supply chain and potentially being made aware of and exposed to more unknown risks. However, given the increasing (critical) interest in electric vehicles and the requirement that they be produced more sustainably, coupled with FC1's general increased emphasis on sustainability in procurement, both companies decided to undertake the project. Following the co-ownership logic of the project and tri-partite implementation, and recognising that risks in the cobalt supply chain would affect both FC1 and T1S, the companies agreed to co-fund and manage the project. Moreover, as a direct supplier of FC1, T1S also reported that it saw participation in such a project as part of demonstrating a commitment to FC1's supplier requirements that they were motivated to fulfil.

To begin the mapping and auditing process, T1S provided FC1 and ASPC1 with an initial SC map, outlining T1S's understanding and knowledge about the cobalt SC, as far as it related to FC1's products. This "before" map was based on information provided to T1S by its suppliers and sub-suppliers. This initial map revealed the following initial, presumed MT-SC situation (see Figure 4).

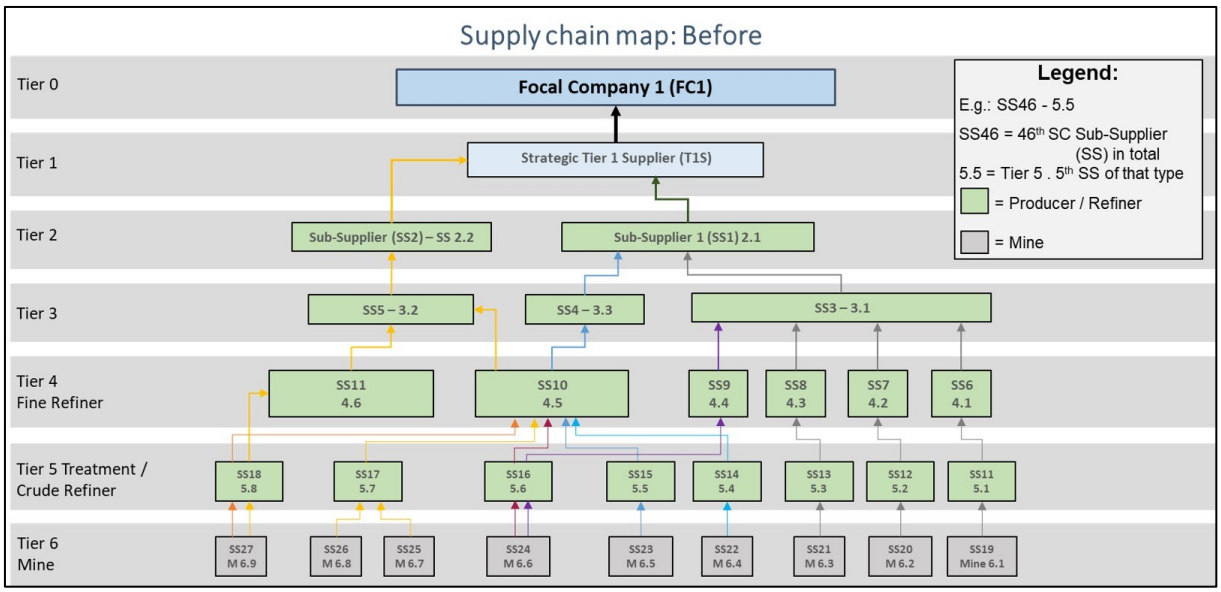


**Figure 4.** initial map provided to FC1 by TS1 of FC1's cobalt supply chain

According to the original SC map estimate, the SC involved the following sub-supplier levels: Tier 2—two cathode producers; Tier 3—three pre-cursor material producers; Tier 4—six fine refiners; Tier 5—eight crude refiners/treatment units; and at Tier 6—nine mines (see Figure 4).

## 4.3 SC Mapping, Auditing and Project Processes

The scope of this initial project was decided based on the information regarding the SC structure and the number of sub-suppliers provided in the initial map to FC1 by T1S (recall Figure 4). Based on ASPC1's advisory, it was agreed to begin auditing and mapping the supply chain tier by tier. At all tiers in the supply chain, ASPC1 checked the relevant company's due diligence in sourcing, managerial awareness and responsibilities, and their due diligence system and site/company sustainability performance. They then proceeded upstream up the SC. The case data was primarily generated through the process of auditing sub-suppliers. The SC mapping audits followed a general supplier audit process for engagement, communication, execution and follow-up, as depicted in Figure 5.

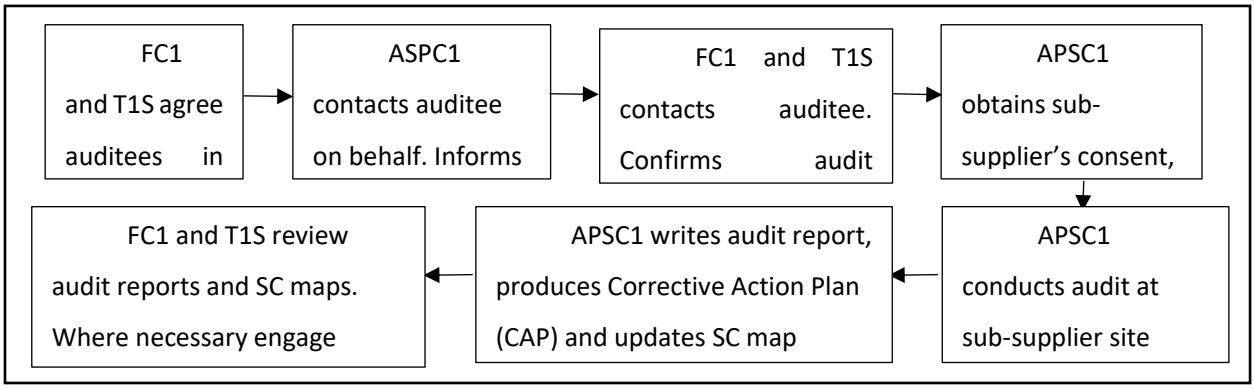


**Figure 5.** Supply chain auditing and mapping process.

The SC-mapping audits were announced and requested by ASPC1, explaining that the audit had been commissioned by FC1 and T1S. Follow up communication by FC1 and T1S was occasionally required to secure sub-supplier acceptance and participation. Each audit generated numerous types of data: process data; SC-mapping data (sub-supplier determination); general supplier sustainability performance data; and particularly, supply chain due diligence data (supplier practices and information measured against OECD guidance, 86). ASPC1 conducted the audits onsite at each of the concerned (sub-) suppliers' facilities, which included documentary and records reviews, management and employee interviews and a facility walk-through for observation. Beyond the supplier data, SC map updates, audit reports and correspondence, the corresponding author also made observations and gathered experience regarding the processes, communication and collaboration, involved in such an MT-SC transparency undertaking.

ASPC1 agreed to provide regularly updated SC maps together with audit reports to demonstrate progress made to T1S and FC1. Regular bi-weekly calls were held between FC1, T1S and ASPC1 in order to discuss progress, escalate issues, brainstorm communications for encouraging sub-supplier participation and acceptance of the audits, request and follow up on corrective action plans, and begin responding to identified risks and issues. FC1, T1S and ASPC1 allowed one of the researchers to accompany an audit of one of T1S's plants, allowing the authors to gain an understanding of how such an SC mapping and due diligence audit is carried out in practice. By the end of an audit, the (sub-)supplier must prove to ASPC1 that they are able to exercise due diligence on the materials under scrutiny in their SC. FC1 decided to continue the SC transparency project in phase two, involving an extension of the auditing and mapping activities to cover discovered but not yet audited parts of the supply chain.

# 5. Case Study Findings and Analysis

In this section, we begin by describing the primary transparency findings of the MT-SC mapping project that constituted our case study, and then we present the findings of this project organised into abductively determined categories.

## 5.1 Case Study Findings

Our qualitative case study of ASPC1's SC mapping and auditing methodology, implemented in FC1's and T1S's common SC, provided us with a rich picture of the complexity, challenges and required steps for obtaining MT-SC transparency. The primary finding of the case study was that the cobalt supply chain, which constituted the unit of analysis of our research, was in fact far more complex than either FC1 or T1S had anticipated and revealed many unknown SC actors, particularly in the midstream SC, as shown in Figure 6. Sub-suppliers are marked green, traders blue and mines grey.

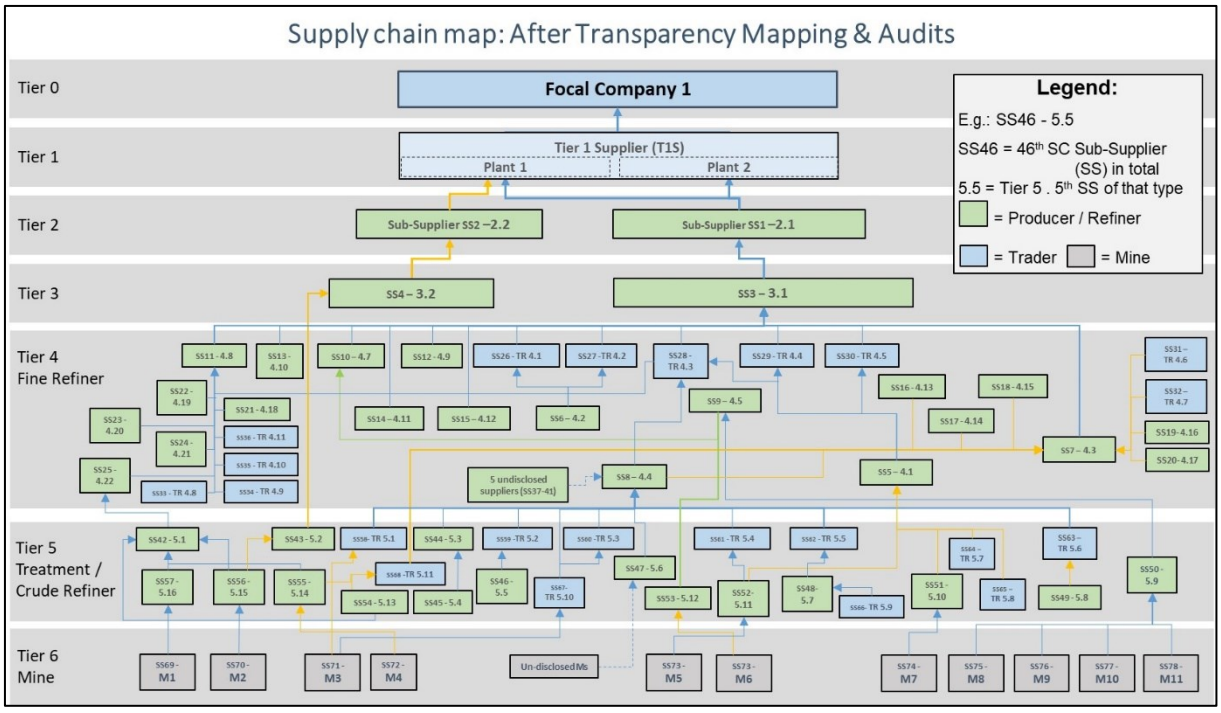


**Figure 6.** Updated supply chain map after the conclusion of Phase 1 of SC mapping and audits project.

A cursory comparison of the two SC maps (depicted in Figures 4 and 6) reveals that a clear and significant increase in MT-SC transparency was achieved and thereby a better understanding of the sub-supply chain. As portrayed in Table 1, the number of identified SC actors increased from 28 to at least 79, representing a 182% increase in visible, identified SC actors.

**Table 1.** Comparison of number of known/disclosed supply chain actors in FC1's cobalt SC.

| Supply Chain Tier | # SC Actors Initially Identified | # SC Actors Identified After Project |
|---|---|---|
| 2nd Tier—Cathode | 2 | 2 |
| 3rd Tier—Pre-Cursor | 3 | 2 |
| 4th Tier—Fine Refiner | 6 | 37 (21 + 11 Traders + 5 undisclosed) |
| 5th Tier—Crude Refiner | 8 | 27 (16 + 11 Traders) |
| 6th Tier—Mine | 9 | 11 (+X? undisclosed) |
| **Total** | **28** | **79** (+ X?) |

Having established these primary comparative findings, we continued with an abductive approach, iterating between the accumulated data, experiences, process knowledge and identified gaps learned in the project and the MT-SSCM literature. In so doing, we began to identify categories of issues to group our findings. These categories were as follows: unexpected sub-supply chain complexity (Section 4.2.1); distance of T1S to its upstream SC (Section 4.2.2); MT-SC collaboration and governance (Section 4.2.3); iterative nature of attempts to gain transparency in MT-SCs (Section 4.2.4); and finally, that transparency, once obtained, only represents a temporal snapshot of the MT-SC (Section 4.2.5).

### 5.1.1 Complexity of Analysed Multi-Tier Supply Chain

The project for improved transparency in the cobalt supply chain was enlightening for both FC1 and T1S. Already after just a handful of supply chain mapping audits, it became abundantly clear that the cobalt supply chain was much more complex than initially understood by both commissioning parties. The prior knowledge, existing methodology and practical implementation experience of the implementation partner, ASPC1, were crucial to the project. The regular SC map updates, provided by ASPC1, clearly demonstrated that the initial supply map provided by T1S was insufficient and incomplete. Not only were many new sub-suppliers uncovered, but the number of traders at various tier-levels added to the complexity, as traders entertain supply relations to many more other SC partners. Even after only a dozen SC mapping audits, the SC complexity became so intense, that it was proving difficult to visualise using standard office computer tools.

### 5.1.2 Distance of Tier 1 to Upstream Supply Chain

Partially owing to the complexity described above, like many Tier-1 suppliers, T1S is highly removed (6 tiers, not including middlemen functions/traders selling material within the same SC tier level) from the upstream SC (mining/extraction level). This case made it apparent that T1S was ill-informed about and/or ignorant of its own sub-supply chain. T1S's initial disclosure was dependent on information from their own direct suppliers. Hence, the case study was not only a wake-up call for T1S, it demonstrated to FC1 that

their Tier-1 suppliers probably have decidedly limited transparency knowledge about their sub-supply chains. The project also helped T1S make the case to its management for more resources and organisational attention, in order to have a better picture about SC transparency in the future. The case demonstrated the pressing need to FC1 to engage its direct suppliers of critical raw materials in order to ensure that MT-SC transparency and due diligence would be improved.

### 5.1.3 Multi-Tier Supply Chain Collaboration & Governance for Sustainability

Once the project began, it also became clear how an attempt to increase transparency (and work towards traceability) also impacted SC collaboration and SSCM governance. Through the thorough work of ASPC1, particularly in the cobalt ecosystem, FC1 and T1S were conducting audits that aligned with global institutional expectations, such as OECD due diligence requirements and Responsible Minerals Initiative (RMI) and Responsible Cobalt Initiative (RCI) governance expectations. Although sub-suppliers accepted the audits, they pointed out that similar audits were being conducted frequently by different global FCs and that there was a pressing need for more standardisation and alignment. Such considerations around the frequency of audits led to ASPC1 and FC1 deepening their relationship to engage other companies in collective action processes with the objective to reduce overall costs and time spent without losing robustness of MT due diligence process. The combined, collaborative approach of FC1, T1S and ASPC1 pushing for more transparency in complex supply chains was effective. The collaboration between the three parties resulted in a high up-take rate of sub-suppliers agreeing to the audits, with only one sub-supplier refusing the audit, reportedly due to audit fatigue. This sub-supplier instead offered to share their third-party audit results with T1S and FC1. With FC1, T1S and ASPC1 working together, the combined weight/clout seemed to have positive effects in terms of ensuring participation and SC disclosure. Not just in the sense of “pressuring” sub-suppliers to agree to audits, but also in terms of engaging with sub-suppliers on the broader issues of transparency, sustainability, instituting management systems for responsible sourcing/due diligence and MT-SC sustainability risk management. Although initial engagement of some sub-suppliers took some recurring effort, once contact had been established, opportunities for increased engagement and cooperation became possible. The direct engagement led to more MT-SSCM exchange, also among FC1 and its Tier 3, 4, and 5 sub-suppliers. The transparency obtained served as a foundation, upon which both FC1 and T1S could base further MT-SSCM measures and activities.

### 5.1.4 Iterative Nature of Gaining Transparency in Multi-Tier Supply Chains

The initially contracted audits focused on those company types mentioned in the initial disclosure: pre-cursor and cathode producers as well as fine refiners and crude refiners, with a goal to find out the

point of origin of raw materials (i.e., mine sources). Whilst the project led to making progress up the supply chain, it was also clear that more iterations would be necessary to uncover new "branches" in the mid-stream supply chain map. Both companies noted that attempts to trace the live material flows of raw material supplies from the origin through the SC (for example, with the help of blockchain technology) would be more fruitful when a comprehensive discovery and visibility of the majority of the supply chain has been achieved.

### 5.1.5 Temporal Nature of Supply Chain Mapping

The case study was based on a disclosed "SC snapshot" from a set point in time. APSC1 audited supplier relations over the 12 months prior to the audit. Even throughout the relatively short, 6-month project, there were proclaimed changes to sub-supply chain structures. This meant that planned future audits were rejected by Tier 4, as they claimed that they no longer sourced from particular identified Tier 5/Tier 6. This posed a challenge in terms of FC1's and T1S's risk management, as the emerging supply chain map was static whereas supplier relations are dynamic. Also, it is possible that sub-suppliers will cancel purchasing contracts for some time (e.g., due to reputational risk) and then resume the supplier relationship later. Or they can simply claim to have cancelled business relationships when in fact this is not the case. For these reasons APSC1 encourages FCs and customers to invest in longer-term, recurrent auditing programmes, to drive continuous improvement and to ensure that this improvement is tracked over time, allowing such SC changes to be monitored and validated.

## 5.2 Within Case Analysis

When surveying the academic literature on MT-SSCM, one could gain the impression that discovering and then interacting with the sub-supply chain is a rather straightforward undertaking. Garcia-Torres et al. [24] and other frameworks [22,28,29,33,41] appear to assume that knowledge about the other SC participants is available, accurate and exhaustive/complete. Or if it is not, that the information to be gained from direct suppliers about Tier 2 or key mid-stream sub-suppliers (such as smelters, refiners) is accurate. Our case study found that such assumptions would be ill-advised. Neither did the extant literature propose guidance on the "how-to" of achieving transparency/ traceability. Even in the TfS framework, this seems to treated as self-explanatory. Our case study findings shed light on an indicative process of how to achieve MT-SC transparency, and demonstrated that it can be a highly complex, demanding process, which may require significant resources and expertise (in this case, external expertise, such as that provided by ASPC1). Moreover, the process entails and requires extensive supplier

coordination, cooperation and collaboration, which is neither a given nor self-explanatory. Obtaining transparency is resource-intensive and time-consuming (e.g., manpower, correspondence, activating multiple hierarchy levels within each company, contracting third-party experts). Such activities required attaining support and commitment from management in both participating companies, who aimed to achieve MT-SC transparency. However, once the process of supply chain mapping for transparency had begun, it led to a strengthening of the strategic partnership between FC1 and its supplier T1S as well as between both parties and ASPC1. This, in turn, helped to improve collaboration and communication with suppliers/sub-suppliers and eventually led to more trust among participating SC actors. This trust and collaboration seem to have laid the groundwork for more explicit governance in the supply chain under consideration. In the following, we discuss the implications of our findings and analysis for MT-SSCM in general.

# 6. Discussion

The case study provided numerous findings that are particularly interesting for MT-(S)SCM in a number of ways. The TfS model of Garcia-Torres et al. [24] was found to generally apply, insofar as the initial goal to *trace* the origin of the raw materials in an FC's products resulted in cyclical (iterative) improvements, including improved and increased collaboration among supply chain actors and the beginnings of governance of the MT-SC (recall Figure 1). However, the focus at the core of this research was the question of what barriers there are to achieving transparency in MT-SSCM, and how this could be operationalised, so that FCs may achieve transparency to enable such tracking and tracing, governance and collaboration in the future. In this discussion we analyse the relevant findings from our case study that demonstrate how *transparency* (in place of column "traceability" in the original TfS framework, recall Figure 3) can be operationalised, before pointing to the limitations of our research and making suggestions about areas for further research.

Analogous to our findings, we structure our discussion of primary findings and their relevance for MT-SSCM into the following categories: underestimated complexity (6.1); distance of Tier-1 suppliers to their upstream SC (6.2); MT-SC collaboration and governance (6.3); the iterative nature of obtaining transparency (6.4); and the temporal nature of supply chain mapping (6.5).

## 6.1 Underestimated Complexity

The case study demonstrates that sub-supply chains can potentially be significantly more complex than companies assume. Considering that the SC maps depicted in Figures 4 and 6 are only for the SC of one supplier supplying specific products to one FC, it is plausible that the entire cobalt supply chain is even more complex. It follows, that increasingly demanding or critical stakeholder expectations [15] will not change the fact that, at present, potentially many raw material supply chains are surprisingly more complex, and that this only becomes apparent, once they are systematically explored [83]. Furthermore, this underestimated, or at least unknown, complexity could pose a threat to FCs' and downstream suppliers' risk management, as it would mean that they do not have accurate or enough information to base risk management estimates on [31].

However, not only is the increased MT-SC complexity worth noting, but also how unexpected this was. Neither the T1S nor FC1 had anticipated an almost threefold increase in the number of sub-supply chain actors. Both practitioners and academics should take this into account when addressing complex SC. Undertaking MT-(S)SCM is more manageable when considering a supply chain with a total of approximately 30 actors. If this number significantly increases, i.e., to 80 (or higher), the amount of coordination, communication and risk management required can quickly become overwhelming. Thus, MT-SSCM research and frameworks should account for such eventualities. This underestimated (or unanticipated) complexity should not serve as a reason to not aim for SC transparency but should be recognised and calculated in terms of managing expectations. One conclusion that can be drawn from our findings, in this regard, is that FCs should aim for sub-SC rationalisation in order to reduce complexity and the corresponding sustainability risk. Finally, this research lends weight to the concept of proactive supply chain leadership, in order to improve SSCM performance [81].

## 6.2 Distance of Tier-1 Suppliers to their Upstream Supply Chain

This case study clearly showed that automotive (but also electronic) mineral supply chains are different from agricultural/produce/food and apparel supply chains. In earlier studies of MT-(S)SCM (e.g., [22,29,30,73]), the supply chain was conceived of as consisting of three tiers. In the SC maps depicted in our case study, we solely depict extraction, treatment, production, and processing steps. If we were to add transport/logistics service providers, there would be even more steps. Our case demonstrates that supply chain actors at the same tier level have business relations, meaning that sometimes transactions can occur

at the same tier level. Hence, unsurprisingly, Tier-1 suppliers (often large multinational companies themselves) in such supply chains are far removed from the realities of mid-stream and upstream SCs and are correspondingly under-informed about the structure of the sub-supply chain. In this manner, they are forced to rely on the disclosure of their suppliers (Tier-2+) and thus it can be highly problematic for FCs purely relying on their Tier-1 for supply chain transparency. Such incomplete SC disclosure does not have to be deliberate, but could also be due to a lack of available knowledge and internal resources to improve the knowledge at T1S. On the other hand, previous research has pointed to the special "double role" of Tier-1 suppliers [33] and that such suppliers' compliance with the sustainability goals and expectations of FCs can depend on public attention and pressure on Tier-1 and the perceived risks of inactivity or non-compliance [26,27]. We argue that our research demonstrates how such mapping projects can significantly increase attention within Tier-1 suppliers' organisations for the need for more resources to address the topic of MT-SC transparency for SSCM. On the other hand, Tier-1 suppliers usually sign contracts in which they agree to adhere to FCs' code of conduct and enforce these further up the supply chain. Such transparency exercises could be seen as risky for Tier-1 suppliers, as it exposures their lack of knowledge.

## 6.3 Multi-Tier Supply Chain Collaboration & Governance

Whilst the focus of this research has been on the transparency/traceability part of the TfS framework (rather than collaboration and governance), it became clear, as the framework suggests, how interconnected these three aspects [24,25] are (recall Figures 1 and 3). In the case at hand, the ability to co-conduct transparency and SC mapping resulted from a string of sustainability workshops and thus we can surmise that, without enough collaboration, a full supply chain transparency project does not have a high chance of success. The engagement, whilst often treated cautiously to begin with (which is an understandable reaction to being audited), in some cases was then used as a platform for more exchange between the mid- and up-stream sub-suppliers and T1S and/or FC1. Potentially, the direction of such a transparency push must not necessarily go from downstream FCs back up to the raw material but could, (conceivably) begin with mines/raw materials producers, who, together with treatment units, wish to work for more transparency in their downstream SC [45,53]. This might then also lead to more exchange, collaboration and eventually strengthened governance [41]. In many cases, the usefulness of achieving MT-SC transparency, undertaking due diligence for responsible sourcing and trying to improve sustainability through the supply chain was able to be "sold" as a benefit for all participating SC actors as it reduces their risks and positively differentiates them, making them a more attractive (sub-) supplier in

the future. Finally, engaging third-party, subject matter experts, in the form of service providers or relevant organisations (e.g., international bodies, NGOs), with specific SC expertise, and who have no buyer-seller relation to the product at hand, is potentially a significant factor that lends legitimacy to the undertaking. Such third-parties can interact with auditees in a different manner to the FC or downstream direct/Tier-1 suppliers. We argue that companies attempting to undertake such supply chain mapping audits themselves will struggle due to the lack of resources and, specifically, expertise in terms of the sub-supply chain mapping process and because their role as a buyer adds pressure to achieve and declare biased outcomes.

## 6.4 Iterative Nature of Gaining Transparency in MT-SCs

Our case study demonstrates that SC transparency is not a static state, but rather something that needs to be worked towards. Thus, operationalising supply chain transparency in large, multi-national SCs probably requires an iterative process, which corresponds to the self-reinforcing cycle proposed by Garcia-Torres et al. [24]. One begins with an incomplete picture (an initial estimated supply chain map), that nonetheless provides a frame of reference and seeks to improve MT-SC visibility [31]. Gong et al. [84] remind us that MT-SSCM should be thought of in terms of processes. They see SC mapping as the first step in such a process toward the dissemination of sustainability throughout the MT-SC. This process could be done at product level, supplier level or perhaps for a raw material. Once mapping activities reveal new supply chain actors, these need to be included in the mapping process and integrated. We argue that proposing a traceability system before having conducted intensive mapping activities will be limited because such an SC map will most probably be incomplete and thus important parts of the supply chain could be missed in the tracking/tracing system. This problem would be intensified if there is not sufficient trust that (sub-) suppliers will proactively disclose that other materials, products or parts are entering the SC but that such sources are not currently in the tracing system. Thus, our case study findings suggest that tracking and tracing would first require multiple iterations of SC transparency and mapping undertakings before it can be effective.

## 6.5 Temporal Nature of Supply Chain Mapping

One final major finding of the case study was the reminder that supply chains are temporal by nature, and that particularly further up the supply chain, sub-suppliers can change their sources without Tier-1 suppliers or FCs knowing. Moreover, new sources/sub-suppliers can be introduced after such SC

mapping audits have taken place, rendering the supply chain map incomplete and the validity limited to a certain point in time. This necessitates re-audits to confirm if sub-suppliers have in fact been discontinued/removed from the supply chain and if new actors are now contributing to the SC. Increasingly technological solutions (such as blockchain) are emerging that could support high levels of complexity and enable real-time confirmation of SC material flows [112,113]. Such solutions would register discontinuation of certain sub-suppliers but new SC actors would have to be brought onboard. Nonetheless, supply chain mapping audits provide an effective method to understand the real structure of a supply chain at a point in time, which can then serve as a base for further activities and measures that enable real-time tracking and tracing. At present, to our knowledge, no technological solutions can also confirm the trustworthiness of the data entering the system, which means that audits are required to validate the SC sustainability data.

Finally, it is worth considering that attaining MT-SC transparency can be independent of sustainability objectives. However, currently, companies seem much more likely to collaborate on sustainability issues. Achieving more SC transparency could also open up an FC to a lot more risks, indirect impacts that are discovered and increased sub-supply chain responsibilities. Given the reputational risk associated with gaining transparency (knowing what is there) without having the resources to back up the process with SSCM (doing something about it), it is not entirely surprising that MT-SC transparency is not so widespread in such critical supply chains. Recognising the tendency to opacity, the researchers are grateful to FC1, T1S and ASPC1 for allowing such project insights to be subject to academic inquiry.

# 7. Conclusions

Progress in achieving SC *Transparency for Sustainability* must be made so that, just as eventually SSCM should become the norm in SCM [10], MT-SSCM should become the norm in SSCM. In this paper, we find evidence for the idea that SC transparency is the pre-requisite for all proceeding MT-SC sustainability activities (whether understanding human rights risks and impacts, working conditions or environmental performance in the sub-supply chain). Our research builds on the framework of traceability for sustainability, uncovering challenges to obtaining transparency and demonstrating how transparency can be operationalised by focal companies. Obtaining transparency can begin an enabling cycle that can improve traceability of products, parts and raw materials, contributing to better collaboration throughout the supply chain and improved SC governance. However, we found that in certain complex supply chains,

the process is a lot more complex than implied in the extant literature. By analysing an in-depth case involving MT-SC transparency, we identify potential factors that require more attention when considering the operationalisation of transparency for sustainability in MT-SSCM.

## 7.1 Implications of Our Research

This research provides much needed empirical insights to academics writing on MT-SSCM approaches, frameworks and models. By demonstrating the unexpected complexity in an exemplary raw material SC, this should cause theoreticians to consider the complex reality that is not accounted for in dyadic or triadic, orderly conceptions of supply chains. Furthermore, whilst this research concerned itself with cobalt, authors have pointed out that various mineral SCs demonstrate similar characteristics [41]. We hope to contribute to a debate around transparency vs. traceability that needs to be better understood in terms of ordering/hierarchies. Technological advancement coupled with the pressure on FCs to demonstrate transparency in their MT-SCs is leading to increasing activities and a number of (pilot-)projects tracking/tracing materials and aiming for SC transparency. We concur with previous authors that such transparency activities contribute to improvements in other areas of SCM and our case study findings provide evidence for this.

For practitioners, our case study demonstrates the importance of FCs of being proactive and taking leadership to begin working towards MT transparency in the most critical SCs for improved SSCM. The research showed that SC complexity is underestimated and that this could have serious consequences for an FC's risk and reputation management. On the other hand, once such activities have been led by the FC, there can be positive reinforcing side-effects in terms of strengthening trust, collaboration and governance with strategic suppliers.

## 7.2 Limitations

There are a number of limitations to the approach taken to SC transparency and to the research itself. The SC mapping audits were announced in advance, as contractually agreed upon. This approach is in contrast to some general supplier sustainability audits, which are unannounced and focus on the current state of sustainability at factory/supplier premises. The audits examined for this research were primarily concerned with due diligence mechanisms, responsible sourcing management systems and suppliers' SC mapping capabilities to generate upstream SC knowledge. Thus, contrary to a supplier sustainability audit,

whereby underage workers can be removed from premises or fire extinguishers placed throughout the premise on audit day, such processes, responsibilities, mechanisms and systems cannot be easily "faked" even with some advance warning. There was a high degree of reliance on the quality of the auditing undertaken. Thus, one of our researchers participated in an audit of one of the T1S facilities and accompanied ASPC1 throughout the entire audit process. In this manner, we could be sure that uncomfortable questions were being asked, that spot checks were conducted and that ASPC1 checked the capacity of the (sub-)supplier to know their sub-supply chain and implement due diligence on their raw material sourcing.

As with all single-case case-study research, we are aware of the limitations to the generalisability of our findings. We selected this particular raw material SC transparency project as cobalt represents a particularly difficult, opaque and critical market. Our survey of the literature found no examples of MT-SSCM being documented and explained at the level of operationalisation for such a complex supply chain and in the automotive industry. Thus, given the opportunity to participate in this case study, we accepted the limited scope (one focal company, one tier one supplier) and the lack of cross-case comparisons. Whilst much more information was gathered as part of the project, in the interest of fair anonymisation, our research primarily focused on the extent of supply chain visibility achieved (and not, e.g., the performance of (sub-)suppliers regarding due diligence).

## 7.3 Recommendations for Further Research

As MT-(S)SCM is still a relatively new field of research, there are many options for building on the concept of transparency/traceability for sustainability. We commend the foundational work of Garcia-Torres et al. [24] and see the descriptive and explanatory potential of the model, particularly in that it proposes an enabling cycle, whereby the aspects traceability, collaboration and governance contribute to one another and depend on each other. We have attempted to shine a light on the workings of traceability within this model (preferring the term transparency) and demonstrate how such transparency might be operationalised and what challenges FCs may face in operationalising TfS. Further research could look at other aspects of the theoretical model to determine whether empirical/real-world experiences align with it. Particularly once more (focal) companies have begun to map entire supply chains and or industry cooperation leads to better integrated technological solutions to improve transparency in MT-SCs, then research could look at the generalisability of our findings and continue to learn from different types of industries and supply chains. Another potential field for future research could be at the intersection of SC

sustainability risk management and transparency in MT-SSCM. As argued above, increased MT-SC transparency should lead to better and more realistic data about more probable and accurate risks, so that companies can advance to pre-empting likely risks in the sub-supply chain before they eventuate. Finally, different auditing standards and approaches for achieving transparency could be the subject of further inquiry, to better understand their effectiveness and role in MT-SSCM as a tool and process.

**Author Contributions:** M.M., J.S. and I.F. conceived of and designed the research; I.F. collected, visualised and analysed the data; I.F. wrote the paper; M.M. and J.S. reviewed, edited and supervised the paper.

**Funding:** This research received no external funding.

**Acknowledgments:** The article processing charge was partially funded by Ulm University. The authors are very grateful for the close cooperation with FC1, T1S and ASPC1 for enabling this research despite the sensitive nature of the topic. The authors would like to expressly thank RCS Global Ltd. (hitherto ASPC1) for their substantial contributions of auditing and mapping methodology that underpins the common project, which constitutes the case study at hand.

**Conflicts of Interest:** The authors declare no conflict of interest.

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# C. Annex

In the following, the research articles are attached, in the form of their original publication.

Fraser, I. J., Müller, M., & Schwarzkopf, J. (2020). Dear supplier, how sustainable are you? *Sustainability Management Forum | NachhaltigkeitsManagementForum,* 28 (3), pp. 127-149. Springer Berlin Heidelberg. DOI:10.1007/s00550-020-00507-z

Fraser, I. J., Schwarzkopf, J., & Müller, M. (2020). Exploring Supplier Sustainability Audit Standards: Potential for and Barriers to Standardization. *Sustainability*, 12(19), 8223. DOI:10.3390/su12198223.

Fraser, I. J., Müller, M., & Schwarzkopf, J. (2020). Transparency for Multi-Tier Sustainable Supply Chain Management: A Case Study of a Multi-tier Transparency Approach for SSCM in the Automotive Industry. *Sustainability*, 12(5), 1814. DOI:10.3390/su12051814

NachhaltigkeitsManagementForum (2020) 28:127–149
https://doi.org/10.1007/s00550-020-00507-z

ORIGINALBEITRAG / ORIGINAL ARTICLE

# Dear supplier, how sustainable are you?

## A multiple-case study analysis of a widespread tool for sustainable supply chain management

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Received: 2 April 2019 / Revised: 21 September 2020 / Accepted: 30 October 2020 / Published online: 13 November 2020
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**Abstract**
This article analyses one of the most common tools employed by global focal companies in sustainable supply chain management (SSCM) across all industries: supplier sustainability self-assessment questionnaires. Extant research has moved beyond the questions of whether and which suppliers should be assessed. Current research is already focussing on how to share and standardise such assessment data. Despite mounting general research on SSCM, we identified that specific tools such as self-assessment questionnaires have not been empirically analysed in SSCM literature. Thus, this paper addresses the research questions of what differences there are among supplier self-assessment questionnaires and how supplier responses to such questionnaires might be influenced. Our research involves an abductive multiple-case study design and an analysis of over 25,000 responses from globally dispersed suppliers to two types of supplier sustainability self-assessment questionnaires administered and requested by a global automotive focal company.
Although the two questionnaires covered similar areas of sustainability practices and were administered to suppliers of the same focal company, the suppliers' responses demonstrated various observable differences in average sustainability scores. Social desirability bias and supplier assessment fatigue were identified as issues confronting such questionnaires. We find that questionnaire design, how the questionnaire is embedded in the focal company's processes and institutional settings are factors that potentially influence suppliers' responses and could counteract social desirability bias and supplier assessment fatigue. Based on these findings we make suggestions for improving these SSCM tools and provide recommendations for further research.

**Keywords** Sustainable supply chain management · Supplier assessment · Self-assessment · Sustainability assessment tools · Supplier assessment fatigue · Social desirability bias

## 1 Introduction

Two decades ago, Crane (1999) titled an article "Are you ethical? Please tick yes or no." Over 20 years later, the title is relevant to sustainable supply chain management (SSCM) research and warrants specific academic attention. Global buying companies increasingly monitor and/or evaluate the sustainability practises of their suppliers with the help of self-assessment questionnaires but these central tools have not been featured in SSCM investigations. This is a problem because, as Das (2017) argues the challenge for SSCM as an academic discipline is "how to make the broad concepts of sustainability relevant, applicable and *operationalisable* to SCM at firm level" (Das 2017, p. 1345). The problem is, how sure are we about the accuracy of such tools for conveying suppliers' sustainability practices and performance?

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And how can companies trust the responses and data generated?

The last decade has seen a veritable boom in publications focussing on SSCM, the closely-related areas of responsible/green/sustainable purchasing and supplier management (Ahi and Searcy 2013; Ansari and Kant 2017; Beske-Janssen et al. 2015; Brandenburg et al. 2019; Gimenez and Tachizawa 2012; de Oliveira et al. 2018; Seuring and Müller 2008; Koberg and Longoni 2019; Walker et al. 2012). This intensification of research corresponds with a continual increase in the importance of SSCM to practitioners/companies, as evidenced by the growth in activity within and among firms regarding sustainability in supply chains (Gimenez and Tachizawa 2012; Schoeggl et al. 2016a; Sancha et al. 2016; Singh and Trivedi 2016). At the same time we note an intensification of stakeholder expectations (Seuring and Müller 2008; Li et al. 2014; Mueller and Bessas 2017) and a densification of guiding frameworks (Rasche and Gilbert 2012; Seuring and Gold 2013; Lee and Kashmanian 2013). By now, large multi-national corporations will inevitably include their approaches to supply chain sustainability in their sustainability reporting (Harms et al. 2011; Walker and Jones 2012). Nonetheless, there still appears to be a gap between theoretical academic SSCM research on the one hand, and SSCM practice on the other. Companies confront increasing expectations of their responsibility and have to devise strategies, measures, processes and tools to improve sustainability in their supply networks as part of their broader sustainability strategies (Canzaniello et al. 2017; Ecovadis 2017; Pagell and Shevchenko 2014).

Various practical approaches and tools employed by multi-national corporations to improve sustainability in their supply chains have been identified (Lee and Kashmanian 2013). Whilst there has been illuminating analysis of the effectiveness of codes of conduct (Egels-Zandén 2014; Bartley and Egels-Zandén 2015) and to a lesser extent audits (Locke 2013; Short et al. 2016; Terwindt and Armstrong 2019), there has otherwise been little focus in SSCM literature on self-assessment as a tool for SSCM. One example is provided by Kashmanian and Moore (2014), whose research primarily focussed on company codes of conduct, which follow recommendations to companies by the United Nations Global Compact (UNGC) and Business for Social Responsibility (BSR). In summarising supplier monitoring activity, they briefly mention supplier self-assessments: "Prior to conducting audits of any kind, a company usually has suppliers perform self-assessments", which they point out are cheaper and faster in terms of identifying sustainability risk (Kashmanian and Moore 2014, pp. 13–14). Das' (2017) review of the state of SSCM research included a framework for SSCM practices, however supplier questionnaires (or similar SSCM performance measurement tools) were not covered. Thus, in this regard it appears that SSCM as an academic discipline is still challenged to be managerially relevant (Carter and Easton 2011) in the sense that it has not analysed the processes and tools that are widely in use. This is supported by Dubey et al. (2017a) who suggest a framework for bundling the numerous theoretical and practical oriented academic works in the field of SSCM (see Fig. 1). One of their constructs, "Operational Performance Assessment" and the corresponding item "Audit and Assessment" (Dubey et al. 2017a, p. 339), forms the particular frame for the current paper. The tools covered by their framework are central to much focal company SSCM work, employed in multiple industries, and are sometimes the sole source of supply chain sustainability information. However, we argue that questionnaires are often taken for granted or overlooked and thus we find that they "must be further scrutinized through phenomenon-driven research" (Hahn and Ince 2016, p. 34).

This paper aims to partially address this research gap, understanding supplier sustainability questionnaires to be part of a supplier assessment process (Mueller and Bessas 2017) and thus it focuses on the following research questions:

> RQ1: What are the differences between an in-house, one-off supplier self-assessment questionnaire and an industry-wide, shared and validated supplier self-assessment?
> RQ2: What might the major factors influencing supplier responses to these two types of sustainability self-assessment questionnaires be?

By answering these research questions with empirical case data on these central tools for SSCM, our research we postulate various factors that may explain substantial differences in the results of suppliers' sustainability self-assessment questionnaires and make suggestions about how to improve the quality of such tools in the future. Following this introduction, we now provide a literature review of supplier assessment in SSCM, supplier self-assessment and challenges to self-assessment questionnaires, such as social desirability bias. Thereafter, we introduce the multiple-case study methodology and focus on supplier sustainability questionnaires as the unit of analysis for cross-case synthesis. We then present the case studies, describing how the data was collected and analysed. Then the results of the cases are presented, compared and synthesised. After this comparative analysis and discussion of both cases, we present our conclusions, including the implications of our findings, limitations of the research and recommendations to both practitioners and academics for areas of improvement and future research.

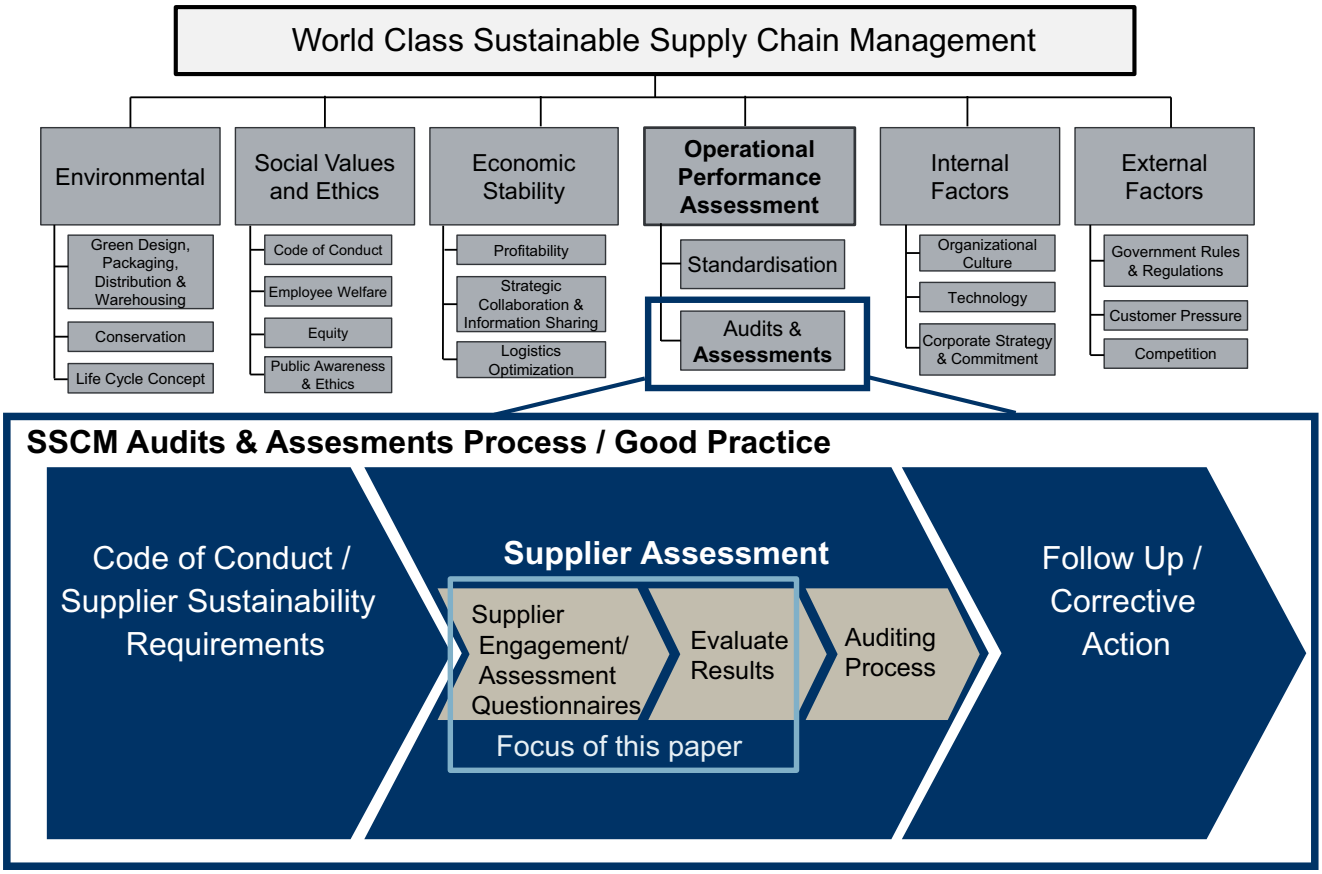


**Fig. 1** Position of our research in existing frameworks. (Authors' own depiction, adapted—with permission—from Dubey et al. (2017a) and Mueller and Bessas (2017))

## 2 Literature review

Global companies have been profiting from globally dispersed supplier networks for many decades (Gunasekaran et al. 2004; Lebaron et al. 2017; Lee and Kashmanian 2013; Petersen et al. 2000). Since the 1990s, public attention has increasingly been drawn to the negative effects of companies' practices and the perception of their responsibility for sustainability problems in global supply chains (Caniëls et al. 2013; Foerstl et al. 2010; Frostenson and Prenkert 2015; Klein 2010; Locke 2013; Seuring and Müller 2008; Wolf 2014). The emergence of SSCM can be seen as a response to this stakeholder pressure (Seuring and Müller 2008). Beske-Janssen et al. (2015) documented the remarkable growth of academic publications on the topic of SSCM. Ansari and Kant (2017) hail SSCM's rise to prominence as the "advent of a new era" (ibid, p. 2524). Most SSCM literature has an implicit or explicit focus on so-called focal companies (Frostenson and Prenkert 2015), which typically exhibit the following characteristics: "(1) rule or govern the supply chain, (2) provide the direct contact to the customer, and (3) design the product or service offered" (Seuring and Müller 2008, p. 1699) and tend to be the owners/drivers of supplier sustainability assessments in their respective supply chains.

### 2.1 SSCM assessment

The SSCM tools and processes that focal companies have at their disposal are applicable across industries (Hoejmose et al. 2013; BSR & UNGC 2015; Mueller and Bessas 2017). For example, Schoeggl et al. (2016b) note that companies in both the electronics and automotive industries are trying to address myriad sustainability issues in their broad and overlapping supply chains through sustainability assessment. As focal companies are increasingly required to assess their supply chains for sustainability risks (Lechler et al. 2019), they must first understand the status quo of SSCM in their supply chain, before they can improve it. To achieve this, they must be able to gauge progress in their suppliers' sustainability performance, which means supplier sustainability performance must be measurable and then assessed (Mokhtar et al. 2017; Reilly 2017). Thus, as Seuring and Gold (2013, p. 2) find, "managing the link to suppliers plays a key role when focal firms aim at moving toward sustainability."

Spence and Bourlakis (2009, p. 27) and Foerstl et al. (2010) have argued that supplier assessment has a positive effect on sustainability performance. Mueller (2017) proposes companies break down their SSCM processes into three steps: prevention, early warning, and reaction (see Fig. 1). Companies need processes and tools to identify sustainability risks in their SCs (Foerstl et al. 2010; Hartmann and Moeller 2014; Kashmanian and Moore 2014), particularly relying on exchange with their top tier suppliers (Leppelt et al. 2013; Sancha et al. 2016; Schoeggl et al. 2016b; Seuring and Gold 2013). One of the primary means for obtaining this sustainability information, necessary for a focal company's SSCM, is through supplier sustainability assessment (Lee and Kashmanian 2013; Schoeggl et al. 2016a; Fraser et al. 2020b). Seuring and Gold (2013) note that more research in the direction of supply chain sustainability *performance* was needed. Dubey et al. (2017b) find that assessing suppliers' sustainability performance is crucial for continuous improvement. Among other things it helps to quantify sustainability performance and thereby contributes to the successful implementation of SSCM (Das 2017). Mueller and Bessas (2017) found that of fourteen sector-based initiatives analysed, twelve of them involved focal companies employed a type of supplier sustainability assessment in the form of questionnaires and/or audits. Canzaniello et al. (2017) found that companies join industry associations ('strategic alliances') to improve the equivocality of supplier assessments and hence improve the ability to share supplier assessment data. Given the growth of SSCM literature, it is surprising that there is little literature that focuses on the 'how to?' of assessing suppliers' sustainability. Furthermore, there is still a particular lack of research dealing with the operative and applied active assessment of suppliers' sustainability practises.

## 2.2 Supplier self-assessment in SSCM

As illustrated in Fig. 1, Dubey et al. propose that supplier assessments are tools within "performance assessment" and constitute one of 18 SSCM items (2017a, p. 339). We propose that this item warrants more academic attention. Questionnaires are a common example of how companies gather sustainability data and assess their suppliers' sustainability performance (see, for example: BSR & UNGC 2015; Ecovadis 2017). Other tools for operative sustainability performance assessment include code of conduct monitoring, audits, certification, sustainable labelling, creating minimum standards, tracking and tracing systems and multi-tier transparency initiatives (Dubey et al. 2017a; Fraser et al. 2020a; Kashmanian and Moore 2014; Mueller and Bessas 2017).

Despite the lack of apparent academic focus on questionnaires as an integral tool of SSCM, they can be found around the world in all types of industries (BSR & UNGC 2015) and settings, ranging from the building and construction industries, universities and government departments to large manufacturers, food and beverage retailers and financial institutions. A number of industry initiatives, such as the automotive industry's AIAG and DRIVE Sustainability, the electronic industry's EICC[1], the toy industry's Ethical Toy Programme (IETP), or the chemistry industry's Together for Sustainability, continue to further develop common and standardized sustainability questionnaires that are given to first tier suppliers[2]. However, widespread use of such tools does not preclude challenges involved with employing self-assessment as a tool, which is why we look at potential problems in self-assessment as applied to supplier sustainability management.

## 2.3 Challenges in supplier self-assessment

Much has been written on the subject of questionnaire design, with research spanning half a century and continuing into the present (for example: Bradburn et al. 2004; Dalal and Hakel 2016; Jenkins and Dillman 2012; Krosnick 2018; Schwarz et al. 1991; Tourangeau 1984; Wright and Barnard 1975). In short, respondent's reactions and responses to questionnaires are affected by: the language used, the questionnaire mode, the way the questions are constructed, the self-assessment process that the questionnaire is embedded in and the visual/spatial construction of the questionnaire (Jenkins and Dillman 2012). Despite much cognitive and organisational research into questionnaires, there remains much to be discovered and improved (Vannette and Krosnick 2018). It follows that SSCM should heed the lessons learned in other academic disciplines and pay particular attention to the tools used to gather sustainability information from the supply chain. One major problem that emerges from self-assessment is social desirability bias.

Walker and Jones (2012) note that despite much progress in the field of sustainable procurement, there are methodological challenges that apply to all corporate social responsibility-related fields (i.e. sustainable procurement, SSCM, green SCM). When respondents are asked to answer questions about sustainability, they "are often compelled to give a positive impression of their own and their organisation's activities" (Walker et al. 2012, p. 202). This is not caused by explicit external pressure but rather due to social desirability bias, one of the main problems encountered when

[1] Since October 2017 rebranded as the Responsible Business Alliance: http://www.responsiblebusiness.org/.

[2] Also more online or platform service providers are responding to the demand for supply chain sustainability assessment, i.e. Sedex (www.sedexglobal.com), Ecovadis (www.ecovadis.com) and NQC Ltd. (https://auto.nqc.com/).

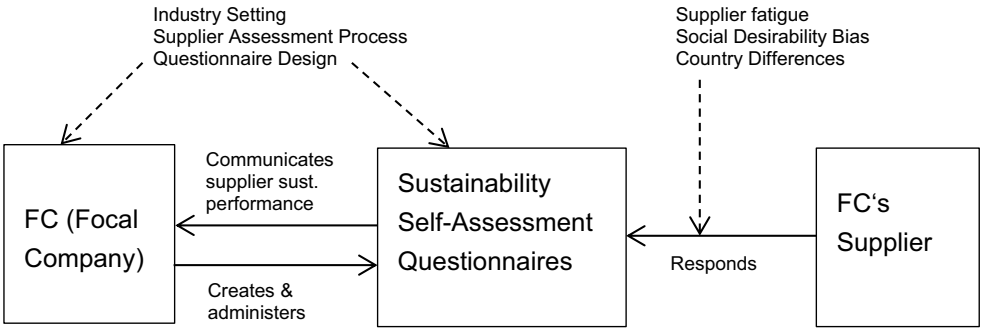


**Fig. 2** Research Model demonstrating process and potential variables affecting supplier responses

direct responses from individuals are sought on moral topics. Whilst van der Vaart and van Donk (2008) critically assess various subjective interpretations of supplier relationships and the dependence on individual assessment of supply chain integration, they do not address the issue of social desirability bias.

In other fields, such as social psychology and organisation behaviour, this bias and the inherent methodological limits of self-report questionnaires have been widely discussed (Dalal and Hakel 2016; Joinson 1999; Rolstad et al. 2011; Scherpenzeel and Saris 1997; Sjöström et al. 2009; Spector 1994), but this debate is barely found in operations research on inter-firm relations, let alone in SCM. One exception is the work of Roxas and Lindsay (2012), which addresses the issue of social desirability bias in small firms and the differences in 'accurate' sustainability reporting. They found that purely self-administered questionnaires led to less accurate reporting and overly positive self-assessment of sustainability. These results confirm the findings of Angus-Leppan et al. (2010) in which respondents were inclined to characterize beliefs and ideal states in an overly positive manner, hindering their ability to realistically disclose sustainability management practices. In all buyer-supplier interactions involving self-assessment questionnaires, individuals' innate biases very probably have an impact on the resulting sustainability performance. Leppelt et al. (2013) take care to address these issues of misreporting and bias in the data for their research into business relationships and SSCM, but so far little work has been done on ensuring the same when designing sustainability self-assessments questionnaires for suppliers.

Beyond the risk of social desirability bias, we should consider the problem of supplier assessment fatigue (Ecovadis 2017; Jiang et al. 2013; Kashmanian and Moore 2014; Newitt 2012; Zamur et al. 2017; Fraser et al. 2020b). Focal companies have responded to the pressure to implement supplier sustainability assessments (BSR and UNGC, 2015). Thus their suppliers receive various sustainability questionnaires and requests for certification and audits, often receiving similar requests from multiple customers (Davies 2012; Ecovadis 2017). This can lead to supplier "fatigue" as supplier production facilities have to incur various compliance cost burdens (Newitt 2012; Fraser et al. 2020b). Initiatives such as Together for Sustainability and Drive Sustainability recognised this burden and identified it as a driver for standardisation (Drive Sustainability 2017; TFS—Together for Sustainability 2016). Jiang et al. (2013) took supplier survey fatigue as a starting point for their research into the challenges and opportunities for supplier disclosure to their customers in SSCM. Grewatsch and Kleindienst (2017) show how cognitive frames affect organizational capabilities, with a particular focus on corporate sustainability capabilities. Accordingly, similar to individuals, companies can take on cognitive identities that then affect the individuals within them (ibid), which could influence an individual's responses. It follows that when individuals are responding to self-assessments on behalf of companies we must ask ourselves to what extent an individual is responding in a socially desirable manner and how this affects the company's sustainability results in a SSCM context.

In the literature we find several potentially significant factors that could affect supplier assessments and self-assessment questionnaires, and importantly the results they produce: social desirability bias (and the supplying company's cognitive frame), questionnaire design and process, supplier assessment fatigue, and the focal company's institutional setting. We also assume that country differences would be a factor in performance variance (see, for example, Jia et al. 2018b). The proposed influencing factors and the relation of these factors to one another in the supplier sustainability assessment process can be seen in Fig. 2.

We have established a need for empirical analysis of supplier sustainability self-assessment questionnaires to investigate what the critical factors are and how they potentially influence supplier responses. In the following section we introduce the multiple-case study design and our abductive method, before describing two case studies focusing on supplier sustainability questionnaires that we conducted to address this research gap.

## 3 Method and multiple-case study design

From the literature it emerges that supplier self-assessment questionnaires play an important role in SSCM but have received little critical academic attention. Hence, we decided to research two available cases of such self-assessment questionnaires and to compare and contrast them in terms of the processes associated with them and the results they generate. Yin (2018) notes that case study research, which seeks to understand complex phenomena in their real world contexts, is well suited to questions of inquiry that seek to understand 'how' and 'why' things occur. Our research involved an empirical inquiry into how suppliers respond to sustainability self-assessment questionnaires and why they might potentially respond in certain ways. Ultimately, the research design, involving multiples cases, allowed us to not only focus on specific variables and results but also the potential for cross-case synthesis. This synthesis involves uncovering within-case patterns and comparing these across the cases in order to determine literal replication (same or similar results in different cases) or theoretical replication (despite case similarities, divergence of outcomes due to predictable factors) (Yin 2018, pp. 174–194).

### 3.1 Research method: design, approach and unit of analysis

We pursued our research based on a qualitative, abductive research design (Helmreich 2007; Ketokivi and Mantere 2010; Timmermans and Tavory 2012). After reviewing the extant literature, we began collecting and analysing our data. We then noted emerging themes and generated conceptualisations and then returned to the literature and repeated this abductive process in several iterations (Biggs 2011; Hahn and Ince 2016; Timmermans and Tavory 2012). In this manner the case studies can serve to improve extant knowledge with the insights gathered from the idiosyncrasies of the empirical context (Ketokivi and Choi 2014; Stuart et al. 2002). The organisational *context* for both case studies was a global automotive focal company "AFC" (henceforth referred to as AFC). The *unit of analysis* was the sustainability self-assessment questionnaire, administered to this company's suppliers. The *subjects* of this research, AFC's suppliers, responded to one or both sustainability questionnaire/s requested by AFC. Thus, our research involved a multiple case-study design wherein the same unit of analysis, the supplier sustainability questionnaire, formed the basis of two case studies (Yin 2018). As detailed in subsection 3.3. below, the questionnaires were similarly structured (indeed, experience gained with the first questionnaire informed the development of the second questionnaire) and fulfilled the same monitoring purposes as part of AFC's sustainable supply chain activities. By analysing two cases involving a large amount of supplier response data gathered over a timeframe of five years, we aimed to identify meta-level potential causal factors that could lead to new understandings for academia and practice.

### 3.2 Case studies: background and setting

Despite the widespread use of supplier sustainability questionnaires in practice and their central place in the canon of SSCM tools and processes (Lee and Kashmanian 2013; Mueller and Bessas 2017), there has been very little academic inquiry into these tools. Consequently, we explored this topic by analysing case data on two supplier sustainability questionnaires and assessment approaches administered by AFC. Whilst each case concerns a different questionnaire, both questionnaires fulfilled a very similar purpose as part of SSCM monitoring. Case A concerns the original, internally-developed supplier sustainability questionnaire (ISQ) and Case B refers to the more recent, industry-wide developed supplier self-assessment questionnaire (SAQ) on sustainability that AFC gathered from some of its suppliers.

#### 3.2.1 CASE A: Internal Supplier Questionnaire (ISQ)

AFC began assessing its suppliers on sustainability in 2006. It created a supplier questionnaire to monitor its suppliers' compliance with AFC's sustainability requirements for business partners. The questionnaire was piloted in 2006 and developed over the ensuing years. In 2012, after years of manual processing, AFC began recording all supplier responses to the ISQ in a central database. Completion of the ISQ was mandatory for those suppliers concerned (defined as over a certain amount of turnover, high-risk, or as a measure/response to concrete suspicions of infringement) in the timeframe under consideration (2012–2017). The ISQ was technologically integrated into the central business partner platform and the completed ISQs could be checked by AFC's buyers in the supplier database.

### 3.3 Case A: ISQ design and integration in AFC's processes

The ISQ was designed to cover major areas of AFC's sustainability requirements for suppliers. It is divided into five major sustainability areas, with each area containing between two and nine questions (see Fig. 3). All questions required a "yes" or "no" answer. The total score for each ISQ was generated by dividing the number of correct responses (points) by the total number of questions (24). All but one question in the ISQ, required a 'yes' in order to score a point. The ISQ process had been technologically

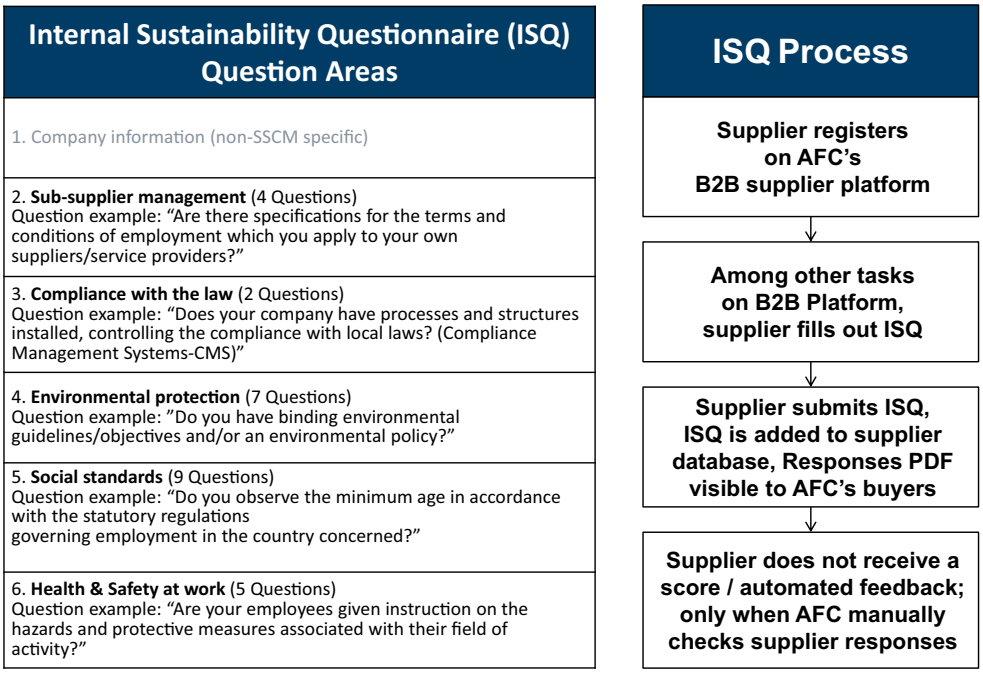


**Fig. 3** ISQ questionnaire design (sustainability areas & example questions) and ISQ process

integrated into supplier onboarding processes since 2012. The supplier received a task as part of this process and reminders to complete the ISQ. In certain cases, suppliers were contacted regarding their responses, which led, in some cases, to suppliers submitting updated ISQs.

### 3.4 CASE B: European Automotive Industry Self-Assessment Questionnaire (SAQ):

In 2013, an Automotive Original Equipment Manufacturer (OEM) working group for sustainability in global supply chains was officially launched (CSR Europe 2013). Based on their respective experiences with sustainability questionnaires, combined with their suppliers' feedback that suppliers were receiving too many individual supplier sustainability questionnaires from OEMs, the working group created a common Self-Assessment Questionnaire (SAQ) on sustainability for suppliers, which was publicly launched in April 2014 (CSR Europe 2014a; Drive Sustainability 2017). The SAQ built upon the Automotive Industry Guiding Principles to Enhance Sustainability Performance in the Supply Chain, which was co-launched by CSR Europe and the Automotive Industry Action Group (AIAG) in March 2014 (CSR Europe 2014b).

### 3.5 Case B: SAQ 2.0 design and integration in AFC's processes

The SAQ evolved from previous experience with supplier sustainability questionnaires and aimed to strike a balance between detailed questions addressing core suppliers' sustainability practices without being overburdening. Thus questions did not just ask whether a supplier had capacity, a sustainability policy or a certified management system, or was undertaking certain measures, but also required evidence for these claims. To remove the processing burden from participating OEMs and to ensure that supplier data was not shared with other OEMs against a supplier's will, the administration was undertaken by the third-party service provider, under the anti-trust oversight of CSR Europe. Each OEM could choose to what extent and how the SAQ was integrated into internal procurement processes and systems. AFC chose to participate in the SAQ sharing platform solution. Suppliers were invited (see Fig. 4) as part of campaigns run together with the service provider, individually or in waves organised by AFC. A supplier was asked to register their supply location on the platform, fill out contact and location details, and answer the sustainability questions. The supplier was then checked by the third-party platform provider. Often the responsible person for completing the SAQ had to gather information, certificates, links and other evidence in the process of filling out the online questionnaire[3]. Once completed, the supplier could choose which OEMs to share their SAQ with. Thereafter the SAQ was validated by the platform provider, to check if the attached evidence supported the responses. Finally, a percentage score was given based on the responses. To begin with, this score could only be seen by the OEMs

[3] The SAQ could be filled out, if necessary over an extended period of time, such that responses already given could be saved to work on later.

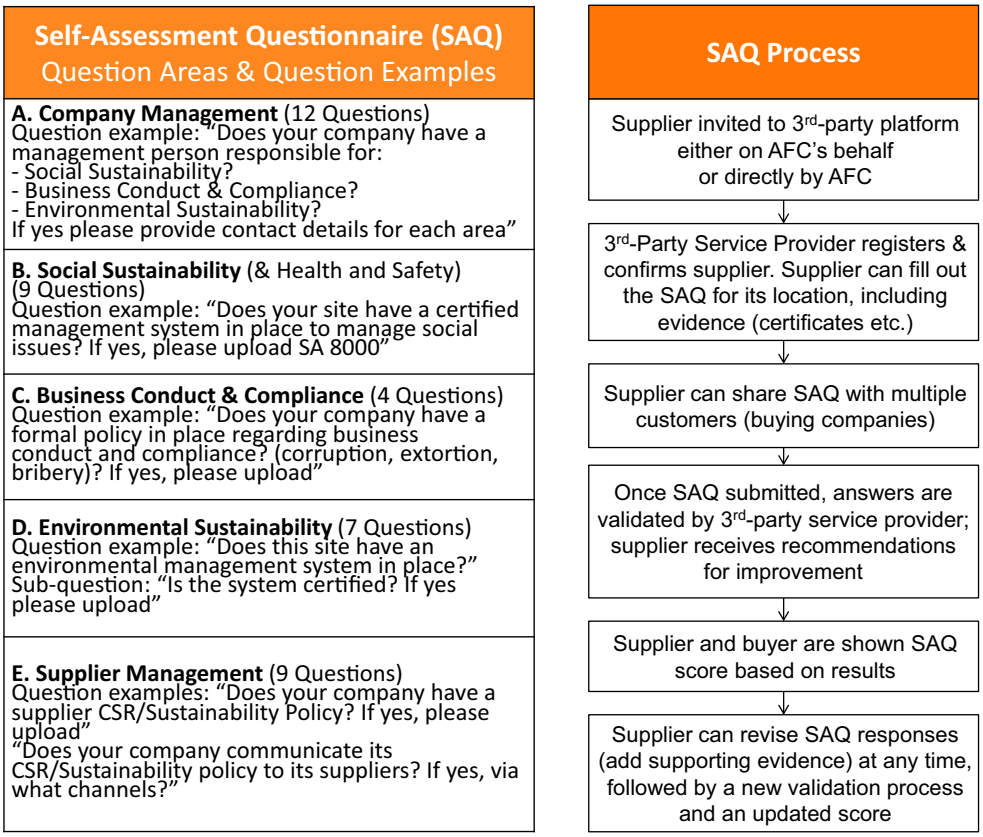


**Fig. 4** SAQ questionnaire design (sustainability areas & example questions) and SAQ process

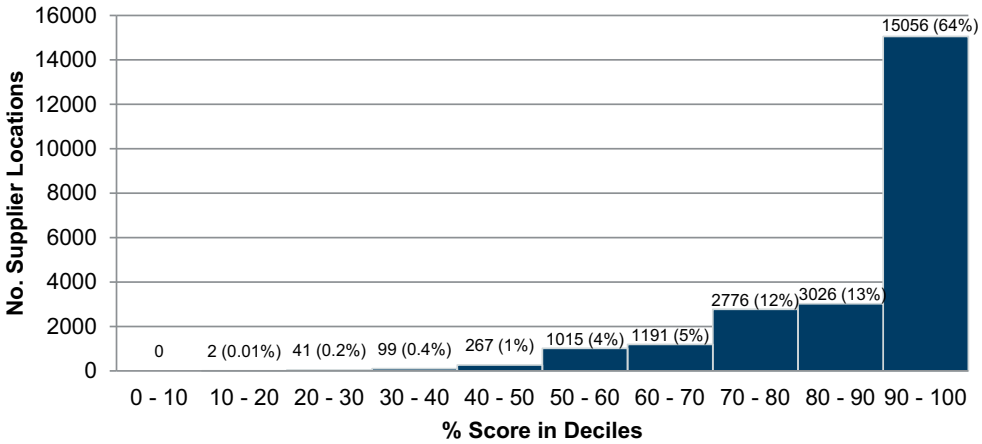


**Fig. 5** Supplier locations' ISQ % Scores, distributed by score decile

with whom the supplier had chosen to share the SAQ; the supplier only saw a coloured 'award' (red, amber or green). As of early 2017 the suppliers could also see their percentage score.

AFC began inviting a small number of supplier locations in 2014 to test the SAQ. Increasingly, AFC began to onboard its most critical and production-essential suppliers. By 2017 AFC had plans to integrate the SAQ into its procurement processes and systems, so that buyers could see the SAQ results for potential and existing suppliers. The SAQ also informed AFC's risk management and more suppliers were successively invited via strategic campaigns.

Apart from a small number of non-weighted questions and sub-questions, each 'mandatory' question resulted in an equal percentage contribution to the total score. Service provider suppliers that were not production site locations did not have to answer as many questions as production locations, but still received a score out of 100%. However, all suppliers invited to fill out the SAQ by AFC were suppliers of parts and components for production (not service

**Table 1** Averages scores by ISQ sustainability area

| Average Total ISQ Score | Sub-suppliers | Compliance | Environment | Social Standards | Safety & Health in workspace |
|---|---|---|---|---|---|
| 89% | 82% | 94% | 79% | 96% | 92% |

**Table 2** ISQ distribution & average scores by top 10 countries

| | Supplier Location Country | No. Supplier Locations | % of all ISQs | Average score % |
|---|---|---|---|---|
| 1 | Germany | 12,331 | 52.5 | 86 |
| 2 | Mexico | 1110 | 4.7 | 92 |
| 3 | Brazil | 995 | 4.2 | 94 |
| 4 | USA | 915 | 3.9 | 90 |
| 5 | Spain | 811 | 3.5 | 95 |
| 6 | Czech Republic | 739 | 3.1 | 93 |
| 7 | China | 728 | 3.1 | 98 |
| 8 | Italy | 671 | 2.9 | 91 |
| 9 | United Kingdom | 527 | 2.2 | 90 |
| 10 | Poland | 510 | 2.2 | 93 |
| | *Total Top 10* | *19,337* | *82* | *92* |
| | All suppliers ISQ | 23,473 | 100 | 89 |

providers). Importantly, at no point in the timeframe under consideration was the SAQ mandatory for suppliers. They were strongly encouraged by the procurement department, but by no means did all invitees register on the platform. Furthermore, not all of those who did register completed a SAQ and not all who completed it shared their SAQ with AFC.

## 3.6 Methods: research procedure

Two members of our research team were able to interact with AFC at different times over a timeframe from 2012 until 2018. Therefore, the data collection, data extraction and data analysis were conducted in a collaborative manner, allowing the researchers to make observations over time that supported the raw data in the form of the suppliers' questionnaires. Both case studies were carried out by the same researcher, who was based at the automotive focal company throughout the research, with access to both databases and all material required. The data informing both cases primarily consists of empirical data in the form of direct supplier questionnaire responses, as well as supporting participant observation carried out by the researcher who was entrusted with analysing both the questionnaire data itself as well as the processes of data collection.

### 3.6.1 CASE a: ISQ data collection

AFC's ISQ database contained over 20,000 supplier sustainability responses. The dataset contains every response recorded in the timeframe from January 2012 until December 2017. Each supplier location's responses were collated in the database. The data were extracted on a single day in January 2018, representing a snapshot of all collected responses up to the end of 2017. The database portrayed each supplier location's responses to individual questions, grouped into sustainability areas, and also contained information on the country location. By means of a unique identifier duplication could be ruled out.

### 3.6.2 CASE b: SAQ data collection

The SAQ data was administered, processed and validated by the platform provider. Therefore, AFC's supplier SAQ data were extracted from the service provider's secure platform. Between 2014 and the end of 2017 there were 8093 of AFC's supplier locations registered on the platform. The final SAQ dataset, forming the basis of Case B, involved 5431 completed SAQ responses. The other 2662 SAQs had not been completed and thus had no score for analysis. A supplier could return to their SAQ and update their responses, resulting in new validation and (potentially) a new score. Our dataset only contains the most recent score for each location as the final score. The database contained country location information and separated each supplier's response to individual questions. By means of a unique identifier number SAQ duplication could be ruled out with high certainty. The platform provider undertook regular data quality checks to ensure supplier data was current.

### 3.6.3 Cross-case synthesis: comparison and analysis

We had the unique opportunity to access two large questionnaire datasets at a time when AFC was shifting its strategy towards more shared supplier assessment. This window of opportunity combined with personal access to AFC's systems and processes meant that a thorough analysis of each case could be undertaken. By analysing total score distributions, and then further sorting response scores into sustainability areas as well as filtering total scores according to countries, we could synthesise the two cases and begin to compare the case data. Various findings arose and by applying abductive logic we proposed a number of variables for better explaining supplier responses to these SSCM tools.

# 4 Results

In the following we present the results of the two questionnaires that constitute the unit of analysis of each cases

study. The results depict the distribution of the overall supplier scores for each case, the average scores for sustainability areas in the questionnaires and the countries with the largest number of supplier locations and the average questionnaire scores at a country level.

### 4.1 CASE A: Internal Sustainability Questionnaire (ISQ)

In total there were 23,473 ISQ responses collected. If an ISQ was resubmitted, the latest response replaced the previous entry in the database, so that all responses were unique. 9224 locations scored a perfect score (24 out of 24 possible points), representing nearly 40% of all ISQs. Scores ranged from 17% to 100% but the *average score was 89%*. Fig. 5 depicts the frequency distribution of the supplier locations' ISQ scores per decile. It is very evident that ISQ scores between 90% and 100% were the most frequent: the majority (64%) of all supplying locations achieved a sustainability score in this decile. Nearly 90% of ISQ scores were in the top three deciles. Conversely, less than two per cent of all supplier locations had scores of less than 50%.

The ISQ was divided into 5 sustainability areas. We analysed the average scores by sustainability area, which ranged from average scores of 79% for Environment to 96% for Social Standards (see Table 1). These high sustainability area scores are understandable considering the average score across all ISQs (89%) and that 40% of all ISQs collected had scores of 100%.

ISQs were collected from supplier locations from 80 countries. Half of all ISQs came from supplier locations in Germany, wherein the average ISQ score was 86%. Overall, 80% of ISQs came from supplier locations based in just 10 countries. Table 2 shows that there was not much variation in average ISQ scores across countries[4]: Germany had the lowest, 86% and China the highest average score, 98%. We now turn to the results of the second questionnaire, the industry-wide self-assessment questionnaire, that constitutes Case B.

### 4.2 CASE B: Sustainability self-Assessment Questionnaire (SAQ)

The results considered in this research are the score that each supplier location last achieved. Only four locations achieved a perfect score (100%), whereas 90 supplier locations submitted a SAQ but received a score of 0%. Thus, the range of SAQ scores was from zero to 100%, with an average score of 65%. The distribution of SAQ scores per decile can be seen in Fig. 6.

We observe that over half of all supplier locations (58%) in the sample achieved a SAQ score in the top three score deciles. Conversely, 42% of all supplier locations got SAQ scores in the lower seven deciles, with more suppliers achieving scores between 50 and 70% and an otherwise fairly even distribution across the score deciles zero to 50%.

The SAQ was divided into five sustainability areas. We analysed the average scores by sustainability area across all supplier locations, which ranged from an average score of 52% for social sustainability to 72% for environmental sustainability (see Table 3).

These sustainability area scores indicate that AFC's suppliers achieved higher scores in the areas of environmental sustainability, company management and business conduct and compliance, but only achieved mediocre scores for social sustainability and supplier sustainability management.

SAQ data was collected from supplier locations in 70 different countries. Germany-based supplier locations constituted over a third of all responses and the top ten supplier location countries accounted for over two-thirds (72%) of all SAQ responses in total (see Table 4). Among the

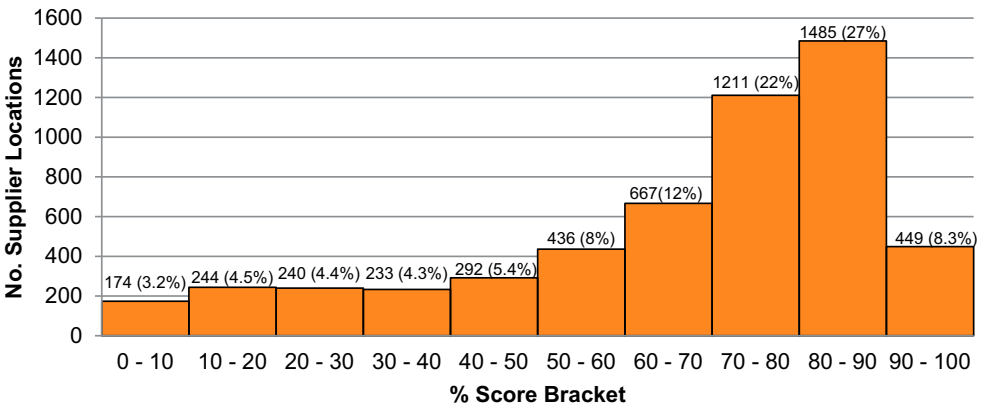


**Fig. 6** Distribution of supplier locations' SAQ % scores, by score decile

[4] The next ten countries only accounted for 11% of all ISQ responses and had an average ISQ score of 92%, with average scores ranging from 89% (Austria) to 94% (Slovakia, Portugal and Sweden).

**Table 3** Average SAQ scores by sustainability area

| Average Total SAQ Score | Supplier Management | Business Conduct and Compliance | Environmental Sustainability | Social Sustainability | Company Management |
|---|---|---|---|---|---|
| 65% | 54% | 67% | 72% | 52% | 70% |

**Table 4** SAQ distribution & average scores for top 20 countries

| | Supplier Location Country | No. Supplier Locations | % of all SAQs | Average score % |
|---|---|---|---|---|
| 1 | Germany | 1927 | 35.5 | 62 |
| 2 | Sweden | 317 | 5.8 | 62 |
| 3 | Mexico | 268 | 4.9 | 73 |
| 4 | Italy | 235 | 4.3 | 61 |
| 5 | Czech Republic | 231 | 4.3 | 70 |
| 6 | Spain | 220 | 4.1 | 67 |
| 7 | Poland | 196 | 3.6 | 72 |
| 8 | Brazil | 173 | 3.2 | 65 |
| 9 | United Kingdom | 164 | 3.0 | 60 |
| 10 | France | 155 | 2.9 | 70 |
| | *Total Top 10* | *3886* | *72* | *66* |
| 11 | China | 136 | 2.5 | 73 |
| 12 | Hungary | 124 | 2.3 | 70 |
| 13 | Austria | 115 | 2.1 | 69 |
| 14 | United States | 114 | 2.1 | 72 |
| 15 | India | 106 | 2.0 | 64 |
| 16 | Slovakia | 103 | 1.9 | 72 |
| 17 | Turkey | 84 | 1.5 | 68 |
| 18 | Romania | 75 | 1.4 | 77 |
| 19 | Netherlands | 66 | 1.2 | 56 |
| 20 | Denmark | 52 | 1.0 | 51 |
| | *Total/Average Top 20* | *4861* | *90* | *66.7* |
| | All Suppliers' SAQs | 5431 | 100 | 65 |

top ten countries, average SAQ scores ranged from 60% (United Kingdom) to 73% in Mexico, indicating low average score variance among countries. When considering the top 20 countries, it is interesting to see that the highest average score was found among suppliers in Romania (77%), whereas the lowest average SAQ country score was in Denmark[5]. In the following we discuss these results and findings from each case, and then synthesise cross-case patterns of similarity and divergence.

[5] Also, unexpectedly, China and Turkey both registered country average scores of 73%; higher than the averages for all western-European countries.

## 5 Discussion

The academic benefit of conducting multiple-case study research lies in finding like cases, with the same unit of analysis (in this case: sustainability questionnaires for suppliers). These can either predict similar findings across multiple-cases, resulting in 'literal replication', or point to like cases that predict contrasting results but for anticipatable reasons, so-called 'theoretical replication' (Yin 2018, p. 57). If either of the results for a particular questionnaire presented above were to be analysed alone, the question might arise, how realistic are these results? Whilst analysing the results of the two cases it became apparent that the meta-results differed in important ways. Although different questionnaires, due to their similar content and purpose a meta-level comparison of the amassed data provided us with insights into supplier sustainability questionnaires as a SSCM tool. Furthermore, both questionnaires served as monitors of suppliers' (reported) sustainability compliance and an assessment of supplier sustainability practices. In general, we found cause for scepticism about how representative the ISQ results are of sustainability performance and that the SAQ is probably a more accurate SSCM tool. In the following, we present our cross-case synthesised findings.

### 5.1 Findings: distribution of average supplier scores

As presented in 4.1 and 4.2, it is worth recalling and synthesising the score distributions of the two questionnaires to make the major finding of our research clear. The SAQ returned a visibly more diverse set of supplier responses/scores than the ISQ. The ISQ responses resulted in very high scores (average 89%) and accordingly a high concentration of high-scores (nearly 90% of all supplier locations responses returned scores between 70% and 100%, recall Fig. 5). The extremely high average ISQ scores and the corresponding lack of differentiation among suppliers' performance meant that deeper analysis of the ISQ results and drawing meaningful conclusions were rendered superfluous. The SAQ responses returned greater variation in scores. The average score was lower (65%) with 42% of supplier responses generating scores between zero and 70%. The SAQ results demonstrated a somewhat top-heavy distribution of scores, with nearly half of all supplier locations achieving scores between 70% and 90% (recall Fig. 6). Still, due to the broader spread of scores (contrast Figs. 5 and 6), it was possible to differentiate more among sup-

plier responses, also when considering other aspects such as questionnaire sustainability area and country results.

### 5.2 Findings: sustainability area scores

Both questionnaires contained different sustainability areas, meaning that supplier location responses could be looked at thematically. Table 1 (Sect. 4.1.4) and Table 3 (Sect. 4.2.4) depict the average scores drawn from the responses based on each sustainability section in the respective questionnaires. The ISQ returned slightly less varied responses when considering average scores by sustainability area and much higher average area scores in total. The highest average ISQ section scores were for social standards (96%) and the lowest for environmental protection (79%). However, given justifiable scepticism about ISQ results in general, we focus on SAQ section results. SAQ sustainability section average scores were significantly lower and ranged from 52% for social sustainability to 72% for environmental sustainability[6].

The SAQ sustainability section results coincide with general literature findings, namely that it is harder to quantify social sustainability and harder for firms to measure and improve performance in this area (Beske et al. 2014; Dubey et al. 2017a; Fish 2015). Thus, suppliers were more likely to achieve higher environmental sustainability scores in the SAQ thanks to ISO 14001 certification and certified management systems etc. Unlike the ISQ, the SAQ points not only to social sustainability as a SSCM area deserving continued attention (Hutchins and Sutherland 2008; Ferri and Pedrini 2018) but also to sub-supplier sustainability (Fraser et al. 2020). These findings correspond well with current problems for practitioners around achieving transparency in SCs (BSR and UNGC 2015; Schwarzkopf et al. 2018), addressing SSCM risks in raw materials SCs and how to pass on requirements beyond tier one suppliers (BSR and UNGC 2015; Drive Sustainability 2017; Sauer and Seuring 2017; Jia et al. 2018a). The SAQ responses demonstrate interesting and differentiated findings about supplier sustainability practices.

### 5.3 Finding: score differences based on location

ISQ responses were gathered from supplying locations in 80 countries and SAQ responses from 70 different countries. Eight of the top ten countries were the same for ISQ and SAQ responses. The top ten supplier locations countries constituted over 80% of all ISQ responses and over 70% of all SAQ responses. ISQ country results were not diverse, due to the limited range and very high average-scores. All countries from which we analysed three or more ISQ responses achieved an average score of *over* 85%. When we consider countries, for which we received three or more SAQs, the country average SAQ scores range from 36% to 85% indicating much more diverse responses and corresponding sustainability performance. Our results included an over-representation of Germany-based supplier locations, both for the ISQ and SAQ.

ISQ results, while demonstrating generally high scores, also demonstrated some counter-intuitive results. Supplier locations based in OECD countries such as Germany (86%) and the United Kingdom (90%) would normally achieve higher average sustainability scores than those supplier locations based in countries such as China (98%) and Brazil (94%). The country responses for countries 10–20 continued to challenge common-sense wisdom: Russia and South Africa (92%) and India (93%) achieved higher average ISQ sustainability scores than supplier locations based in Austria (89%), the USA (90%) and Italy (91%). Thus, ISQ results can be questioned as not being indicative or representative of country sustainability practices and performance[7].

SAQ responses, however, also returned country results that were contrary to our expectations. For example: Mexico (73%), China (73%) and Brazil (65%) achieved higher average SAQ scores than Germany (62%), Sweden (62%) and the United Kingdom (60%)[8]. As described, these suppliers had to upload evidence to support their SAQ responses, which means that there is little basis for questioning the accuracy of the individual location scores, and therefore the aggregated scores. However, self-selection bias could account for some of the unexpected higher country-score averages. The SAQ was not mandatory for AFC's supplying locations in the timeframe under examination. Several thousand supplying locations had registered on the platform between 2014 and 2017 but did not complete or share their SAQ with AFC. Some suppliers began to fill out the SAQ and then stopped, possibly realising that completing it would probably return a low score. Other suppliers, upon realising that the SAQ was not mandatory, might not have wanted to disclose their porous sustainability practices. One

[6] Interestingly, the highest average section score for the ISQ (social standards) was the lowest average scoring section in the SAQ (52%). Conversely the lowest ISQ section average scores were for environmental protection (79%), whereas this was the section with the highest average scores (72%) for the SAQ.

[7] For example, supplier locations based in developing countries like Iran and Botswana (score 100%), Philippines (99%), Indonesia (98%), Thailand (97%), Tunisia and Morocco (96%) and India (93%) paint a high-scoring picture for these countries when looking at ISQ responses.

[8] Furthermore, countries such as the United Arab Emirates (81%), Timor-Leste (74%), Nicaragua (79%), the Philippines (85%) and Indonesia (83%) all demonstrated perhaps unexpectedly high SAQ average scores, but the sample size for these countries was very small (one to three supplier locations) and thus should not be considered representative for general sustainability performance in these countries.

can similarly surmise that suppliers who were confident of achieving higher scores would be more likely to complete and share a SAQ. German and Swedish suppliers were prioritised for various reasons by AFC. Possibly these country results are more statistically representative in general. These supplying locations might have been more likely, due to historic and strategic partnerships, to feel compelled to complete and share their SAQ with their customer AFC.

The country responses showed the SAQ responses are probably *not* representative of general sustainability risks indicated by the respective social economic development level of those countries, prominent examples being China, Mexico, Turkey and Romania outperforming Denmark, Germany and Sweden. With nearly 2000 data-points, the results for German suppliers could possibly be considered representative, but all other countries (from which we gathered less than 320 SAQs each) cannot plausibly be considered representative of sustainability performance at country level.

## 6 Conclusions, limitations and relevance for SSCM

We began our research asking ourselves what the salient differences are between two types of suppliers' sustainability self-assessment questionnaires. With access to a large amount of data from two different types of questionnaires (designed to fulfil the *same* SSCM *purpose* and constituting the *same type of tool*), we wondered how suppliers might respond to them, how these responses might differ, and if so, why this might occur. We proposed that responses to self-assessment questionnaires could be influenced by: supplier assessment fatigue, a supplier employee's social desirability bias (and the supplying company's cognitive frame), questionnaire design and how it is embedded in company processes, the focal company's institutional setting and potentially by country differences. We conclude our article with major conclusions resulting from our cross-case comparison and findings before illuminating limitations to our research and making recommendations for future research. Finally, we highlight the relevance of this research for SSCM academics and practitioners.

### 6.1 Main conclusions on self-assessment questionnaires for SSCM

In response to a demonstrated research gap and directed by our two research questions, this research demonstrated how such supplier sustainability self-assessment tools can differ, both in terms of their questionnaire structure and the institutional setting and company processes that they necessitate. It then sought to explain why supplier responses might differ, depending on the supplier self-assessment tool. In the following we expound on the role and importance of questionnaire design, assessment process and institutional setting, concluding that more diverse, realistic supplier assessment tools are essential for SSCM.

#### 6.1.1 Addressing SDB and cognitive frame: questionnaire design & process

We found that both questionnaire design and the process seemed to influence the responses and could potentially limit social desirability bias and address negative cognitive framing. In other disciplines much attention has been paid to questionnaires (such as the order of questions, leading vs. open questions etc.) and their design (Bradburn et al. 2004; Dalal and Hakel 2016; Jenkins and Dillman 2012; Tourangeau 1984). In our case studies we clearly observed that the ISQ's 'leading questions' (that were noticeably looking for one type of socially desirable response) were overwhelmingly responded to in the expected manner. Apart from one question that required a "no" answer, it could be inferred that those filling out the ISQ were aware that "yes" was the desired response. SSCM tools are designed to assess suppliers, but those responding to such questionnaires are still individuals, who are subject to psychological tendencies such as social desirability bias. The ISQ can thus be defined as a form of self-report.

By contrast, the SAQ can only be defined as semi-self-report due to the validation that took place after responding. Suppliers were aware of the process and design of the questionnaire and that their answers would be validated. The final score, therefore, did not necessarily represent the initial self-reported responses, as those responses that could not be supported had to be revised. SSCM questionnaires and other assessment tools and methods must be designed with social desirability bias and supplier assessment fatigue in mind. Our cases demonstrated how both questionnaire design and assessment process can potentially reduce the tendency to respond in a socially desirable manner. Standardising SSCM tools and enabling results sharing among an industry can reduce the fatigue of those suppliers responding to multiple buying focal companies. Moreover, we observed that the SAQ and the supplier results served as the basis for dialogue between AFC and its suppliers for further supplier development. As the SAQ could be revisited by the supplier, it enabled continued supplier sustainability development and potentially created a different impression on those completing the questionnaire.

#### 6.1.2 Addressing supplier assessment fatigue: SSCM processes & institutional setting

AFC (presumably like many focal companies) began their SSCM journey by developing their own solutions to new requirements and reacting to emerging challenges and sustainability expectations. In this context, larger companies might initially develop their own supplier sustainability assessment tools. However, given overlapping supply chains, particularly when it comes to multi-tier, globally dispersed supplier networks (Schoeggl et al. 2016a), large tier-1 suppliers probably receive numerous and similar sustainability questionnaires from their (focal company) customers. If not, a supplier location may wonder what the purpose of such a questionnaire is and may not have the competencies or human resources easily available to respond to the questionnaire[9]. In both cases the questionnaire may be regarded as an annoying 'must do' that is essentially about ticking boxes for compliance. If the supplier has the impression that the questionnaire is a one-off matter, along the lines of "are you ethical—please tick yes or no" (Crane 1999), then much less importance will probably be attached to understanding the topics and making sure that policies, process and competencies are in place to ensure more sustainable practices. The responses made in the ISQ were self-reported and only checked through manual intervention by AFC on a case-by-case basis. While we could not gather exact data from suppliers on how many self-assessments they had undertaken for different focal companies, we generated SSCM process findings that could point to supplier assessment fatigue as an explanatory factor. A potential example of this is the surprising number of suppliers (over 250) who responded "yes" to an ISQ question which asked whether involuntary labour had been used. This anomaly was discovered by AFC and suppliers were confronted about their responses. Then a so-called ad-hoc case was opened, and suppliers received a list of measures that had to be addressed as part of a monitored due diligence process. Suppliers explained that their response must have been a mistake. We infer that the ISQ was possibly seen as a tick-the-box measure that was necessary to proceed with registration on the business partner portal. If suppliers believed that no follow up would occur, then they may have rushed through the questionnaire, ticking 'yes' without slowing down to understand the questions.

On the other hand, if the supplier understands the questionnaire to represent an entire industry's sustainability expectations, and that multiple buyers could be analysing the results of the questionnaire, the importance attached to the questionnaire could be much higher. By contrast, the SAQ process may have given more of an impression of supplier development, rather than a quick, one-off compliance check. This is because once suppliers completed their SAQ, the SAQ platform and process generates an automated catalogue of recommended improvements (based on the gaps stemming from the suppliers' responses). This allows for continued interaction between suppliers and focal companies across the industry, to address the gaps, risks and issues identified (Foerstl et al. 2015). Whilst in some cases suppliers reported that the SAQ was first filled out by an administrative person in the company with little knowledge of sustainability practices, once feedback came from buyers regarding the low score, the responses were corrected, and the performance improved. CSR Europe and the SAQ platform service provider both confirmed that numerous SAQs were being shared with up to five focal companies. Furthermore, conversations with individual suppliers demonstrated that they were glad that they only had to fill out one SAQ (compared to earlier years) and for the option to share it with multiple buying focal companies.

We therefore conclude that SSCM tools, particularly supplier assessments and questionnaires, must make better use of institutional (and industry) settings, to maximise standardisation and the perceived importance of the tool, and thereby its potential sustainability impact. One way to achieve this is for industry players to collaborate and cooperate, agreeing on common sustainability standards and the tools to measure compliance with these standards (Mueller and Bessas 2017). Suppliers, like focal companies, have limited resources and more standardisation reduces their burden while simultaneously making it clear that the tool is to be taken seriously.

#### 6.1.3 Differentiation in SSCM responses (sustainability areas & country performance) desirable

Our research demonstrated that the aspects detailed above (industry setting, assessment tool standardisation, questionnaire design and process integration) can lead to more differentiated supplier responses. We conclude that more differentiation among supplier sustainability responses is of much more utility for SSCM. If all scores are the same, how should companies make sustainability-risk based decisions, prioritise supplier development, and select sites for more in-depth monitoring such as sustainability audits? Companies around the world are at very different stages when it comes to sensitisation for sustainability and the place it may have in their company (procurement) strategies. If the SSCM assessment tools return a homogeneous response landscape, then one must question the design of these tools and processes surrounding them. We found that more differentiation (such as in the SAQ results) allowed for meaningful

[9] Indeed, the researchers were confronted time and again with suppliers who genuinely wondered why they 'had' to fill out such questionnaires and what it might be good for.

further analysis of sub-areas of the questionnaire, directing AFC's attention to sub-supplier management and social sustainability as areas requiring further development. One plausible explanation for the higher scores in some areas, is that SAQs were resubmitted by suppliers, often after being engaged by different OEMs at different times (including AFC), potentially regarding certain topics (for example energy management), to improve their SAQ performance in this area. As well as highlighting differentiated supplier performance and responses in regard to sustainability areas, our findings also covered thousands of suppliers in different country settings.

Country (or regional) differences are a continuing topic in SSCM, as their socio-economic conditions are a major factor in supply chain networks (Beske et al. 2008; Locke 2013). However, our results showed the need for caution. As depicted in 5.1.3, our findings could not be considered representative for most of the countries. But this raises questions about the extent to which questionnaires are able to generate responses that can be generalised to the country level, and whether country-based risk factors can be transferred to individual suppliers. Both a well-run factory, with good environmental social and environmental performance in a developing country, as well as a supplier in a highly developed country, barely conforming with minimal legal requirements (or even acting in contravention of them) are conceivable. Many focal companies have conducted country risk analyses, so it is plausible that sustainability trainings for suppliers in such countries partially explain the surprisingly high average SAQ scores for certain countries.

The two case studies help confirm our initial propositions that supplier sustainability questionnaire responses would be affected by social desirability bias, questionnaire design and process, supplier fatigue, and the focal company's institutional setting. In addition, they help confirm that similar questionnaires can generate very differing responses. A self-assessment questionnaire that undergoes validation and whose results can be shared with multiple focal companies elicited responses that (with a higher degree of probability) are more realistic. If SSCM tools generate favourable responses, one must either conclude that the supplier locations were all very sustainable, or that the questionnaire did not fulfil its role as a tool to accurately capture suppliers' sustainability practices. Such a concentration of positive responses renders any analysis nearly useless, as one cannot differentiate and determine which responses genuinely represent 'good' sustainability practises and which responded in a socially desirable manner. The SAQ produced more balanced results, that probably more accurately depicts sustainability practices and provided AFC a basis for further SSCM actions and decisions.

### 6.2 Limitations and recommendations for further research

There were several limitations that potentially affected our research, one methodological limitation and a number relating to the questionnaire processes and the supplier sampling. We recognise the methodological limitations of comparing two different tools. However, various case study research has involved comparing differing interventions (policy, management approaches, systems and process) to address the same problem across cases (Yin 1989, 2018; Eisenhardt 1991; Cavaye 1996). In this vein, we argue that the two different questionnaires are comparable, because they were designed to fulfil the same task—monitoring supplier conformance with sustainability requirements and documenting their activities.

Regarding the questionnaire process, one limitation may have been the degree of obligation on suppliers to complete the two questionnaires. The ISQ was mandatory for suppliers concerned and was an integral part of AFC's supplier onboarding process. The SAQ was never strictly mandatory in the timeframe under consideration (although the preferred tool by 2017) and thus if suppliers refused to complete or share the SAQ with AFC, there were no hard/straightforward consequences. As mentioned in 5.1.3, the SAQ responses probably reflect a degree of positive self-selection bias, as those suppliers with better performance were more likely to share their SAQs. However, assuming this bias had a significant effect, it would mean that more representative SAQ results would then on average be even lower, with those supplier locations 'required' to fill out the SAQ bringing down the average score.

A further limitation relates to the supplier country differences and potential cultural differences. A third of all SAQs and over half of all ISQs collected came from supplier locations in Germany. Interestingly, in both cases the German average scores were not as high as expected, particularly compared to other countries. With over 12,000 ISQs and nearly 2000 SAQs these country samples represented two large datasets for Germany-based suppliers and yet the average scores were significantly different (ISQ: 86%; SAQ: 62%). Due to the unreliability about the accuracy of the ISQ scores it would be worth focussing our attention on the SAQ scores. Unfortunately, the next largest country samples only involved a few hundred suppliers and thus cross-country comparisons are not fruitful. AsZamur et al. (2017) have recently shown in their research, there is preliminary support for their hypotheses that cultural and institutional background can influence the perception of suppliers' managers of their customers' sustainability requirements and the probability that they will be motivated to comply with them. As part of our research to manage and gather supplier's responses, it also became clear that language dif-

ficulties meant that some suppliers understood that "yes" was the desired response, but not necessarily the content of the questions. Another important, potentially limiting factor on our results was company size. The SAQ requires formalised certifications (e.g. ISO 14001) and internationally certified management systems that are complex and expensive. For smaller suppliers such 'sustainability investments' represent a larger personnel and financial burden. Another limitation may be the timing of our research, as the SAQ (a tool employed by DRIVE sustainability) is finding increasing usage both within AFC and across the group of participating companies.

Finally, this research postulates probable explanations for suppliers' responses to an SSCM self-assessment tool. These conclusions are based on thorough, qualitative analysis of a large number of questionnaire responses and observations of the management of the questionnaires over a five-year period at AFC. However, the research did not follow-up with suppliers to ask them for explanations of their responses. Future research should focus on suppliers' perspectives on such SSCM assessment tools in order to make the processes and tools even more effective in terms of improving SSCM transparency and performance.

### 6.3 Relevance of this research for SSCM

Our research aimed to critically examine an under-researched and yet centrally, operationally important component of established SSCM. By analysing two cases of sustainability self-assessment questionnaires, we could show that the setting in which such a tool is placed is important. Companies are well advised to consider psychological and organisational behaviour aspects surrounding the design of questionnaires before using them blindly as instruments that should inform SSCM strategy. Standardised questionnaire processes (at industry level, for example) reduce the burden on suppliers and potentially increase the chance of accurate results, as the supplier anticipates the validation and importance of their responses. If supplier sustainability assessment tools have a higher probability of returning more realistic and differentiated responses, then more reliable sustainability data can be generated. This more representative supplier data can lead to more focussed supply chain sustainability strategies and improved supply chain risk management, based on real data rather than estimations. The unexpected emergence of the Covid-19 pandemic and the serious disruptions it caused to global supply chains brought wider public attention to the vulnerability and centrality of SCs to our global economy. Sustainable supply chain management can continue to gain in significance through these recent developments as companies and consumers try to better understand where their products come from and how to make supply chains more resilient. Well designed and implemented SAQs, such as those case-studied in this research, could expand their scope, to include further aspects to better prepare for future pandemics and contribute to more sustainable supply chains.

Future research on SSCM assessment could focus more on country comparisons of sustainability performance, changes in supplier sustainability performance over time, cultural differences regarding sustainability disclosure, and testing the correlations of sustainability self-assessment questionnaire results with sustainability audit results. Given the increased interest in sharing assessment data among SC actors, research should also be directed towards how inter-industry assessment data can be exchanged (e.g. between the mining extraction sector, the automobile industry and the chemistry industry). Then companies can surpass questionnaires of the ilk "Are you ethical? Please tick yes or no" (Crane 1999).

**Funding** Open Access funding enabled and organized by Projekt DEAL.

**Conflict of interest** I. J. Fraser, M. Müller and J. Schwarzkopf declare that they have no competing interests.

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## Appendix

**Table 5** Side-by-side comparison of the two questionnaires, matched by relating sustainability area

| Internal Sustainability Questionnaire (ISQ) | Self-Assessment Questionnaire (SAQ) |
|---|---|
| **1. Company Information** | **A. Company Management** |
| (Not part of ISQ—general company questions asked elsewhere) | *1. Does your company have a management person responsible for:*<br>1a. Social Sustainability *****<br>1b. Business Conduct & Compliance *****<br>1c. Environmental Sustainability *****<br>*2. Does your company publish a corporate social responsibility report/sustainability report?******<br>2a. Is your most recent report 3rd party assured? *****<br>2b. Are the operations of all your company sites included in that report?<br>*3. Does your company have a Code of Conduct in place?******<br>3a. Is the Code of Conduct enforced at this site?<br>*4. Do you organise training sessions to enhance the understanding of Corporate Social Responsibility/Sustainability at your site?*<br>4a. On which of the following topics do you organise training sessions:<br>– Code of Conduct<br>– Social Issues<br>– Anti-Corruption & Ethics<br>– Health & Safety<br>– Environmental Management<br>*5. Have employees from your site participated in external Corporate Social Responsibility/Sustainability training?*<br>5a. Who organised the training:<br>– An OEM *****<br>– The Automotive Industry Action Group *****<br>– European Working Group on SC Sust. *****<br>– Other<br>*6. Does your company participate in any voluntary CSR/ sustainability initiatives?* ***** |

**Table 5** (Continued)

| | |
|---|---|
| **2 Sub-suppliers**<br>2.1 Does your company have its own suppliers/service providers<br>2.2 Are there specifications for environmental protection which you apply to your own suppliers/service providers?<br>2.3 Are there specifications for the terms and conditions of employment which you apply to your own suppliers/service providers?<br>2.4 Are there specifications on health and safety issues which you apply to your own suppliers/service providers? | **E Supplier Management**<br>*20. Does your company have a supplier CSR/ Sustainability Policy?* *****<br>20a. Which areas are covered by this policy?<br>– Respect for human rights<br>– No forced or compulsory labour<br>– No human trafficking<br>– No child labour<br>– Working conditions<br>– Remuneration<br>– Non-discrimination<br>– Freedom of association<br>– Collective bargaining<br>– Anti-corruption and bribery<br>– Healthy and safety<br>– Environment<br><br>20b. Which supplier category is covered by your CSR/ Sustainability policy?<br>– Direct procurement suppliers<br>– Indirect procurement suppliers<br><br>*21. Does your company communicate its CSR/Sustainability policy to its suppliers?*<br>21a How is the supplier CSR/Sustainability policy communicated?<br>– During supply meetings<br>– In contractual terms<br>– Brochures, magazines, newsletter, webpage<br><br>*22. Which processes do you have in place to ensure that your Supplier Sustainability Policy is efficiently implemented by your suppliers?* *****<br>– Self-assessment questionnaire<br>– Audits conducted by the company<br>– Supply meetings<br>– Audits conducted by an external 3rd party auditor<br>– Other (please specify)<br>– None |
| **3 Compliance with the Law**<br>3.1 Does your company have processes and structures installed, controllingthe compliance with local laws? (Compliance Management Systems-CMS-)<br>3.2 When will you have installed a Compliance Management System-CMS? | **C Business Conduct and Compliance**<br>*13. Does your company have a formal policy in place regarding business conduct and compliance? (corruption, extortion, bribery)* *****<br>13a. Are the following areas covered by this policy or the related processes & procedures?<br>– Corruption, including extortion<br>– Bribery<br><br>*14. Does your company have a formal policy in place regarding Competition Law Compliance?* *****<br>14a. Does this site have a documented business conduct & ethics management system in place? ***** |

**Table 5** (Continued)

| | |
|---|---|
| **4 Environmental Protection**<br>4.1 Creation and application of environmental management system<br>4.1.1 Have you set up a certified environmental management system?<br>4.1.2 If yes → Stop; If no → following questions:<br>4.1.3 Is an environmental management system without certification in use?<br>4.1.4 Does your organisation have a contact person with responsibility for environmental protection?<br>4.1.5 Do you have binding environmental guidelines/objectives and/or an environmental policy?<br>4.1.6 Did you define responsibilities in respect of environmental protections of your company?<br>4.1.7 Does a record exist of compliance with statutory and company regulations on environment protection?<br>4.1.8 Are your employees informed and qualified in respect of environmental protection | **D Environmental Sustainability**<br>*15. Does your company have a formal environmental policy, which includes a commitment to legal compliance, continuous measurement andcontinuous improvements in environmental performance?* *****<br>15a. Are the following areas covered by this policy or the related processes and working procedures?<br>– Energy consumption<br>– Water Usage<br>– Air Emissions<br>– Waste Management<br>– Restricted substances & chemical handling<br>– Other areas, please specifiy<br>15b. Does your company have annual objectives and activities accordingly in the areas covered by your environmental policy? *****<br>*16. Does this site have an environmental management system in place?* *****<br>16a. Is the system certified? *****<br>If no → 16aa. Have internal environmental audits been conducted at this site? *****<br>*17. Do other production sites/locations have a certified environmental management system?* *****<br>*18. Does your facility use restricted substances or chemicals for your production? If yes → 18a.*<br>18a. Does your facility have work procedures to manage the use of restricted substances and chemicals? *****<br>18b. Has the management system used for managing the usage of restricted substances or chemicals been certified? *****<br>*19. Do you upload your material data to the International Material Data System (IMDS)?* |
| **5 Social Standards**<br>5.1 Contact Person<br>5.1.1 Does your organisation have a contact person that is responsible for social standards?<br>5.2 Freedom of association<br>5.2.1 Do you grant your employees the right to form and/or join trade unions or employee-elected representative bodies in accordance with national statutory regulations?<br>5.2.2 Where this right is limited by local laws, are there alternative forms of co-determination for employees in your organisation<br>5.3 Discirmination<br>5.3.1 Do you guarantee equal opportunity and treatment—regardless of ethnic origin, skin colour, gender, religion, nationality, sexual orientation, social origin or political views as long as these views are based on the democratic principle and tolerance towards those who hold different views?<br>5.4 Forced labour/child labour<br>5.4.1 Do you use forced or compulsory labour, or involuntary work performed bydetainees?<br>5.4.2 Do you observe the minimum age in accordance with the statuatory regulations governing employment in the country concerned?<br>5.5 Remuneration<br>5.5.1 Are the remuneration paid and benefits provided at least equivalent to the national standard or minimum standard of the relevant national sector?<br>5.6 Working hours<br>5.6.1 Are the working hours at least in line with the national statutory guidelines or standards of the relevant national sector?<br>5.7 Employee information<br>5.7.1 Are your employees informed and qualified in respect of social standards? | **B Social Sustainability**<br>*7. For which of the following social issues does your company have a policy in place?* *****<br>– Respect for human rights<br>– No forced or compulsory labour<br>– No human trafficking<br>– No child labour<br>– Working conditions<br>– Wages & Benefits<br>– Non-discrimination<br>– Freedom of association<br>– Collective bargaining<br>*8. Does your site have a certified management system in place to manage the above mentioned social issues?* *****<br>– No, on none of the above<br>– Yes (please upload SA8000 Social Management System) *****<br>– No, but have internal documented procedures and policies *****<br>*9. Have social audits/assessments been conducted at this site?* *****<br>– No<br>– Yes, internal audits<br>– Yes, external 3rd party audits ***** |

**Table 5** (Continued)

| | |
|---|---|
| **6 Health and Safety at Work** | *10. Does your company have a written health & safety policy in place, which complies with industry, national and international standards? ** |
| 6.1 Are health and safety duties and responsibilities clearly regulated in your organisation? | 10a. Have specific activities on health & safety been organised at this site during the last year? * |
| 6.2 Are hazards evaluated in your organisation, and are the resulting protective measures developed and implemented and is their effectiveness monitored? | *11. Does this site have a health & safety management system in place? ** |
| 6.3 Are precautionary medical examinations carried out in your organisation? | 11a. Is the system certified? * |
| 6.4 Does your company have an internally organised first aid facility? | If no → 11aa. Have internal H&S audits been conducted at this site? * |
| 6.5 Are your employees given instruction on the hazards and protective measures associated with their field of activity? | *12. Do other production sites/locations have a certified health and safety management system? ** |
| | **F Special Areas** |
| | *23. Is the 3TG (tantalum, tin, gold or tungsten) necessary to the production of your company's products and contained in the finished product that your company manufactures or contracts to manufacture?* |

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# Exploring Supplier Sustainability Audit Standards: Potential for and Barriers to Standardization

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Received: 10 September 2020; Accepted: 2 October 2020; Published: 6 October 2020

**Abstract:** Global focal companies are increasingly required and expected to monitor the sustainability risks and activities in their supply chains, which has resulted in increasing supplier sustainability audit activity and growth in the number of sustainability initiatives/associations. While common, shared audit standards were originally conceived to reduce audit fatigue; with overlapping and converging supply chains there could be a need for cross-recognition or standardisation of supplier audit standards. This research aims to provide empirically grounded insight into sustainability audit activity, audit processes and standards for suppliers and the extent to which they overlap. Audit standards employed by eight multi-brand, voluntary sustainability initiatives/associations, focusing on supply chain sustainability (SMETA, PSCI, ICTI, FWF, ASI, JAC, amforiBSCI and RBA) were inductively analysed. This research compares the audit processes and standards, detecting common audit categories, analysing points of overlap and difference. We find empirical evidence of significant growth in supplier sustainability audit activity. We also find overlap among the standards in terms of audit process and steps, as well as at the level of audit focus categories. Deeper analysis reveals large differences at the granular level in terms of questions asked to assess specific topics. We conclude that there is potential for standardisation and cross-recognition but that significant barriers to agreement at the level of audit questions and how topics are evaluated remain. This research provides a first empirical overview of this important tool and its application in various industries for sustainable supply chain management.

**Keywords:** SSCM; supplier sustainability audits; ethical audits; sustainability alliances; industry initiatives; supplier audit fatigue

## 1. Introduction

Given that the global supply chains of multinational Focal Companies (FCs) constitute over 80% of trade worldwide [1], it is not surprising that influential FCs are increasingly held accountable for the (lack of) sustainability in their supply chains [2–4]. A mounting body of literature has focused on the importance of the purchasing/procurement function in FCs [5–8] and the strategic necessity of incorporating sustainability into supply chain management (SSCM) [2,3,9–12]. Supply chain sustainability expectations of influential global FCs have been steadily increasing [13–16]. As a result, FCs are expected to take responsibility for improving sustainability in their supply chains [17], by: formulating extensive sustainability requirements, analysing sustainability risks, measuring, monitoring and improving the sustainability performance of their suppliers and communicating about their SSCM activities [1,18–20].The most common first response by firms to such sustainability expectations of their supply chain management (SCM) has been to formulate codes of conduct for their

suppliers [21,22]. However, FCs are also required to determine their suppliers' compliance with such codes and monitor suppliers' efforts to improve sustainability in their supply chains [6,23–28].

By 2020 there has been a proliferation of different private, voluntary, corporate sustainability initiatives/associations [29–31] that have developed their own common audit standards. Member companies commission supplier sustainability audits that are carried out against these standards. Companies join such 'strategic alliances' [31–33] for a number of reasons, including to pool resources, increase the scope and reach of their SCM sustainability activities, share sustainability risk management efforts, reduce the redundancy and costs and correspondingly improve the efficiency of such activities [30,34–38]. In the context of SSCM, such initiatives also point to the urgent need to redress supplier assessment fatigue, and specifically audit fatigue [27,36,38–41]. Qualitative, empirical research on the practices and activities of these private strategic alliances for supply chain sustainability are lacking. Based on our evaluation of current SSCM developments, we surmise that the number of supplier sustainability audits is increasing worldwide. We further propose that numerous emerging supplier sustainability audit standards (SSAS), developed by and conducted for the FC members of voluntary sustainability initiatives and associations (SI/As), are potentially similar, both in terms of the audit process and the sustainability topics that they cover. Therefore, such audit standards could potentially be mutually recognised, not just within a SI/A but among different SI/As and thus various industries, and we can postulate about the potential of and limits to standardisation. The objective of this research is to explore and better understand the phenomenon of SSAS, including its prevalence. The researchers aimed to collect and generate empirical data on these audit standards in order to qualitatively analyse and compare them, to determine potential for cross-recognition and standardisation.

Many FCs have broad, complex supply chains that can involve many hundreds, multiple thousands or even tens of thousands of suppliers [14,42–44], meaning that suppliers can often supply parts or provide services to multiple industries. For example, the electronics industry increasingly overlaps with automotive [45] but also toy and children's entertainment industries [46]. Once suppliers are in business with multiple FCs that are members of different SI/As, each with their own audit standard, the chance of suppliers being audited against various, differing audit standards increases. Given a continual growth in SSCM activities [1,17,47–49], it is likely that audit activity will continue to proliferate and hence that more and more suppliers will be audited [50]. Furthermore, voluntary, private industry initiatives, raw material sustainability groups, corporate strategic alliances for supply chain sustainability (and so forth) continue to proliferate and each often employs its own sustainability standards and audits [30,50,51]. This could plausibly lead to an emerging situation of significantly overlapping audit activity and a new type of 'audit fatigue'. No longer caused by the audit requirements of individual global companies, but rather by overlapping, differing SI/A audit standards.

Thus, our research begins by exploring what different supplier sustainability audit standards (SSAS) there are. In this paper we identify eight different SSAS, each from a different industry initiative/sustainability association and analyse them in detail to understand what the supplier audits entail and what aspects of sustainability they cover. We then compare the scope and processes of the SSAS, to better understand the extent to which they overlap and what barriers there are to standardising SSAS, thus reducing supplier assessment fatigue and competition among SI/As. This leads to our research questions:

- RQ1: What are main audit process characteristics of supplier audits developed by multi-brand sustainability initiatives/associations and to what extent are they similar?
- RQ2: What are the main sustainability aspects covered by SSAS developed by SI/As and to what extent does the content of their audit standards overlap?

This research was undertaken based upon the central motivating research proposition that supplier sustainability audit standards (SSAS) are similar both in terms of process and structure, and that therefore, mutual recognition (not just within an industry initiative/corporate association) but also

among SSAS should be practicable. In order to test this central proposition, we need to answer the research questions detailed above. In the next section we begin by presenting background information and a summary of literature on the development of audits as SSCM evaluation tools and on private sustainability initiatives and associations. We also clarify the term supplier sustainability audit, as this constitutes the unit of analysis for the present research. This is followed by a description of our empirical research approach, outlining which SSAS form the basis of our analysis and how the data was collected, compared and analysed. Thereafter we present our findings, outlining the similarities and differences among the SSAS in our sample. Finally, we discuss the significant similarities found but also the problematic differences at the level of the individual audit protocols/questions, depicting barriers that need to be overcome for supplier sustainability audit standardisation to become a practicable reality.

## 2. Literature Review

Multi-national companies have profited from globally dispersed supply chains (SCs) for some decades [27,52,53]. However, particularly in the last decade, sustained critical attention and increasing stakeholder pressure have focused public attention on the negative effects FCs have had by pursuing low-price purchasing strategies and critics underline the responsibility that FCs have to improve the sustainability in their SCs [2,7,13,16,54–56]. The emergence of SSCM, which began as a fringe sub-topic of supply chain management [57] can be seen as a response to this stakeholder pressure [2]. The remarkable growth and massive research activity in SSCM attest to the continued academic significance of the topic [3,10,15,58–60], which has also become a seemingly indispensable part of FCs' sustainability activities [2,6,61]. Roy et al. [15] take stock of the approaching overwhelming amount of literature on SSCM and develop a thematic landscape schematisation of SSCM research since 2000, in which they prescribe understanding SSCM as a process that begins with adoption, then implementation and extension, and continues with maintenance and then analyses of outcomes. By contrast, Dubey et al. [58] put forward a schematic categorisation, dividing SSCM into six major areas, each covering multiple SSCM aspects and activities (such as supplier codes of conduct, audits and assessments). Companies often begin with a supplier code of conduct, in which they stipulate their expectations of their suppliers in terms of minimal standards [22,38,62]. Thereafter, companies increasingly begin to apply monitoring mechanisms and tools to be able to prove whether suppliers were adhering to those stipulated standards [1,22] and as a means of sustainability risk management [2,7,63] and supply chain governance [18,24,64]. In the following section we summarise extant literature on supplier assessments in more detail, particularly audits, explaining our choice of the term supplier sustainability audit, narrowing in on the phenomenon of supplier audit fatigue and then finally the emergence of private, voluntary corporate sustainability initiatives and associations for supply chain sustainability. This provides more context for the inductive research at hand, making the gap in empirical understanding evident and the necessity for our research questions clearer.

### *2.1. Supplier Assessment for SSCM*

A number of standard SSCM tools have been identified, which FCs employ to ensure minimum standards, identify and minimise risk and improve sustainability in their supply chains [7,18,25,31,58,62,65]. The most common, easily-implemented tool is the code of conduct for suppliers [22,66], followed by supplier self-assessment questionnaires and then by more resource-intensive supplier audits [1,13,67,68]. A code of conduct outlines a company's expectations of its suppliers' sustainability compliance. Self-assessments and audits can be employed to verify compliance with such codes as well as for sustainability risk management [7,63], to identify, analyse and manage sustainability risks and activities within the FC's supply chains. While pure self-assessment relies on the self-reported estimation of the supplier, audits are normally commissioned by a third party or a downstream SC actor (usually the FC) to determine the sustainability performance of the supplier and whether the supplier conforms with environmental and social sustainability requirements [1,20]. Because many FCs began by administering their own supplier sustainability

assessments [40,69], many suppliers were subjected to a broad array of similar but different sustainability audits. Before moving on to explore the issue of supplier audit fatigue and the emergence of SI/As for SSCM, we briefly clarify the term supplier sustainability audit, which constitutes the primary focus and unit of analysis of the present research.

Clarification of Terminology: Supplier Sustainability Audits (SSAs)

The term sustainability audits can entail the following types of audits: CSR Audit, Social Audit, Ethical Audit, Environmental Audit, etc., as well as addressing a supplier of an FC. Although we note the use of the term 'ethical audit,' including references to audits of suppliers' sustainable behaviour [39,46,51], we consider that term too broad and open to too much interpretation. For example, ethical audits have been proposed as audits that evaluate a company's latent and manifest alignment in its operations with ethical values [70]. Hence for this research, we prefer the term *supplier sustainability audit* (SSA), which makes it clear that the audits are not optional, voluntary audits (such as SA 8000, ISO 45001 etc.) that an organisation decides to undertake itself, but rather are audits requested, commissioned and demanded by FCs. SSAs encompass audits of the suppliers' operations (headquarters and/or production facilities) with the aim of evaluating the supplier's sustainability practices and compliance with sustainability requirement, including an assessment of both social and environmental aspects of sustainability.

### 2.2. Supplier Audit Fatigue

Given the noteworthy increase in the focus on SC sustainability and companies' general preference for a voluntary approach to sustainability self-regulation [27,71,72], it is not surprising that there has been a corresponding increase in audit activity, voluntarily commissioned by focal companies [1,38–40,73,74]. The multiplicity of standards and assessments that confront supplier factories can lead to "audit fatigue" [27,38,40,41]. To gain an appreciation of the vast amount of supplier sustainability audit activity occurring, consider that an ethical trade service provider, Sedex, reported having conducted nearly 300,000 audits by 2018 [75]. From an FC perspective it can be a very demanding task to assess the sustainability activities of *all* direct suppliers in their supply base. Thus, FCs in various different industries join SI/As focused on SC sustainability, in order to pool resources, and implement common supplier sustainability assessment tools and systems [31,76]. Doing so removes the double disincentive of (1) high investment costs in sustainability activities and (2) being the 'only' FC with such demanding expectations of their suppliers [37,38]. Initially such strategic alliances of companies with similar goals led to process standardisation and efficiencies, reducing audit fatigue [38,69], so that suppliers no longer had to respond to the same type of assessment issued by competing purchasing FCs [22,36,37,73]. SI/As not only developed and share their own common audit standard, but also share audit results or even conduct common audit assessments i.e., [19,36,46,68,73,77,78].

### 2.3. Private Sustainability Initiatives and Associations for SSCM

In 2011, the OECD first released guidelines for multinational enterprises, in which they suggest that FCs engage and encourage their suppliers to improve their sustainability performance [19,20]. Already at that time, the OECD recognised the potential for 'conflicting requirements' that could overlap whereby a supplier is exposed to audits and other SSCM practices of multiple FCs [79]. The OECD guidance also encourages participation in cooperative arrangements among companies, e.g., in a common industry, to advance SSCM by coordinating tasks, including independent audits [12,79]. And indeed, private supply chain initiatives and associations were founded in response to pressure for increased sustainability compliance and monitoring and to fill a gap for such coordinated services [34,80]. Furthermore, they serve as a platform for FCs to exchange good practice regarding standards, processes, tools and approaches to sustainability in supply chain management such as sustainability audits [30,62,65,76,79]. Fransen et al. note that the majority of activity defining "appropriate business practices are taking place in collaboratively developed and governed CSR standards" [81]. They further

indicate recent work done to compile a database of multi-stakeholder initiatives (for more detail, see M.S.I. Integrity 2017 [29]) and differentiate between different varieties of international CSR standards, private initiatives and associations, based on characteristics such as: composition between civil society, private firms and government, geographic focus on producing countries or buyer countries and degree of formalisation [81].

We note that there has been much focus on multi-stakeholder initiatives [29,37,38,73,82] and that various stakeholders are sceptical of business-driven standards and initiatives [39]. Canzaniello et al. [31] analyse intra-industry multi-brand strategic alliances and note that these are now focusing on collaborating to address supply chain sustainability risks. In a recent analysis of the German context, Mueller and Bessas find that "companies increasingly found or join industry initiatives (Brancheninitiativen) to achieve sustainability in supply chain management" [30]. Such initiatives can be considered strategic alliances [32,33] that involve a formal association of companies (often within a branch/industry) and that use their pooled knowledge and resources to develop common tools for assessing and evaluating supplier sustainability [30,71,83], including standards for supplier sustainability audits. Such initiatives have the potential to achieve consensus around sustainability standards in their respective industry's supply chains and thereby to sensitise suppliers in those respective industries [36]. Despite a seemingly common purpose, Mueller and Bessas find multi-brand supply chain sustainability initiatives and associations to be rather heterogeneous and to demonstrate widely varying focuses for their activities, including a range of instruments and tools [30].

Previous research had focused in depth on one or two initiatives/associations e.g., [36,37,73,84], normally with a specific industry focus or a high-level survey of what initiatives, associations and standards there are (e.g., Newitt [38]). Thus, our research aims to shine light on numerous emerging multi-brand SI/As for supply chain sustainability, to determine the current state of affairs with regard to their audit standards and activity, and then to explore the potential for aligning/standardising such audit standards. As Terwindt and Armstrong [50] convincingly argue, supplier sustainability audits are very much part of the current SSCM reality that has firmly established itself. Hence the onus is on academia to understand this phenomenon and seek to improve it. We began our exploratory research on SSAS by identifying a wide range of examples of such multi-brand, private SI/As that represent activities within and across multiple industries. We wanted to find illustrative examples of *shared* audit standards that are being employed by private company alliances for sustainable supply chains. The research then involved capturing the number of audits conducted over the last decade and the audit processes entailed in these shared audits. Furthermore, we intended to create a dataset including the structure of each audit standard (including the categories the audits address and specific content of the audit standards and audit protocols in the form of questions). In the following section, we describe the methods employed to identify the standards included in our sample and explain how the data was collected and analysed.

## 3. Data and Methods

In this section we outline our qualitative, inductive and exploratory research methods [85–88]. This includes how the exploratory research was approached, how the sustainability initiatives and associations (SI/As) with common sustainability audit standards for their suppliers were selected, how the audit data from the identified SSAS was collected and finally how it was collated, analysed and compared.

### *3.1. Research Approach*

Our survey of the extant literature revealed no empirical insights into audit activity, neither an analysis or comparison of audits being employed as part of SSCM, nor a discussion about the implications of parallel audit standards. Discussing exploration as one of three purposes for qualitative research, Yin [88] notes that explorative research fulfils a number of functions while pursuing various research goals. These include an exploration of under-researched phenomena of interest, an account

of *how* to explore the issue, as well as generating findings that may serve as the basis for more refined research. Our research began in late 2017 with a perceived increasing number of industry initiatives and corporate associations that have developed and aligned their own audit standards for monitoring supplier sustainability. The initial underlying assumption motivating this research was that if there are similar (or divergent/competing) overlapping audits, increasing in number and frequency, being conducted by a broad range of voluntary, multi-brand SI/As, such audit standards could be cross-recognised or eventually standardised to reduce duplication of effort and supplier audit fatigue. Before this proposition could be addressed, the researchers needed to gain a deeper qualitative understanding of what SI/As there are that focus on supply chain sustainability and also employ a common audit standard, conduct audits and share the audit results amongst members. The unit of analysis for this research is the supplier sustainability audit standard (SSAS). Initial SSAS data (such as audit process steps, audit standard structure, sustainability categories focused on and detailed composition down to the level of questions asked) were collected in the form of audit protocol/question catalogues, and analysed and compared in early 2018. The research took an iterative approach to collecting, analysing and generating data, whilst expanding the empirical sample [89].

This research employed an iterative 'purposeful sampling' approach [86,89], aiming to identify an array of standards that would provide rich, empirical data from a range of industries. The initial focus and research on the first few discovered SSAS (belonging to the SI/As: SMETA, ICTI, PSCI and FWF) helped attune the researchers to what to search for and how to collect further data. Once data had been collected and collated for all eight SSAS (see Table 1 below), text analysis, coding and detailed analysis of the audit standard data began in late 2019 and continued into 2020. Finally, in 2020 the researchers contacted various SI/As to gain access to older annual reports, ascertain missing audit number data and for final clarification of findings.

### *3.2. Data Collection*

The research on initiatives and associations began in late 2017. The primary exploratory criteria for including SI/As were: publicly available audit protocols and audit process information; different industry representation; private, voluntary organisations (not primarily multi-stakeholder); and an audit standard that was actually being used and shared among members. Data from the following SI/As were downloaded in early 2018: SMETA, PSCI, ICTI and FWF. The sample was then expanded later in 2018 to include the audit protocols of: ASI, JAC, amfori BSCI and RBA. The intensive data collation and initial analyses began in 2018. All audit standards (SSAS) included in our sample were publicly available via the internet. The content of each audit standard/protocol was copy and pasted or transcribed into various excel tables, in order to compile master lists and a master table, to enable side-by-side comparison of their structure and content. Examples of the audit standard documentation and protocols as well as the tables created to compare and contrast the data can be found in the Supplementary Material.

Once a SSAS had been identified, initially screened for relevance and determined to be included in the sample, the search for different SSAS continued. Once a representative standard had been identified for a particular industry/branch focused association, no more effort was made to find further SSAS in the same industry. Rather, the focus was on other industries to generate a sample that was as broad as possible and hence as indicative as possible of SSAS irrespective of industry affiliation. Consequently, this research involved a comparative analysis of the SSAS of eight identified sustainable supply chain initiatives and associations. The SSAS that comprised our final sample can be found in Table 1.

**Table 1.** Research sample of sustainability initiatives/associations & supplier audit standards (SSAS).

| Name of SI/A (&SSAS) | Acronym | (SI/A) type [31]: Multi-brand vs. Multi-Stakeholder; Intra-industry vs. Cross-Industry; Horizontal vs. Vertical vs. Mixed | SSAS Documents Accessed/ Downloaded |
|---|---|---|---|
| Sedex (SMETA) | Sedex Members' Ethical Trade Audit | Multi-brand; Cross-industry; Mixed; | July 2018 |
| ICTI (IETP) | Interntl. Council of Toy Industries ICTI Ethical Toy Program | Industry Focus: Toy manufacturing; multi-brand/multi-stakeholder; intra-industry; Mixed | July 2018 |
| PSCI | Pharmaceutical Supply Chain Initiative | Industry Specific: Pharmaceuticals; Multi-brand; Intra-industry; Horizontal | July 2018 |
| FWF | Fair Wear Foundation | Multi-stakeholder; Intra-Industry: Apparel; Horizontal | July 2018 |
| ASI | Aluminium Stewardship Initiative | Industry (Raw Material) Specific; multi-brand & multi-stakeholder; Mixed | Sept. 2018 |
| RBA (VAP) | Responsible Business Alliance (formerly EICC) Validated Audit Program | Multi-brand; Formerly intra-industry—Electronics—now increasingly cross-industry, from horizontal to increasingly mixed (smelters/component processing). | July 2018 |
| JAC | Joint Audit Cooperation | Multi-brand; Intra-Industry (Telecom); Horizontal | Sept. 2018 |
| amfori BSCI | Business Social Compliance Initiative | Multi-brand; cross-industry; Horizontal | Nov. 2018 |

Appendix D.

Although 11 industry initiatives and associations were initially identified, the actual audit protocols could only be accessed in nine cases. The final sample only includes eight SI/As because after further investigation, it became apparent that GSCP audit standard was more of an ideal for member companies to orient themselves toward, and not a standard that had been broadly audited against. Also, audit numbers could not be disclosed. The chemical industry's Together for Sustainability (TfS) was not included in the comparison because we could not find publicly available information on the audit questions included in their common standard. The conflict free smelter initiative (CFSI, later expanded to become the responsible minerals initiative—RMI) was initially considered, but due to the varying audit types, depending on supply chain role (i.e., whether the auditee is a manufacturer, traders, or processor etc.) could not be considered as one standard and were not comparable with the other unitary SSAS.

The data collected for this research was not intended to be used to create a complete or comprehensive database of all multi-brand SSAS but rather to enable a comparison of SSAS from a broad as possible range of different industries and from associations with different focuses to explore potential differences and similarities in terms of their potential for mutual recognition and standardisation.

### *3.3. Data Comparison and Analysis*

As described in Section 3.1 and evident in Table 1, data collection occurred in a number of phases. This was also applied to the analysis and comparison of the SSAS data that was collected in an exploratory and iterative manner. Once the SSAS audit process and audit composition data could be accessed, it was downloaded. This information was converted into Excel format to enable a disaggregation and then itemisation of individual process steps and audit questions. Once the data had been tabularised and juxtaposed, the SSAS could be better compared. The first comparison involved a

comparison and analysis of the audit phases and audit process steps of each SSAS. This was followed by an analysis of each SSAS to determine the major categories that comprised the audits, to understand how each of the audits were structured. Once this had been determined, the ensuing categorisations were employed to compare the SSAS in a structured manner (Appendix A). With comparable categorisations we could show the degree to which the SSAS overlapped and resembled each other at a higher level. Further analysis involved determining the number of individual questions to be answered or checked by the auditor on a certain topic as well as specific questions within a main category, to ascertain the potential for cross-recognition among SSAS and perhaps standardisation. In the following section we present our findings based on the explorative research.

## 4. Findings

Our exploration of various SI/As and the ensuing in-depth analyses of the audit processes and comparison of the content of the eight identified SSAS uncovered a lot of information. Not only could we understand and compare the standards' audit processes, but also the sustainability categories they focused on and the questions asked as part of such shared audits. To get a sense of how much audit activity is occurring (and to test our initial proposition that SI/A audits are increasing) and the scope of SI/A's activities, we compiled data on the number of shared audits conducted yearly by each SI/A (see Table 2).

**Table 2.** Annual Audits conducted by each multi-brand SSA initiative.

| Sust. Initative/ Association | Total 2010–2019 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sedex SMETA | 156,697 | 7893 | 9182 | 10,291 | 12,499 | 14,644 | 14,749 | 16,045 | 19,738 | 25,476 | 26,180 |
| ICTI - IETP | 29,626 | 2454 | 3507 | 2550 | 2057 | 2887 | 2761 | 3756 | 3721 | 3123 | 2810 |
| PSCI | 984 | | | | 91 | | | 83 | 148 | 270 | 392 |
| FWF | 1588 | 8 | 79 | 120 | 175 | 161 | 187 | 220 | 230 | 212 | 196 |
| ASI | 80 | - | - | - | - | - | - | - | - | 16 | 64 |
| RBA | 4186 | 97 | 157 | 348 | 422 | 512 | 504 | 538 | 786 | 822 | 1007 |
| JAC | 539 | 21 | 18 | 35 | 37 | 37 | 61 | 68 | 89 | 89 | 84 |
| amfori BSCI | 124,265 | 0 | 0 | 35 | 215 | 9409 | 16,060 | 20,034 | 22,194 | 26,081 | 30,237 |
| Total | 318,972 | 10,488 | 12,958 | 13,394 | 15,420 | 27,665 | 34,338 | 40,744 | 46,906 | 56,089 | 60,970 |

In general, as Table 2 depicts, we observe a significant increase in audit numbers (and by inference activity) over the previous ten years, with a total of around 10,000 audits reported in 2010, and over 60,000 audits conducted against the same respective common audit standards by 2019. Some SSAS first began auditing in the last five years but many have been conducting audits since at least 2010. The degrees of transparency surrounding reporting of core facts such as numbers of audits conducted were also highly variable. Some SI/As (IETP, FWF) were highly responsive to our official requests for information, either producing audit statistics on demand and/or directing our attention to old annual reports, not easily found online. Other SI/As only produced audit numbers after repeated inquiry (Sedex, PSCI, JAC, amfori BSCI). Exploring and collecting data on the actual audits conducted and shared helped us to refine our sample; for example, it became clear that the Consumer Goods Forum's Global GSCP (Global Social Compliance Programme) audit standard was more of a reference or best practice benchmark, and not a standard that was being recurrently audited against, the results of which were shared among members.

Furthermore, all initiatives apart from the Fair Wear Foundation (who conduct their own, intensive audits) employed the services of third-party auditors. Hence, we analysed the number, concentration and overlap of auditing companies that were commissioned to audit suppliers according to the corresponding SSAS. Our research shows that there is significant variance among the SSAS, with SMETA currently working with around 60 different auditing companies (as of April 2020), whereas the other SI/AS contracted between 4 and 13 auditing companies, as depicted in Table 3.

**Table 3.** Number of auditing companies contracted to audit according to SSAS.

| SMETA. | IETP | PSCI | FWF | ASI | RBA | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|
| 60 | 4 | 12 | internal auditors | 13 | 12 | 4 | 13 |

The most frequently contracted auditing service provider was SGS (used by seven of the eight SI/As) followed by Intertek and TÜV Rheinland (who both audit against five SSAS) and Bureau Veritas Certification, ELEVATE and UL—Responsible Sourcing Inc. (each contracted by four SI/As). For a full depiction of which SI/As worked with which audit companies, please consult Appendix B.

In the following, in Section 4.1, we detail the overlaps in the audit process prescribed by each of the initiatives and associations. We then present the findings of our comparison of the audit protocols in Section 4.2, wherein we identify the SSA main categories (such as "no child labour and underage worker protection" and "working hours") and compare their frequency, in order to determine the level of structural overlap among the audit standards. Finally, in Section 4.3, the article focusses more specifically on the level of audit subcategories, which entail the detailed individual audit questions within an audit main category.

### *4.1. Comparison of Audit Processes for Supplier Sustainability Audit Standards*

Analogue to the process of analysis applied to the data, we begin by presenting our findings on the SSAS process. We were able to access the audit process information from eight of the SI/As identified for this research. The majority of the SI/As published their audit process online and these were publicly available. The ICTI Ethical Toy Program (IETP) provided detailed responses to our request for information on common audit process, pointing out that the process differs depending on whether an audit is announced or not. Five common main audit stages were identified: 1. Pre-Audit Planning, 2. Audit Preparation, 3. Audit Execution, 4. Audit Report & Corrective Action Plan (CAP) and 5. Follow-Up, Audit Closure. Stage 3. 'Audit Execution' was the most extensive stage across all SSAS analysed and we identified six audit steps within this phase that were nearly covered by all standards (see stages 3.1–3.6 in Table 4). The SSAS covered in our research demonstrated a high degree of homogeneity, as evident in the small number of exceptions where there was not 100% overlap among the SSAS in Table 4.

**Table 4.** Audit process phase-overlap among SSAS.

| Identified Audit Process Stages/Steps: | Found in How Many SSAS: | SMETA | IETP | PSCI | FWF | ASI | RBA | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|---|---|
| 1. Pre-Audit Planning | 7 | x | ○ | x | x | x | ○ | _ | x |
| 2. Audit Preparation | 8 | x | x | x | ○ | x | x | x | x |
| 3. Audit Execution | 8 | x | x | x | x | x | x | x | x |
| 3.1 Opening Meeting | 8 | • | • | • | • | • | • | • | • |
| 3.2 Site Tour | 8 | • | • | • | • | • | • | • | • |
| 3.3 Interviews | 8 | • | • | • | • | • | • | • | • |
| 3.4 Document Review | 8 | • | • | • | • | • | • | • | • |
| 3.5 Pre-Closing Meeting | 7 | • | • | • | • | • | • | _ | • |
| 3.6 Closing Meeting | 8 | • | • | • | • | • | • | • | • |
| 4. Audit Report & CAP | 8 | x | x | x | x | x | x | x | x |
| 5. Follow-Up, Audit Closure | 8 | x | x | x | x | ○ | x | x | x |

x = phase covered by SSAS; • = step covered by SSAS; ○ = phase briefly mentioned; _ = not covered.

These findings address our first research question, as they clearly demonstrate that, in terms of audit process phases and steps (prescribed and carried out in thousands of audits around the world) for various industries, the SSAS do overlap to a large extent.

### *4.2. Common Audit Main Categories among Supplier Sustainability Audit Standards*

By extracting the written structures and indexes of the SSAs and collating and juxtaposing them, we found a high level of overlap among the eight SSAS analysed. Thirteen main, common sustainability categories were identified, as displayed in Table 5 below. Of the 13 main categories identified, seven categories were found in all SSAS (marked bold in the table), including: 2. Freely chosen employment, 3. Child labour and protection of underage workers, 4. Fair remuneration, 5. Working hours, 6. No discrimination, 8. Freedom of association and 11. Facility safety systems. Six further main categories were identified that were identified in at least three quarters of the SSAS, but not all. The second column (Count) in Table 5 tallies the number of initiatives/associations that included these categories in their audit standard. The data revealed that, similar to audit processes (refer to Section 4.1 above), the SSAS we analysed demonstrated a high degree of overlap, in terms of their structure, main categories and overarching content.

**Table 5.** Main sustainability categories identified and extent of coverage in SSAs.

| Identified Main Categories: | Frequency Count of Categories: | SMETA | IETP | PSCI | FWF | ASI | RBA | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|---|---|
| 1. Management Systems | 7 | x | – | x | x | x | x | x | x |
| **2. Freely Chosen Employment** | **8** | x | x | x | x | x | x | x | x |
| **3. Child Labour & Young workers** | **8** | x | x | x | x | x | **X** | x | **X** |
| **4. Fair Remuneration** | **8** | x | x | x | x | x | x | x | x |
| **5. Working Hours** | **8** | x | x | x | x | ○ | x | x | x |
| **6. No Discrimination** | **8** | x | x | x | **X** | x | **X** | x | **X** |
| 7. Business Ethics | 7 | ○ | ○ | x | – | ○ | **X** | **X** | **X** |
| **8. Freedom of Association** | **8** | x | x | x | **X** | X | **X** | x | **X** |
| 9. Discipline, Discrimination Grievances | 7 | x | x | | X | ○ | x | ○ | x |
| 10. Fire & Emergency | 6 | | x | x | x | – | x | x | x |
| **11. Facility Safety Systems** | **8** | x | x | x | x | X | **X** | x | x |
| 12. Environment | 7 | x | x | x | | x | **X** | x | X |
| 13. Employment Practices | 6 | **X** | x | – | x | | x | x | **X** |

Category in Bold = covered by all standards. **X** = SSAS covered topic in detail; x = SSAS includes category; ○ = SSAS briefly mentions category; – = SSAS only covers similar/neighbouring topic; [Empty] = Category not covered by SSAS.

However, upon closer inspection, it became clear that some SSAS covered certain main topics in great detail (i.e., with ten or more audit questions solely addressing the specific sustainability issue) and their audit protocols contained many questions to evaluate a supplier's conformance and activity within this category. Other SSAS explicitly mentioned the category as an area of focus but only documented a few questions to be asked about the issue. A few SSAS either did not cover the topic at all or only mentioned neighbouring topics. The extent of coverage is indicated by the symbols in each cell in Table 5 (please refer to the legend). Once we had collated the audit protocols/audits structures and juxtaposed them for clearer comparison, it became apparent that the SSAS covered the categories to differing degrees. The findings presented here in Section 4.2 provide an answer to our second research question ("What are the main sustainability aspects covered by SSAS and to what extent does the content of their audit standards overlap?") by identifying 13 common audit focus categories and confirming that there appears to be a lot of overlap, at least at the structural level of the standards. While the exploratory findings at this aggregated level of comparison are a good indication of audit standard similarity, they certainly do not provide enough information to confirm or refute our initial research proposition, that SSAS could be cross-recognised or potentially standardised.

### *4.3. Analysis of Sub-Categories among Supplier Sustainability Audit Standards (SSAS)*

The preceding sections demonstrated the structural overlaps at the level of sustainability categories identified across most or all SSAS. But how much overlap was there at the detailed level of individual questions, asked as part of each SSAS? Compiling manageable tables from multiple-hundred-page audit protocols was a challenge for this research. In order to present the findings on the limits to

the overlaps, a much more granular level of detail is required. We selected two common audit main categories (identified in Section 4.2) that feature in all eight SSAS, and compared audit focus areas at the sub-category level (within the category) to demonstrate overlap and differences among the sampled audit standards at a finer level. A more detailed impression of the granular differences and similarities can be gained by consulting the Supplementary Material. We demonstrate findings from two main categories that were found to be included in all SSAS, namely 'working hours' and 'child labour and young workers'. Due to considerations of article length, a further detailed analysis of the main category, 'fire and emergency' (included in six of the nine SSAS), can be found in Appendix C.

#### 4.3.1. Comparison of Findings for Audit Standard Category: Child Labour and Young Workers

Child labour is one of the most prominent and publicly decried social sustainability/human rights issues [90], hence, unsurprisingly, this main category was covered by all SSAS in our sample. A closer look at the number of questions that each audit standard contained on the issue, however, revealed a much more differentiated picture. We found that three quarters of the SSAS analysed had 10 or less audit questions covering the issue of child labour/young workers as tallied in the third column of Table 6. On the other hand, the audit standard employed by amfori BSCI contained more questions (over 80) within the child labour and young workers category than all other standards combined.

**Table 6.** Number of audit questions on child labour & underage workers per SSAS.

| **Audit Main Category: Child Labour & Young Workers** | | |
|---|---|---|
| SSAS | Section(s) and reference within respective SSAS: | Nr. of Questions in SSAS |
| SMETA | 4. Child Labour Shall Not Be Used (p. 31–32) | 5 |
| IETP | Section 3: Employment Practices (p. 3–5);<br>Section 4: Special Protections (p. 6) | 7 |
| PSCI | Labor (pp. 11–14) | 3 |
| FWF | Labour standards—No exploitation of child labour<br>(A6: p. 55–56, B4: 68–69, C6: 86, D2: 93) | 10 |
| ASI | C. Social—10. Labour Rights (p. 16f) | 4 |
| RBA | A. Labor—A2) Young Workers (pp. 14–21) | 23 |
| JAC | A—Labour Requirements—2. Child Labour (p. 3f) | 4 |
| Amfori BSCI | 2.8. Perf. Area 8: No Child Labour (p. 142–147)<br>2.9. Perf. Area 9: Special Protection for Young Workers (pp. 148–152) | 86 |

Not only did we discover quantitative variance in the focus of the audits (represented by the number of questions dedicated to a certain main category or sub-category), we also discovered significant variance in the wording of the audit headings and questions. In the examples evident in Table 7 it becomes clear that a range of policies are being focused on by the audits and that different audit standards can ask different questions. Some SSAS want to confirm that no child labour occurs at the supplier site, while others deal with the contextual complexities that accompany the phenomenon of child labour (e.g., prevalence of migratory workers, lack of education opportunities, need to supplement family income, etc.). Differing age limits and cut-offs are named and some SSAS include the neighbouring topic of young workers, whereas others solely focus on child labour.

**Table 7.** Extracts from SSAS documentation, example questions on Child Labour policies.

| **Audit Main Category: Child Labour and Young Workers<br>Sub-Category Focus: Child Labour and Young Workers Policies & Checks** | | |
|---|---|---|
| **SSAS/Nr. of Questions in Category** | **Sub-Category:** | **Example Question(s) from Audit Documentation:** |
| **SMETA**/<br>5 Questions on Child Labour & Young Workers | General: 4. Child Labour Shall not be used | "Policy: No Child Labour Employed<br>Check: 4.A Legal age of employment? 4.B Age of youngest worker found? 4.C Children present but not working? 4.D % under 18's at site (of total workers)? 4.E. Workers under 18 subject to hazardous materials?" |
| **IETP**/<br>7 Questions on Child Labour & Young Worker | 3.1 Policy;<br>3.3 Underage workers;<br>4.1 Young Workers | "Policy: Does the factory have a written minimum working age policy in line with legal and IETP requirements?<br>Are the contents of the policy made available and effectively communicated to all workers?<br>Checks:<br>3.3. Are underage workers prohibited in the factory?<br>Does the factory have no cases of historical underage workers?<br>4.1. If young workers are present, are they working on allowable assignments, as specified by legal and IETP requirements? Does the factory keep a list of appropriate assignments for young workers?" |
| **PSCI**/<br>3 Questions on Child Labour & Young Workers | Labour Policy;<br>Child Labor and Young Workers | "Policy: Does the facility have a policy (or statement of commitment) regarding labor practices? Labor policy: Does the policy cover: … Prohibition of child labor, … etc., Please provide a link to the policy on your web site, or alternatively attach a copy of the policy.<br>Checks: Does the facility ensure that no child labor takes place in their operations? Please list the documents reviewed. Does the facility ensure that workers under age 18 are not involved in hazardous or strenuous or physically demanding work?" |
| **FWF**/<br>10 Questions on Child Labour & Young Workers | Labour Standards (Sub-Sections: A6, B4, C6, D2)—no exploitation of child labour | "Policy: What is the employment practice and policy of the enterprise regarding age?<br>Since when is this policy in place<br>What is the practice and policy regarding hazardous work (which is not allowed under the age of 18)?<br>Check: How does management check the age of applicants? Is proof of age document kept in the records? Does the management allow juvenile workers (16 to 18 years) the opportunity to apply for a position in the factory? If yes, are there any schemes available to support such workers?<br>In case child labour is found: (1) How many children are found working in the factory? (2) Do they work in specific departments? Are their wages lower than adult workers working in the same department? What document proving your age do you submit when applying for a job in this factory?<br>Have you seen child labour in any other section of this industry? E.g., in the subcontracted jobs?<br>C6. Labour standards—No exploitation of child labour<br>In case child labour is found, check whether children are working in specific departments or/and are paid lower than adult workers hired for the same job?<br>D2. Labour standards—No exploitation of child labour<br>Are apparently young workers present? Do you get the impression that some workers are fleeing or kept out of sight? If so, find out why this has happened." |
| **ASI**/<br>4 Questions on Child Labour & Young Workers | Sub-section 10.2: Child Labour | No Policy Question;<br>"Check: The Entity shall neither use nor support the use of Child Labour as defined in ILO Conventions C138 and C182, and shall comply with related national and international law: A basic minimum working age of 15 years. Not engaging in or supporting Hazardous Child Labour.<br>Not engaging in or supporting Worst Forms of Child Labour." |
| **RBA**/<br>23 Questions on Child Labour & Young Workers | A2 Sub-section Young Workers | "Policy: A2.1-Workers are not below minimum age.<br>Checks: Records: (a) Personnel file sample shows all workers are above minimum age or above company policy minimum age (whichever is greater). The worker roster shows all workers are above minimum age or above company policy minimum age (whichever is greater). Auditors need to ensure that sample covers all types of workers/employees.<br>Policy: A2.2-An adequate and effective policy and process is established to ensure that workers below the legal minimum working age are not hired either directly or indirectly via labor agencies/contractors.<br>Checks: There is a reliable ID verification system to control the workers' access into the facility. Auditee does not refuse the worker's job application after the "child" worker's age meets legal requirements. Underage assistance:<br>There is a procedure to assist underage children found working for the Auditee that is designed to provide for the welfare of the child. Inspect and cross-reference to verify the validity at least two types of official ID *. Reliable ID verification system to control the workers' access into the facility e.g., finger printing or ID card with owner's photograph to prevent under-age workers entering the facility by using another person's ID. ID types for verification and cross-reference." |

**Table 7.** *Cont.*

| Audit Main Category: Child Labour and Young Workers<br>Sub-Category Focus: Child Labour and Young Workers Policies & Checks | | |
|---|---|---|
| **SSAS/Nr. of Questions in Category** | **Sub-Category:** | **Example Question(s) from Audit Documentation:** |
| **JAC**/<br>4 Questions on Child Labour & Young Workers | Sub-section A2.: Child Labour | "Policy: Child Labour (1) is strictly prohibited. No person is employed who is below the legal minimum age for employment.<br>Check: Where no local legislation exists to define the minimum legal age, no person is employed below the minimum age which is the age of completion of compulsory schooling, or not less than 15 years (or not less than 14 years, in countries where educational facilities are insufficiently developed) in accordance with international conventions.<br>Policy: Children under the age of 18 shall not be employed for any hazardous work or work that is inconsistent with their individual development.<br>Check: Where no local law exists to define working hours and working conditions for children under the age of 18, the Supplier should not employ them for work that is hazardous, unsafe or unhealthy such as among others: work with dangerous machinery, equipment and tools, or work which involves the manual handling or transport of heavy loads, work in an unhealthy environment that may, for example, expose children to hazardous substances, agents or processes, or to temperatures, noise levels or vibrations damaging to their health" |
| **Amfori BSCI**/<br>86 Questions on Child Labour & Young Workers | 2.8 No Child Labour & 2.9 Special Protection for Young Workers | "8.1 Policy: Auditee does not engage in illegal child labour directly or indirectly. If child labour is found during the audit, immediate actions (defined in SSAS) shall be taken by the auditor at that very moment.<br>Check: The auditee has taken the necessary measures to:<br>- Understand what child labour is, building the awareness of supervisors and recruitment staff. - Identify likelihood of child labour in its industry or region (some industries have a higher risk of child labour than others). - Not engage child labour indirectly (e.g., using recruitment agencies, allowing migrant/seasonal workers to use their own children to support them at work). The auditee keeps accurate records of: - Migrant and/or seasonal workers' children's names, ages, school schedules and information on their schools.<br>- Age and identity cards of workers engaged via recruitment agencies. - Agencies' recruitment procedures to avoid engagement of children or illegal workers (among others).<br>- The auditee keeps contact details of the stakeholder(s) to be involved in the solution of child labour cases<br>8.3 Policy: The auditee has adequate policies and procedures in writing toward protecting children from any kind of exploitation.<br>Check: If procedure outlines: Necessary steps to ensure children are protected from exploitation; How to deal with the case of child labour in the most responsible and humane way. Business based in a region where family poverty driving force behind child labour? Any child labour programme or projects run in the area by government, NGOs or others? Any trade union which could provide support in cases of child labour? Any educational or vocational training facility nearby or in the regional vicinity? Are there available contact details and/or schedules? Can the education or social welfare authorities provide assistance? Is there financial compensation available for children to stop working so they can go to school?" |

* Please refer to References Section for a full list of links to audit standard materials.

#### 4.3.2. Comparison of Results for Audit Standard Main Category Working Hours

Working hours can be seen as an indicator of the general working conditions at a worksite and excessive working hours can potentially be a quantitative indicator for more complex sustainability issues [13,91]. Thus, as with the main category "Child Labour" above, we found that all SSAS addressed this topic. However, the distribution of focus was equally split into three SSAS groups: audit standards with a minor focus on the issue (six or less questions on the issue), SSAS with a moderate focus (between 10 and 20 audit questions) and SSAS that focused in detail on the category, containing over 20 questions to assess the topic (see Table 8 for more details). As detailed in the case of Child Labour (Section 4.3.1 above), we again find that the RBA and amfori BSCI standards are the most exhaustive in terms of questions focused on working hours, but that the Fair Wear Association also had a significant of focus on this topic within their standard.

**Table 8.** Number of audit questions on working hours per SSAS.

| Audit Main Category: Working Hours | | |
|---|---|---|
| **SSAS** | **Section(s) and Reference within Respective SSAS:** | **# Questions** |
| SMETA | 6: Working Hours are not Excessive (pp. 37–41) | 15 |
| IETP | Section 5: Working Hours (pp. 7–10)<br>Section 8: Forced & Prison Labor (pp. 17–19) | 13 |
| PSCI | Labour (pp. 11–14) | 3 |
| FWF | Labour standards—No excessive working hours (A6 p. 59f, B4: 73, C6: 89, D2: 93) | 21 |
| ASI | C. Social—10.8 Working Time (p. 16f) | 1 |
| RBA | A. Labour—A3) Working Hours (pp. 22–29) | 32 |
| JAC | A—Labour Requirements – 4. Working Hours (p. 4) | 6 |
| Amfori BSCI | 2.6. Performance Area 6: Decent Working Hours (pp. 114–118) | 30 |

A closer, comparative look at the detailed questions on working hours revealed interesting findings. There is much focus on maximum work allowed in a week/average workload over a defined period (month/year), with nearly all audit standards explicitly referring to a 48-h or maximally accepted 60-h working week. However, only five of the SSAS analysed appeared to require auditors to check if and how working hours were being recorded, measured and collected. In Table 9 we present the SSAS' questions used to determine how suppliers deal with the issue of excessive working hours, overtime and breaks, including what methods are used to track time worked.

A close reading of the detailed depictions of individual audit questions and checks as stipulated by all SSAS in our comparison demonstrates a significant range of approaches both in terms of depth and breadth. After this presentation of the findings across all eight SSAS and the two exemplary in-depth comparisons of how sub-topics were dealt with in the eight SSAS, we now turn to a discussion of these findings. We discuss how they relate to both our research questions and the guiding research proposition and what implications these findings might have for practice and academia.

**Table 9.** Extracts from SSAS documentation, example questions on Working Hours.

| Main Category: Working Hours;<br>Sub-Category Focus: Recording/Documenting Excessive Working Hours | | |
|---|---|---|
| **SSAS/Nr. of Questions in Category:** | **Sub-Category:** | **Example Question(s) from Audit Documentation:** |
| **SMETA**/<br>15 Questions | 6: Working Hours are not Excessive (p. 37–41); Working hours' analysis | "Systems & Processes to determine working hours are not excessive:<br>A. What timekeeping systems are used: time card etc.? B. Is sample size same as in wages section? . . . F: Are workers provided with at least 1 day off in every 7-day-period, or 2 in 14-day-period: (Please select applicable: 1 in 7 days, 2 in 14 days, No; Is this allowed by local law?; Maximum no. of days worked without a day off (in sample). Overtime Hours worked: I: Actual overtime hours worked in sample (State per day/week/month): Highest OT hours: __? J: Combined hours (standard/contracted plus= total 60) found?" |
| **ICTI**/<br>15 Questions | Section 5: Working Hours (p. 7–10) | "5.2 Documentation: Are all hours worked documented? Are all hours worked documented? Are all hours worked documented? Are workers aware of, and able to verify, their working hours in their time records?<br>5.3 Working Hours: Are maximum weekly working hours within IETP requirements?<br>5.4 Breaks: Are workers aware of, and able to verify, their working hours in their time records?" |
| **PSCI**/<br>3 Questions | Section: Labour | "Does the total number of weekly working hours (including overtime) per employee not exceed 60 h (as required per ILO standard on maximum working time of 60 h per week) or less if defined so by local law?" |

**Table 9.** *Cont.*

| Main Category: Working Hours; Sub-Category Focus: Recording/Documenting Excessive Working Hours | | |
|---|---|---|
| **SSAS/Nr. of Questions in Category:** | **Sub-Category:** | **Example Question(s) from Audit Documentation:** |
| **FWF**/ 21 Questions | Labour standards—No excessive working hours (A6 p. 59f, B4: 73, C6: 89, D2: 93) | "A6. Labour standards – No excessive working hours: What are the normal working hours, normal working week, for men and women? Management asked to explain the enterprise's overtime policy. Specific questions: What are the usual low and high season periods? How were they over the last year? How often does overtime occur? Which workers work overtime? What are the causes of overtime work; can the FWF member enterprise help to reduce overtime? Is this documented? Is there a documented working time register? B6. Labour Standards: What are the normal working hours, normal working week, holidays? Is this documented? What are the usual low and high season periods? How were they over the last year? How much overtime has the interviewee recently made. Try to get a picture as precise as possible, so that the records inspector can crosscheck it. Check for possible gender discrimination if overtime premium payments are paid. Who allocates overtime shifts? Do piece-rate workers make overtime because otherwise they cannot reach their production targets? Is there gender discrimination in the type of payment system—for example are most women on piece work while men are more likely to be able to earn premium rates for overtime?" |
| **ASI**/ 1 Question | 10.8 Working Time | "The Entity shall comply with Applicable Law and industry standards on Working Time (including Overtime working hours), public holidays and paid annual leave." |
| **RBA**/ 32 Questions | A. Labor – A3) Working Hours (p. 22–29) | "A3.1 Hours worked in a workweek over the last 12 months does not exceed 60 h. Check Records: (a) Mandatory sample size of individual time records as well as summary reports, show the number of hours worked - including overtime - per worker per week should not exceed 60 h. A3.3 Adequate and effective policy and system/procedures are established to determine, communicate, record, manage and control working hours including overtime, including reliable and detailed records of workers' regular and overtime working hours. Check Policy: (a) Adequate and effective working hours/days off policies and procedures are in place to (i) Accurately determine (ii) Record (iii) Manage (iv) Control working hours including overtime and days off. (b) If non-conformance is detected, documented corrective action should be implemented and progress against the corrective action documented. Additional Records Checks: (a) Review the company's time records and system for recording time worked to determine that time is recorded accurately and completely. Additionally check: (b) All workers have a time record. (c) Each time record is accurate and can be cross-referenced with leave records, production records, maintenance, procurement or other relevant records. (d) Regular working time and overtime recording. (e) Adequate detail to allow for daily, weekly and monthly working time and overtime analysis. Recording devices: Time Recording Devices are present and all are in working order." |
| **JAC**/ 6 Questions | 4. Working Hours | "The Supplier shall ensure that normal working hours and overtime of individual employees do not exceed the maximum of limits set by local law. Where no local law defines a working week/overtime, Supplier expected to adopt the following: (a) a normal working week in line with ILO Convention in respect of applying the principle of the 8-h day or of the 48-h week and (b) overtime in line with limits as specified in SA8000: (i) in respect of 12 h overtime per week and (ii) in respect of one day off following every six consecutive working days." |
| **amfori BSCI**/ 30 Questions | 6. Decent Working Hours | "6.1 Is there satisfactory evidence that the auditee does not require more than 48 regular working hours per week, without prejudice to the exceptions recognised by the ILO? Are workers aware of the regular working hours and possible exceptions? Are exceptions documented and made available? 6.2—Is there satisfactory evidence that the auditee request of overtime is in line with the requirements of the amfori BSCI Code of Conduct? 6.3—Is there satisfactory evidence that the auditee grants workers the right to resting breaks in every working day? 6.4—Is there satisfactory evidence that the auditee grants workers the right to at least one day off every seven days?" |

## 5. Discussion

We began our research with the general observation and underlying hypothesis that supplier sustainability audits are increasing in number and scope worldwide. We noted that multi-brand, voluntary sustainability initiatives/associations (SI/As) have created their own audit standards and proposed that these audit standards are probably similar and therefore that the standardisation of such SSAS may be a possibility. In the following we begin with a discussion of our findings and how these findings relate to our assumptions, propositions and helped us to answer our research questions.

Thereafter we point out the limitations of this research and make suggestions for further research before concluding the section by highlighting the relevance and implications for practice.

### *5.1. Discussion of Exploratory Findings*

Our exploratory research of hundreds of pages of audit standards and protocols and numerous SI/A annual reports understandably generated an enormous amount of data. To make sense of the key findings we can categorise them into five discussion points: (Section 5.1.1) increasing audit activity; (Section 5.1.2) very similar audit processes; (Section 5.1.3) broad landscape of auditing companies; (Section 5.1.4) audit category overlap; (Section 5.1.5) divergent audit detailed content.

#### 5.1.1. Increasing (SI/A) Audit Activity

Our findings, depicted in Table 2, certainly agreed with our assumption that supplier sustainability audits (carried out for SI/As) are increasing. We discovered an apparent proliferation of audit activity happening within and across various industries, conducted by both-stakeholder driven initiatives (such as FWF) and multi-brand associations (the majority of our sample), some with a longer history (such as the toy industry and BSCI) and others much more recently (e.g.: ASI, PSCI). Larger organisations like amfori BSCI and Sedex have conducted over 100,000 supplier sustainability audits each in the last decade. The other SI/As together accounted for around 38,000 audits in the same time frame. Our data denotes a growth in over 50,000 more audits per year in 2019, compared to the baseline in 2010. This represents a remarkable 481% growth in audit activity from 2010 to 2019 among the initiatives/associations included in this research. In surveying the SSCM literature we did not discover empirical research or data that gave a clear indication of actual supplier sustainability assessment activity; thus, these findings contribute to addressing such a gap. Many SI/As indicate that a desire to reduce redundant activity, improve efficiencies and reduce supplier audit fatigue were the reasons for coming together as an industry or association. However, given that only the eight SSAS that we explored were applied in the form of over 60,000 audits in 2019, we can only hope that these audits do not involve double auditing of suppliers according to different (competing) SSAS. Also given the trend that we have captured over the last ten years, we see support for the move toward standardisation, so that if audit activity continues to grow at such a pace, suppliers will be held up to the same standards.

#### 5.1.2. Audit Process Similarity

Our first research question pertained to the main audit process characteristics and the extent to which these might overlap. Our comparative research and analysis of the standards found that SSAS *processes* are very similar. Recalling the findings in Table 4, our exploratory research revealed that eight SSAS have established nearly identical audit processes. Nearly all SSAS had the same wording when it came to audit phases and there was also a high degree of overlap when it came to the sub-phase audit steps for carrying out the audit execution itself. Common sense reassures us that most audits would need to be prepared, conducted and followed up, which is what the identified common phases conform to and such audit steps are probably neither specific to supplier audits nor sustainability audits. Hence, it is conceivable and possible that such SSA could be standardised, at least from a process perspective.

#### 5.1.3. Audit Company Landscape

All SI/As included in our research, apart from FWF, do not conduct the audits themselves and thus hire external auditing companies to audit suppliers against their standards. We found some significant overlap among the initiatives/associations in terms of the auditing companies whom they partner with (recall Table 3, see Appendix C for greater detail). There was particular convergence on the companies Intertek, TÜV Rheinland, Bureau Veritas Certification, ELEVATE and UL—Responsible Sourcing Inc, who were contracted by at least half of the SI/As surveyed. In terms of our research proposition and questions, we argue that—from the perspective of the service providers—the potential for alignment and standardisation is demonstrated by globally distributed and different auditing companies carrying

out audits against the standards. Thus, assuming alignment among different initiatives, in terms of the focus of audits, the questions to be asked and the length of the audits necessary, we see the potential for standardisation.

#### 5.1.4. Audit Standard Categories

As demonstrated in Table 5, our analysis of the eight available supplier sustainability audit protocols and documents revealed 13 main sustainability categories that were found in all, or the majority, of the SSAS. This clearly demonstrates that, at the structural level of the audit, the SSAS have a high degree of thematic overlap, which has been pointed out in the literature (see for example: 81 for a summary of proliferation of private, voluntary supply chain standards). Despite the organisational, industry, size and temporal differences among the SI/As included in our research, we found that the SSAS were focussing on remarkably similar topics at a higher level. We surmise that this sample probably reflects the spectrum of sustainability challenges and risks in global value chains [59]. It also points to a degree of convergence and emerging consensus on what constitute important sustainability risks, that need to be monitored and managed at supplier locations [63]. This discovered SSAS overlap gives the impression that our initial proposition, that SSAS are similar and could be standardised, is plausible. Had our analysis and comparison stopped at this level of analysis, we could infer that there is a lot of potential for standardisation and cross-recognition of each other's standards, as all standards were dealing with the same aspects of sustainability.

#### 5.1.5. Audit Standard Detailed Content

As depicted in Table 5, different audit standards covered different categories to varying degrees of detail. This research is not evaluating which standards are better, or arguing that more questions are necessarily a sign of quality, but rather highlighting the detailed differences between standards. While the main categories demonstrate much intersection, there were also specialist categories, such as responsible raw material sourcing, that were more pertinent to certain associations/industry initiatives (e.g., RBA, ASI). Due to constraints of length and complexity, it was not possible to compare every sub-topic and outlying question that was possibly present in only one SSAS. Hence this research is intended to be exemplary, rather than exhaustive; providing an exploratory insight into potential convergence among audit standards. Other SSAS were initially conceived as a tool for social sustainability monitoring (not environmental) and thus did not cover the ecological category in as much detail/at all. We surmise that this broad sustainability category alignment among the SSAS potentially reflects iterative processes that occurred within each initiative/association. When considering the potential for standard alignment (as currently being undertaken by the Sustainable Supply Chain Initiative—SSCI) it would be necessary to find broad agreement first among members in such multi-brand/multi-stakeholder associations, as member would presumably not agree to implement a shared audit standard that was considered inadequate or insufficient, compared to the standard they are currently used to applying. Standardisation should not cause a race to the bottom or force agreement on the lowest common denominator. Once such private/voluntary organisations agree to adopt a global, inter-operative standard, only then could the difficult process of alignment on the details begin.

#### 5.1.6. Potential/Limitations of Audit Standardisation

Our more detailed analysis of the content of the audit categories revealed wide divergence in terms of the number of questions on sustainability aspects within that category, differentiated sub-categories, as well as much variance in the number and type of questions that are posed to the supplier. There are no doubt plausible explanations for why one initiative/association thought that category 'XYZ' could be adequately evaluated with three questions, whereas another initiative determined 40 questions to deal with the topic. Moreover, as critical literature has repeatedly pointed out, having many well-formulated questions, excellent audit statistics and documentation does not necessarily reflect

audit quality, let alone guarantee effectiveness [50,72,83,92,93]. Nonetheless, this divergence in audit questions poses an array of fundamental challenges to our major proposition of standardising such SSAS to reduce inter-industry audit fatigue. In order for audits to be able to be mutually recognised or standardised, there would have to be overarching alignment that ensures agreement on a standard audit process and more pertinently on common audit categories that comprise an acceptable audit (which our research showed), as well as the questions asked/contained in audit protocols. Furthermore, it remains to be seen whether companies/initiatives are willing to accept an audit that they have not designed themselves.

Designing a type of global audit standard that could be applied across diverse industries and supply chain stages and in all geographies would require a form of governance discussion among existing standards (and others not covered by this paper) and a long process of discussion about which categories, sub-categories and questions must be included (or excluded). Moreover, a solution would need to be designed to account for certain specialty areas, which are of key concern for particularly industries, but not relevant enough to be included in a global, general audit standard. Perhaps this would require an international, independent body (such as the UN, ILO or OECD), involving broad worker-participation and civil society representation [94] to bring in an aspect of arbitration and legitimacy for such a standardisation project. Given the lack of such overarching hybrid governance [64] on global value chains at present [71] and the how arduous such a global supplier sustainability audit standardisation process would be, it is worth critically considering whether such standardisation is realistic at present and worth pursuing in the future. This needs to be weighed up against the apparent continual increase in auditing activity and the self-fulfilling nature of more activity that could eventually see (sub-)suppliers serving various industries being audited multiple times by different initiatives/associations—for example electronics sub-suppliers that produce components for the toy, automotive and mobile devices industries [45,95].

Critical literature continues to query the effectiveness of sustainability audits [93], particularly as a stand-alone instrument [13,72,83], and challenges the legitimacy and independence of auditing companies [96,97]. Some authors note that effectiveness depends on institutional pressure and follow-up activities for audits to address problems and support their improvement [13,72,92]. In the context of our research, it can be argued that standardised and shared supplier assessment [76], such as supplier sustainability audits, should also aim to improve their effectiveness. Standardising better audit standards would free up both suppliers' and focal companies' resources (time, budgets and personnel) by reducing redundant/overlapping audits and thereby allow both suppliers and FCs to focus more on addressing the identified gaps and other sustainability problems. Whilst noting valid concerns in critical research on audits, our research provides empirical evidence of how well-established supplier sustainability audits have become. As Terwindt and Armstrong [50] argue, such audits are here to stay, and we reveal the scope they cover and demonstrate that they are increasing in number. Therefore, it makes sense to research this phenomenon in further detail and contemplate standardising them to reduce redundant activity and increase their effectiveness as a tool for SSCM.

### *5.2. Recommendations for Further Research*

Our research was exploratory in nature as no other research could be identified that compared so many common supplier sustainability audit standards, despite the key role that such audits fulfil in current SSCM strategies, approaches and toolkits. While we discovered and analysed audit standards that had been applied in over 300,000 supplier audits (recall Table 2.), the authors are cognisant of the inbuilt limitations that accompany inductive reasoning [85], namely how generalisable such findings might be. We endeavoured to counteract this by including established standards, new standards, large and smaller SI/As and including SSAS from different industries. Nonetheless, more research and more empirical data to build on and extend our findings could be useful. Much SSCM literature treats these monitoring instruments as neutral tools [58,62] taken in a positivistic sense and considers them to be self-explanatory, objective measuring devices to carry out SSCM.

However, it is important to recognise the many critical voices that question the effectiveness of audits specifically [91,92] and the self-legitimising nature of private, voluntary self-regulation by companies in general, as generating a type of pseudo-legitimacy and technocratic distraction from more systemic issues [64,84,98]. Further research should aim to bridge the gap between critical literature that fundamentally questions the validity of the instruments and the private-voluntary governance that surrounds them on the one hand, and SSCM/operations/international business research which tends to approach the tools, structures and mechanisms in an apolitical manner.

We noted two cases in the extant literature, where databases have been created, to gather empirical data on the sustainability activities of companies [1] and on the array of multi-stakeholder industry initiatives for sustainability [29]. The former had a limited industry focus (food/produce, wood/timber and textiles/apparel) and the latter primarily focused on initiatives with a strong civil-society, multi-stakeholder component, but only covered a few multi-brand, voluntary initiatives such as those covered in more depth in this research. Future research could draw on all three approaches, to more comprehensively cover the overlaps among different types of initiatives. While the empirical reality of SSCM (as it is practised), is being documented, continued research should focus on long-term impact and improvement resulting from the increased audit activity. The question of auditor neutrality, auditor accountability and effectiveness must also be brought into the management and SSCM considerations [4,96]. The persistence of serious problems in the conduct and thus results of audits presents serious risks for the legitimacy of such programmes and the results that FCs report based on such audits. As Fransen et al. [81] argue, there is clear need for an integration of insights gained in global governance literature, political economy, labour relations and compliance and international business, specifically SSCM research. Researchers should also continue to undertake critical research into the actual effectiveness of audits, both in terms of genuinely reducing risk exposure and in terms of improving sustainability performance and conditions in the supply chain. This research must, however, consider that audit activity is increasing and attempt to address the reasons for why this is the case. Finally, SSCM and global value chain (GVC) governance research could and should collaborate, building on this paper by suggesting a standardised audit standard, with modular additions (for specialist areas), as well as accountability measures, and survey the potential openness and acceptance among various supply chain actors and stakeholders for such an idea.

### *5.3. Relevance for Practice*

Our findings will hopefully serve as a good benchmarking reference for practitioners who want to gain insight into a cross-section of current supplier sustainability audit activity. We also anticipate that this research could be an important reference for future supply chain initiatives that are yet to design and/or align on a common audit structure. Governments, focal companies, suppliers, workers and NGOs should continue to critically analyse the efficacy and presumed role that audits play in addressing sustainability issues in global value chains. Audits are increasing in number, despite the standardisation (and intended reduction in redundant re-auditing) and audit sharing that is occurring within multi-brand and multi-stakeholder initiatives. Fair Wear Foundation has taken note of critical inquiry into the limited effectiveness of monitoring (e.g., [73,83]) and consequently endeavoured to develop a holistic and more collaborative approach to improving conditions at suppliers' factories, whilst also holding participating brands more accountable to their commitments to sustainability improvement [68]. Many other sustainability initiatives/associations (SI/As) surveyed in this research increasingly stress that audits are an important measuring tool, but that the important focus needs to be on what is done with the results of audits [46,68,78]. SSCM tools cannot be considered in a vacuum, independent of questions of accountability and governance.

Suppliers should assess the varying audit requests they are receiving and point out the overlap to the buying companies/customers requiring them to undertake such audits. Industry initiatives/sustainability associations should enter into dialog with other organisations that employ a similar audit standard (they could draw on our research to demonstrate such overlaps) and consider

steps towards reducing audit fatigue among suppliers that supply to multiple industries. The SSCI is currently one vehicle for sustainability standards to undergo a benchmarking and it is plausible that this organisation could play a key role in supporting cross-initiative standardisation [99]. Further attention should be paid to developing review and effectiveness management into all supply chain audit schemes, ensuring a race to the top in terms of better standards; not a race to the bottom, in which companies pick the easiest standards with the least accountability.

## 6. Conclusions

Sustainability is increasingly becoming a central tenet of many discourses and global supply chains are no exception to this trend. Focal companies have developed numerous strategies and tools to manage sustainability risks in their supply chains. This qualitative research focused in-depth on sustainability audits as a core element of SSCM toolkits. The research contributes to literature on SSCM, sustainability/ethical audits and sustainability initiatives by providing empirical evidence for an increasing amount of global audit activity and by describing how supplier audit standards are structured and differ. Global FCs are increasingly combining their efforts in multi-brand SI/As to pool resources, share good practices and to reduce supplier audit fatigue and redundant activities. We identified eight supplier sustainability audit standards (SSAS) from differing industries and found that supplier sustainability audit activity is increasing. Our inductive analysis of the data collected confirmed our underlying research assumption and we found very similar processes for conducting supplier sustainability audits and some convergence in the choice of service providers for such audits. Qualitative text analysis of the SSAS also demonstrated a high level of overlap in terms of the structure of the audits (sustainability issues covered as main categories). However, at a granular level, the SSAS were highly heterogenous. Thus, whilst standardisation of SSAS is conceivable, it would be much more complex than initially hypothesised. This is because audit standardisation would mean alignment of SSAS at the micro-level of the audit protocol questions, which would entail broad-ranging, granular agreement and conceivably necessitate an arbitrating governance body that could determine which aspects of which SSAS could become the one global standard. Given the evidence we found for increased global audit activity, it would be advisable to understand these critical SSCM tools in more detail, and work to make them more effective and standardisable to further reduce audit fatigue and free up supplier and FC resources for implementing continuous sustainability improvements in global supply chains rather than just monitoring supplier compliance.

**Supplementary Materials:** The following are available online at http://www.mdpi.com/2071-1050/12/19/8223/s1. Working Tables Collating and Comparing Audit Protocols, and all relevant audit documents from the sustainability initiatives/associations that featured in this research.

**Author Contributions:** Conceptualization, J.S., M.M. & I.J.F.; methodology, I.J.F.; formal analysis, I.J.F.; investigation, I.J.F.; writing—original draft preparation, I.J.F.; writing—review and editing, J.S. & M.M.; visualization, I.J.F.; supervision, J.S. & M.M.; project administration, J.S. & M.M.; funding acquisition, M.M. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding. The APC was funded by the University of Ulm.

**Acknowledgments:** The authors would like to expressly thank Marlene Zeitler for her invaluable contributions to the early stages of the research, for diligently scouting through hundreds of pages of audit protocols and manuals. We would also like to thank the representatives of the eight initiatives surveyed as well as representatives from the Consumer Goods Forum GSCP/SSCI for providing us with supporting information to better understand the scope and content of their activities.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A. Comparison of SSAS Categories

Table A1 depicts an overview of the 13 identified sustainability categories contained in the audit standards, and the respective SSAS chapters that cover related issues.

**Table A1.** Sustainability category coverage by supplier sustainability audit standard.

| No. | Category | SMETA | ICTI | PSCI | FWF | ASI | RBA (EICC) | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|---|---|
| **1** | **Management System** | 0B. Management systems & code implementation | (brief mention)<br>1: Audit Process<br>7.1 Policy | A. Management Systems | A1. Basic facts; B1. General; A5, C5. Factory Management system; A3., C3. FWF Affiliate's System to monitor & remediate working conditions | 2. Policy and management<br>3. Transparency | E. Management System | E. Measurement & Continuous Improvement | 1: Social Management System and Cascade Effect |
| **2** | **Freely Chosen Employment** | 1. Freely chosen Employment | 8. Forced and Prison Labour | C. Freely Chosen Labour | A6., B4., C6., D2 Employment is freely chosen | 10.3 Forced Labour | A1) Freely Chosen Employment (1.1, 1.2, 1.5) | 3. Forced Labour | 11: No Bonded Labour |
| **3** | **Underage/Child Labour** | 4. Child Labour | 3.1 Policy, 3.2 Training;<br>3.3 Underage Workers;<br>4. Special protections (Young/Pregnant Workers) | C. General, Child Labour and Young Workers | A6., B4., C6., D2. No exploitation of child labour | 10.2 Child Labour | A2) Young Workers | 2. Child Labour | 8: No Child Labour<br>9: Special Protection for Young Workers |
| **4** | **Fair Remuner-ation** | 5. Living Wages and Benefits<br>6: Working Hours are not Excessive | 6. Compensation | C. Wages, Benefits, and Working Hours | A6, B4, C6. Living wage A6., B6. Legally binding employment relationship; B4. Employment freely chosen; A6. No excessive work hours | 10.7 Remuneration | A4) Wages and Benefits | 5. Fair Remuneration<br>4. Working Hours | 5: Fair Remuneration<br>6: Decent Working Hours |
| **5** | **Working Hours** | 6. Working Hours | 5. Working Hours<br>8: Forced and Prison Labour | C. Wages, Benefits, and Working Hours | A6., B4., C6., D2. • No excessive working hours | 10.8 Working Time | A3) Working Hours | 4. Working Hours | 6: Decent Working Hours |
| **6** | **No Discrimination** | 7. Discrimination | 9. Discrimination | C. • Non-Discrimination and Fair Treatment | A6., B4., C6., D2. No discrimination in employment | 10.4 Non-Discrimination | A6) Non-Discrimination | 7. Discrimination | 4: No Discrimination |
| **7** | **Business Ethics** | 10C. Business Ethics | 2. Business Ethics | B. Ethics | (brief mention)<br>A2., B2., C2. Sourcing practices of the FWF affiliate | (brief coverage)<br>1. Business Integrity | D. Ethics | D—Ethics & Anti-Corruption | 13: Ethical Business Behaviour |
| **Category #** | Sustain-ability **Category** | **SMETA** | **ICTI** | **PSCI** | **FWF** | **ASI** | **RBA (EICC)** | **JAC** | **amfori BSCI** |
| **8** | **Freedom of Association** | 2. Freedom of Association and Right to Collective Bargaining | 10. Grievance Mechanisms | C. • Freedom of Association | A6, B4, C6, D2.freedom of association & right to collectivebargaining; A4, B3, C4, D1 communication, consultation & grievance procedure | 10.1 Freedom of Association & Right to collective Bargaining; 10.5 Communication & engagement | A7) Freedom of Association<br>E7) Communication<br>E8) Worker Feedback and Participation | 8. Freedom of Association & Right to Collective Bargaining | 3: The Rights of Freedom & Association and Collective Bargaining<br>2: Workers Involvement & Protection |
| **9** | **Discipline, Discrimination & Grievances** | 9. Harsh or Inhumane Treatment | 7. Disciplinary Practices<br>9. Discrimination<br>9.3 Reporting Mechanismpartially 10: Grievance Mechanism | No Mention<br>// | A4., B3., C4., D1. Communication, consultation and grievance procedure (partly) | (Limited coverage)<br>10.6 Disciplinary practices | A5) Humane Treatment | 6. Disciplinary Practices | 4: No Discrimination – 4.3 |

**Table A1.** *Cont.*

| No. | Category | SMETA | ICTI | PSCI | FWF | ASI | RBA (EICC) | JAC | Amfori BSCI |
|---|---|---|---|---|---|---|---|---|---|
| **10** | **Fire & Emergency** | No Mention // | 12: Fire & Emergency | Health & Safety Compliance and Risk Management – Emergency Preparedness & Response, Hazard Information | D2. Labour standards – OHS Requirements tick list (partly) | (Limited coverage) A. Governance – 2. Policy and Management (2.6 Emergency Response Plan) | B. Health & Safety – B2) Emergency Preparedness | (Limited coverage) B—Health & Safety—13. Accident and Emergencies Readiness | 7: OHS – 2.7.6. Accident & Emergency Procedures; 2.7.9. Escape Routes & Emergency Exits |
| **11** | **Facility Safety & Hygiene** | 3. Safety and Hygienic Working Conditions | 13. Environmental, Health & Safety 11. Facilities | E. Health & Safety Compliance and Risk Management | A6., B4., C6., D2. Safe & healthy working environs, OHS Requirements | 11. Occupational health and safety | B. Health & Safety | B—Health & Safety | 7: Occupational Health and Safety |
| **12** | **Environment** | 10B2. Environment 2-Pillar; 10B4. Environment 4-Pillar | 13.12 Environmental | D. Environmental Protection | No Mention // | B. Environment | C. Environment | C- Environment | 12: Protection of the Environment |
| **13** | **Employment Practices** | 8. Regular Employment 8A. Sub-Contracting & Homeworking 10A. Entitle-ment to Work & Immigration | 3. Employment Practices | C. Freely Chosen Labour | A6., B4., C6., D2. Legally binding employment relationship | No Mention // | A1) Freely Chosen Employment (1.3, 1.4) | 1. Contract of Employment | 10: No Precarious Employment |

## Appendix B. Audit Company Comparison

In Table A2 we present an overview of Auditing Companies contracted (as of April, 2020) by the multi-brand voluntary sustainability associations/initiatives that constitute the sample in this research:

**Table A2.** Auditing companies conducting supplier sustainability audits for sustainability initiatives.

| Auditing Companies | SMETA | ICTI | PSCI | FWF | ASI | RBA | JAC | Amf.BSCI | Total |
|---|---|---|---|---|---|---|---|---|---|
| Total auditing companies contracted: | 60 | 4 | 12 | Internal | 13 | 12 | 4 | 13 | |
| ABS Quality Evaluations Inc. | x | | | | | | | x | 2 |
| Accordia | x | | | | | | | | 1 |
| ACTE International | x | | | | | | | | 1 |
| AJA Bangladesh | x | | | | | | | | 1 |
| ALGI | x | | | | | | | x | 2 |
| APCER | | | | | | | | x | 1 |
| API Audit Limited | x | | | | | | | | 1 |
| AQM HK Limited | | | | | | | | x | 1 |
| ARCHE Advisors Inc. | x | | | | | | | | 1 |
| AUS-MEAT | x | | | | | | | | 1 |
| Benchmarks Company Ltd. | x | | | | x | | | | 2 |
| BNQ | | | | | x | | | | 1 |
| BSI (Group) | x | | x | | | x | | | 3 |
| **Bureau Veritas Certification** | x | | x | | x | | | x | **4** |
| Centre Testing International Corporation | x | | | | | | | | 1 |
| China Quality Testing Int.Corp | | | | | x | | | | 1 |
| Chola MS Risk Services | | | x | | | | | | 1 |
| Control Union Certifications | x | | | | | x | | | 2 |
| Cosultivo | | | x | | | | | | 1 |
| CSR Solutions | x | | | | | | | | 1 |
| Dekra | | | x | | | | | | 1 |
| Deloitte | | | x | | | | x | | 2 |
| DNV GL | x | | | | x | x | | | 3 |
| DQS CFS Gmbh | x | | | | x | x | | | 3 |
| Ecocert IMOswiss AG | x | | | | | | | | 1 |
| **ELEVATE** | x | x | | | | x | | x | **4** |
| Environmental Resources Management (ERM) | | | x | | | | | | 1 |
| ERM CVS | | | | | x | | | | 1 |
| Ethical Trade Services Africa | x | | | | | | | | 1 |
| EUROCERT SA | x | | | | | | | | 1 |
| Extensive Standard Technical Services Co. Ltd. | x | | | | | | | | 1 |
| FLO-Cert | x | | | | | | | | 1 |
| Globalgroup Certification Limited | x | | | | | | | | 1 |
| Goler Associates | | | x | | | | | | 1 |
| GREENMENT | | | | | | x | | | 1 |
| GSCS International Limited | x | | | | | | | | 1 |
| GUTcert (AFNOR Group) | | | | | x | | | | 1 |
| Hong Kong Q.C. Center | x | | | | | | | | 1 |
| IBL Certification | x | | | | | | | | 1 |
| Insite Compliance | x | | | | | | | | 1 |
| International Associates | | | | | x | | | | 1 |
| International Compliance Group | x | | | | | | | | 1 |
| International Safety Systems | | | x | | | | | | 1 |
| **Intertek** | x | | x | | | x | x | x | **5** |
| IQC | x | | | | | | | | 1 |
| IQNet | x | | | | | | | | 1 |
| Leverage Limited | x | | | | | | | | 1 |
| **Auditing companies contracted:** | **SMETA** | **ICTI** | **PSCI** | **FWF** | **ASI** | **RBA** | **JAC** | **Amf. BSCI** | **Total** |
| LRQA | x | | | | | | | | 1 |
| Manumit87 | x | | | | | | | | 1 |
| MPS-ECAS | x | | | | | | | | 1 |
| NSF Certification | x | | | | | | | | 1 |
| Openview Service Limited | x | | | | | | | | 1 |
| Partner Africa (prev. Africa Now) | x | | | | | | | | 1 |
| Primus Auditing Ops | x | | | | | | | | 1 |
| PwC Australia | x | | | | | | | | 1 |
| QIMA Limited | x | | | | | | | x | 2 |
| Q-Inspect | x | | | | | | | | 1 |
| QMSCERT | x | | | | | | | | 1 |
| Reassurance Network | x | | | | | | | | 1 |
| RINA | x | | | | | | x | | 2 |
| SCS Global Services | x | | | | | | | | 1 |
| **SGS** | x | x | x | | x | x | x | x | **7** |
| SIPAS CR - Peru | x | | | | | | | | 1 |
| SMT Global | x | | | | | | | | 1 |
| Social Compliance Services Asia | x | x | | | | | | | 2 |
| SWEDAC Zertifizierungsgesellschaft International GmbH | | | | | x | | | | 1 |
| TÜV Austria CERT | x | | | | x | | | | 2 |

**Table A2.** *Cont.*

| Auditing companies contracted: | SMETA | ICTI | PSCI | FWF | ASI | RBA | JAC | Amf. BSCI | Total |
|---|---|---|---|---|---|---|---|---|---|
| TUV Nord Cert | x | | | | | | | x | 2 |
| **TÜV Rheinland** | x | | x | | x | x | | x | **5** |
| TÜV SUD | x | | | | | x | | x | 3 |
| **UL—Responsible Sourcing Inc.** | x | x | | | | x | | x | **4** |
| URS Verification | x | | | | | | | | 1 |
| Verisio | x | | | | | | | | 1 |
| Verité | | | | | | x | | | 1 |
| Verner Wheelock | x | | | | | | | | 1 |
| V-Trust Inspection Service | x | | | | | | | | 1 |
| Wieta | x | | | | | | | | 1 |

## Appendix C. Deep Dive into Further SSAS Category: Fire & Emergency Safety

Analogous to our analysis approach to the two main audit sustainability categories (in Sections 4.1 and 4.2 of the main article) we also counted the number of questions in the SSAS that related to fire safety capacity and emergency response procedure. Similar to the findings presented in Sections 4.3.1 and 4.3.2, the SSAS demonstrated varying degrees of detailed coverage. We identify three groups: those SSAS with low coverage (between 0–9 questions on the issue), those containing 10–29 audit questions on the matter, and finally those audit standards that covered the topic in a high degree of detail (over 40 questions just for this category). Table A3 displays our findings for this category. It becomes apparent that the IETP, RBA and amfori BSCI covered this specific topic each in more detail alone than the combined number of questions of the other five standards.

**Table A3.** Number of audit questions on Fire and Emergency Safety per SSAS.

| **Main Category: Fire Safety & Emergency Response** | | |
|---|---|---|
| SSAS | Section(s) and reference within respective SSAS: | # Questions |
| SMETA | None | 0 |
| IETP | Section 12: Fire & Emergency (pp. 31–41) | 46 |
| PSCI | Health & Safety Copmpliance and Risk Management (pp. 21–33) | 15 |
| FWF | D2. Labour standards—OHS Requirements tick list (pp. 94–100) | 10 |
| ASI | A. Governance— 2.Policy and Management (p. 10f) | 1 |
| RBA | B. Health & Safety (pp. 52–97) | 75 |
| JAC | B—Health and Safety (pp. 6–9) | 9 |
| Amfori BSCI | 2.7. Performance Area 7: Occupationals Health and Safety (p. 119–141) | 49 |

Comparative findings of detailed questions on fire and emergency safety: as the Rana Plaza catastrophe and many other horrendous factory fires have demonstrated, the ability for workers to be able to respond to a fire and stop it from spreading can have an immediate positive impact on social sustainability and health outcomes of workers in such emergencies. Thus, we decided to compare detailed questions within the category of fire and emergency safety on audit questions regarding the availability of fire-fighting equipment. As can be seen in Table A4, the particulars of how to audit for firefighting capacity are wide-ranging in the different SSAS; not just in terms of breadth and thoroughness but also in terms of how to check systems that enable firefighting.

**Table A4.** Extracts from SSAS documentation, example questions on Fire Safety.

| **Main Category: Fire Safety & Emergency Response**<br>**Sub-Category Focus: Capacity for Response to Fire/Fire-Fighting** | | |
|---|---|---|
| **SSAS:** | **Sub-Category:** | **Example Question(s) from Audit Documentation:** |
| IETP | Section 12: Fire & Emergency (p. 31–41);<br>12.5<br>Fire Fighting System: | "Is the fire safety system inspected by a qualified entity?<br>Is the number of functional and appropriate fire extinguishers in line with legal requirements?<br>Are fire extinguishers properly installed?<br>Are fire extinguishers clear from obstruction?<br>Are fire extinguishers fully charged and inspected monthly?<br>Is the sprinkler and fire hydrant system functional?<br>Is the sprinkler and fire hydrant system clear from obstructions?<br>Is the sprinkler and fire hydrant system inspected monthly?<br>Is the water supply adequate for fire hydrant or sprinkler system?<br>Are emergency response personnel trained on the proper usage of firefighting equipment?" |
| PSCI | Health & Safety Compliance and Risk Management (pp. 21–33);<br>"Emergency Preparedness and Response" | "Are the following areas of the facility equipped with fire detection/protection systems? (Site areas, Fire/smoke detectors, Sprinkler or suppression systems): -Raw material warehouse, -Flammable liquid storage tanks, -Process areas, -Finished product warehouse<br>Does the facility ensure that an adequate amount of fire water is maintained for fire protection?<br>Are new facilities constructed of fire resistive or non-combustible materials?<br>Are emergency exits and evacuation routes clearly marked, kept free of obstructions (unlocked), and illuminated with emergency backup power?<br>Are regular emergency evacuation drills conducted, and what is the frequency?<br>Is the fire alarm system monitored 24 h a day (including weekends and holidays) with prompt notification to emergency services (within 5 min)?<br>Does the facility provide sufficient portable fire extinguishing equipment for the hazards present?<br>Is the facility emergency response equipment (fire extinguisher, fire pumps, sprinkler systems) visually inspected monthly, comprehensively inspected annually, and documentation maintained for all inspections? |
| GSCP | 5. Health and Safety (Appendix C, pp. 20–27);<br>5.4 Physical Employment site Inspection | "There are at least 2 unlocked/unblocked fire exits on each floor of the employment site.<br>There are a sufficient number of fire extinguishers, fire hydrants and sprinklers to provide sufficient coverage for the whole employment site.<br>All fire safety equipment should be appropriate and have been checked within the past year.<br>All fire exit signage should be clearly visible and fire exits must not be blocked.<br>5.4.14 Fire Safety Precautions<br>Safeguards against fire are provided, including: fire extinguishers and/or hoses; fire and smoke detectors; emergency exits which open outwards and are unlocked/unblocked at all times; fire exit and warning signage; hazard/emergency lighting which runs in the event of a power cut or emergency; fire alarms which can be activated by detectors or workers and can be heard throughout the employment site.<br>Fire safety equipment is regularly maintained with written documentation and that it is in good conditions." |
| FWF | D2. Labour standards–OHS Requirements tick list (p. 94–100);<br>Fire Safety | "Fire extinguishers are appropriate to the types of possible fires in the various areas of the factory, are regularly maintained and charged (check dates), and are mounted on appropriate places." |

**Table A4.** *Cont.*

| Main Category: Fire Safety & Emergency Response<br>Sub-Category Focus: Capacity for Response to Fire/Fire-Fighting | | |
|---|---|---|
| **SSAS:** | **Sub-Category:** | **Example Question(s) from Audit Documentation:** |
| RBA | B. Health & Safety (p. 52–97); B2.2 Adequate and effective fire detection, alarm and suppression systems are in place. | "Process: Automatic fire sprinklers (if required by law or insurance company), portable fire extinguishers, heat and smoke detection, and an alarm and notification system are inspected, tested and maintained for good state of operation on a regular basis, as required by insurance company or common practice<br>Records: (a) The inspection frequency for portable fire extinguishers shall not be less than monthly. The inspection frequency for single unit smoke detectors shall not be less than semi-annually.<br>(b) Inspection for all other fire safety equipment, testing and maintenance frequency shall not be less than that required/recommended by the manufacturer, local code or insurance company whichever is more stringent<br>Fire suppression<br>(a) Portable fire extinguishers are installed<br>(b) Fire extinguisher inspection tags<br>(c) automatic fire sprinklers as required by insurance company<br>(d) Fire hose inspection tag" |
| JAC | B—Health and Safety (p. 6–9); 13. Accident & Emergencies Readiness | [Supplier] "Shall identify and assess potential emergency situations and events, and minimize their impact by appropriate fire detection, sufficient extinguishers" |

## Appendix D. Sustainability Initiative/Association Resources and Links

- Sedex/Sedex Members' Ethical Trade Audit (SMETA):
  - General Information: https://www.sedexglobal.com/about-us/
  - Audit documents protocol (downloaded July, 2018): https://www.sedexglobal.com/smeta-audit/smeta-documents/
- International Council of Toy Industries (ICTI)/ICTI Ethical Toy Programme (IETP)
  - General Information: https://www.ethicaltoyprogram.org/en/who-we-are/
  - Audit document/protocol (downloaded July, 2018): https://prismic-io.s3.amazonaws.com/wdr-test-icti%2Fc6f5027e-af47-4eda-8ba6-49b93e94fcea_ietp+checklist+version+2018+v1.0.pdf
  - Annual Reports and Specific IETP information: https://www.ethicaltoyprogram.org/en/resources/publication-library/
- Pharmaceutical Supply Chain Initiative (PSCI)
  - General Information: https://pscinitiative.org/about
  - Audit document/protocol (downloaded July 2018): https://pscinitiative.org/resource?resource=32
- Fair Wear Foundation (FWF)
  - General Information: https://www.fairwear.org/about-us
  - Audit document/protocol (downloaded July 2018): https://www.fairwear.org/wp-content/uploads/2016/06/FWFauditmanual-march2012.pdf
  - Annual Reports and Specific FWF information: https://www.fairwear.org/resources-and-tools/resource-documents
- Aluminium Stewardship Initiative (ASI)
  - General Information: https://aluminium-stewardship.org/about-asi/

- Audit document/protocol (downloaded July 2018): https://aluminium-stewardship.org/asi-standards/asi-assurance-manual/

- Responsible Business Alliance—RBA (previously EICC)
  - General Information: http://www.responsiblebusiness.org/about/rba/
  - Audit document/protocol (downloaded July 2018): http://www.responsiblebusiness.org/media/docs/CodeInterpretationGuidance.pdf
  - Annual Reports and Specific RBA information: https://www.responsiblebusiness.org/publications/ar2019/ https://www.responsiblebusiness.org/publications/ar2018/ https://www.responsiblebusiness.org/publications/ar2017/

- Joint Audit Cooperation (Telecommunications Industry)—JAC
  - General Information: https://jac-initiative.com/about-us/
  - Audit document/protocol (downloaded November 2018): https://jac-initiative.com/download/jac-audit-process/

- Amfori BSCI (Business Social Compliance Initiative)
  - General Information: https://www.amfori.org/content/amfori-bsci https://www.amfori.org/content/amfori-bsci-code-conduct-
  - Audit document/protocol (downloaded November 2018): https://www.amfori.org/sites/default/files/amfori%20BSCI%20System%20Manual_ENG.pdf

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# Transparency for Multi-Tier Sustainable Supply Chain Management: A Case Study of a Multi-tier Transparency Approach for SSCM in the Automotive Industry

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Received: 1 February 2020; Accepted: 25 February 2020; Published: 28 February 2020

**Abstract:** Sustainability in supply chain management (SSCM) has become established in both academia and increasingly in practice. As stakeholders continue to require focal companies (FCs) to take more responsibility for their entire supply chains (SCs), this has led to the development of multi-tier SSCM (MT-SSCM). Much extant research has focused on simple supply chains from certain industries. Recently, a comprehensive traceability for sustainability (TfS) framework has been proposed, which outlines how companies could achieve MT-SSCM through traceability. Our research builds on this and responds to calls for cases from the automotive industry by abductively analysing a multi-tier supply chain (MT-SC) transparency case study. This research analyses a raw material SC that is particularly renowned for sustainability problems—the cobalt supply chain for electric vehicles—and finds that the extant literature has oversimplified the operationalisation of transparency in MT-SSCM. We compare the supply chain maps of the MT-SC before and after an auditing and mapping project to demonstrate the transparency achieved. Our findings identify challenges to the operationalisation of SC transparency and we outline how FCs might set to increase MT-SC transparency for sustainability.

**Keywords:** sustainable supply chain management (SSCM); supply chain transparency; multi-tier SSCM; sustainability; automotive industry; case study research

## 1. Introduction

The last decade has seen remarkable growth in the interest in sustainable supply chain management (SSCM). This entails how companies mitigate sustainability risks in their global supply chains (SCs), as well as how they improve their own sustainability performance by making their SCs more sustainable [1–10]. Continual advances in information and communications technology (ICT) have led to near-global connectivity. These advancements have not only made global sourcing and outsourcing [11,12] more practicable, it is also becoming easier for buyers and suppliers and sub-suppliers to pass on information [11,13]. On the other hand, critical stakeholders are more able than ever before to draw attention to the negative impacts of global firms' operations all around the globe [3,8,14–17]. At a time when consumers are increasingly wondering where and how their clothes are made and just how sustainable their potential new electric vehicle might be, given the raw materials required to make it, transparency in global supply chains is a core issue to be addressed. Just as Seuring and Beske [18] and Pagell and Shevkchenko [10] demonstrated the need for normalising sustainability

in supply chain management (SCM), in the last decade, authors have increasingly recognised the central importance of extending (S)SCM beyond dyadic supplier–buyer relations [19–23] to developing multi-tier SSCM (MT-SSCM) [24–30]. In order to achieve MT-SSCM, supply chain transparency is required in order to know which parties in the supply network must be engaged [14,23,25,31,32].

Whilst numerous authors have noted that some industries (such as food, agriculture, chemicals and pharmaceuticals) have been the subject of significant research on MT-SSCM [24,32,33], in which a degree of transparency has been/could be achieved, other industries such as apparel [24,34] and automotive [35–37] struggle to encompass the entire supply chain to achieve visibility and transparency. In this context, academics have drawn attention to the particular challenges and complexities of mineral SCs for MT-SSCM [38–41]. Such raw materials go through many processing steps that can include smelting and refining, often spanning multiple continents, making transparency and tracking/tracing very difficult [42]. Furthermore, whilst focal companies (FCs) are able to leverage their contracts with direct suppliers to demand conformity with sustainability requirements, the lack of a contractual relationship with sub-suppliers adds to these challenges. The challenge of multi-tier transparency in complex SCs, confronting both academia and practitioners [32,43,44], is, as Bastian and Zentes [32] refer to it, the 'key prerequisite' for achieving MT-SSCM.

Various authors have drawn attention to the serious sustainability challenges and risks in differing mineral supply chains [31,40,45–47]. The mining and extraction sector is an industry associated with invasive effects on the environment and hazardous working conditions [40,48–50]. Due to the many stages that some minerals go through before they reach the final consumer, traceability is a particularly difficult process [51,52]. One example of a raw material involving complex, opaque SCs is cobalt. Whilst the longest-standing focus has been on conflict minerals (tin, tantalum, tungsten and gold—the so-called "3TGs" [31,39,42,51,53]), cobalt has, for good reason, also received particular attention [54]. This attention has been directed to consumer electronics and increasingly to the automotive industry as significant downstream customers of lithium-ion batteries containing cobalt [16,55–61].

Sustained, targeted pressure on FCs related to cobalt follows a growing trend whereby companies are held accountable for negative sustainability impacts in their sub-supply chains [26,28,29,33,39,62], the so-called "chain liability effect" [15,63]. This pressure is becoming more acute because of the transition to electric mobility and a corresponding spike in demand for electric vehicle (EV) raw materials [36,54,58,60,64,65]. Although this recent activity could give the impression that the problems have only recently surfaced, knowledge on the importance of cobalt to the Congo and the precarious conditions and sever sustainability issues in the cobalt mining sector have been available for a long time (see, for example, Global Witness [66], Nordbrand and Bolme [67], Garrett and Mitchell [53], Franken et al. [49], and Garrett [68]). However, minerals SCs are simply indicative of a larger challenge facing academia and practitioners concerned with the implementation of MT-SSCM broadly across industries and product segments.

Garcia-Torres et al. (2019) point out that although traceability has been the focus of certain industries and achieved for certain products/produce, SC traceability for sustainability in general remains a distant reality. To address this gap in the literature, Garcia-Torres et al. [24] recently proposed a "traceability for sustainability (TfS)" framework, based on a comprehensive literature review of MT-SCM, SSCM, and apparel literature. The TfS framework outlines three dimensions, governance, collaboration and traceability and tracking, involved in an enabling cycle for more sustainability in multi-tier SCs [24]. Our research is motivated by a desire to apply this promising framework to a critical case to improve our understanding of how transparency can be achieved in MT-SCs for improved SC sustainability.

This case study research will attempt to answer the following research questions.

**RQ1.** *What challenges do focal companies face when operationalising transparency for multi-tier (sustainable) supply chain management, in particular opaque supply chains?*

**RQ2.** *How might these challenges be overcome and what are the implications for the TfS model?*

In answering these questions, this research aims to contribute to the research on how MT-SSCM is instigated, practised and improved. To achieve this, the current article expands on a part of the TfS framework proposed by Garcia-Torres et al. [24] and analyses how transparency can be achieved as a necessary pre-condition for traceability for sustainability in multi-tier supply chains (MT-SCs). Following a qualitative abductive logic, we begin with the TfS framework and undertake a case study of a project in which an FC sets to gain transparency in a cobalt supply chain. By providing learning from a particularly critical, complex and long supply chain, this article will demonstrate the challenges to realising MT-SC-transparency, contribute to a deepened understanding of how such a process can be operationalised in an MT-SC, in order to work towards the TfS envisioned by Garcia-Torres et al. [24]. Our qualitative research seeks to understand how the framework might look when applied in detail to a concrete case (a project to attain MT-SC transparency), thus our choice of a case study research approach (Eisenhardt, 1989; 1991).

The article continues with a review of the extant literature on SSCM, MT-SSCM, and transparency/traceability in the supply chain context, leading to the recently proposed framework for achieving MT-SSCM: Traceability for Sustainability [24]. Building on arguments presented in the literature review, the authors propose to deviate slightly from the term traceability (preferred as the overarching category by Garcia-Torres et al.), suggesting that transparency for sustainability is the optimal concept. After introducing the adjusted theoretical frame, the article describes the abductive qualitative research approach and the case study methodology. This is followed by the findings of the case study. Finally, in the discussion, identified challenges to TfS in MT-SSCM are presented, conclusions are drawn from the case and the authors propose ways for FCs to better achieve transparency for MT-SSCM. The article concludes with limitations to the research and makes recommendations for practitioners and academia for the further understanding of TfS and MT-SSCM.

## 2. Background

Responding to the opportunities presented by globalisation and in an effort to become more competitive, global companies have been profiting from globally dispersed supplier networks for a number of decades [12,69–73]. Recurrently and increasingly, various stakeholders have directed their critical attention to the negative effects of large FCs' sourcing and procurement practices and the perception of their responsibility for sustainability problems in their global SCs [8,21,23,35,74–77]. Thus, in hindsightKlicken oder tippen Sie hier, um Text einzugeben., it is not surprising that SCM expanded its focus to include sustainability and that sustainable supply chain management (SSCM) has become a prominent academic field in part responding to the calls for more critical attention [1,2,4,18,78].

### *2.1. Sustainability in Supply Chain Management Beyond Tier 1*

Throughout the development of SSCM, many authors have focused on the barriers and drivers for implementing SSCM [3,9,29,79–81]. By early 2019, over 1500 drivers of SSCM have been identified [78]. However, one major barrier confronting FCs wanting to improve the sustainability of their SCs is the lack of SC visibility [31], hence limiting their ability to influence and improve sustainability in their sub-supply chains [15,29,73]. This corresponds to the earlier problem of SSCM research that focused on dyadic supplier–buyer relationships [19,22], whereby FC influence on sub-supply chain sustainability performance decreases with rising SC distance [22,28,29,82]. This initial dyadic focus in SSCM research is particularly interesting, given that seminal SSCM definitions include the entire supply chain [8,52]. Sauer and Seuring [28] argue that suppliers' and sub-suppliers' actions and practices are more likely to be adapted to their SC setting, rather than an FC's sustainability requirements, given the decreasing FC influence upstream in the SC.

To overcome the limited, prevailing dyadic SC focus, Mena et al. [22] conducted a multiple-case study of businesses from the food sector to propose a theory of multi-tier SCM and determined specific relational practices among SC partner in MT-SCs. The authors concluded that "more companies [will be] forging relationships across supply networks for various reasons, such as sustainability" and

recommended that future research examine multi-tier SCs "in other industries with more complex and longer supply chains, such as automotive or electronics" [22]. Seeking to advance this initial MT-SC research, Tachizawa and Wong [29] conducted a structured literature review and sought to advance this initial research by moving beyond relational factors in MT-SCs to governance mechanisms, practices and contingency factors. Importantly, they added the context of sustainability, creating multi-tier SSCM (MT-**S**SCM). Hartmann and Moeller identified and clarified a primary motivator for FCs to commence MT-SSCM and found evidence for the "chain liability effect" in MT-SCs [15]. Although they recognised the "limited" possibilities for FCs to establish full SC transparency, they noted, nonetheless, that "the market will punish the focal firm [FC] for its suppliers' behaviour . . . " and they recommended that "companies should work to ensure sustainable behaviour throughout the supply chain, to protect themselves from chain liability" [15]. They concluded by calling for additional research on how SCM can extend its reach to increase transparency in MT-SCs.

Grimm et al. [25,26] furthered MT-(S)SCM knowledge by focusing on the role of sub-suppliers and their interaction with FC sustainability requirements. They analysed two MT-SCs in the food industry and identified four groups of critical success factors that influence how successfully sub-suppliers will comply with sustainability standards [25]. They noted the need to obtain more data and conduct research in other industries/sectors. Building on these preceding contributions to MT-SSCM, Wilhelm et al. [33] identified the "instrumental" role of Tier-1 suppliers that have a double agency: fulfilling FCs' requirements and actively passing on such requirements to the upstream SC [33]. Their research involved FCs from the food industry and one consumer electronics FC. They concluded that their analysis demonstrates different applications of purchasing power, but that power asymmetries in SCs differ from industry to industry and that problems of (sub-)supplier opportunism can be "alleviated through increased efforts to improve supply chain transparency" [33]. In another study, based on data from seven MT-SCs in the food, apparel, packaging and consumer electronics industries, Wilhelm et al. [30] built on the FC practices identified and proposed by Tachizawa and Wong: "direct", "indirect", "work with third parties" and "don't bother" [29]. In close alignment with previous research, they discerned four MT-SC scenarios from their seven cases: open, closed, third party and "don't bother", as well as three main factors influencing FCs choice to conduct MT-SSCM: supply chain complexity, SSCM capabilities of Tier-1 suppliers and TBL/sustainability aspect in focus [30]. They recognised that different MT-(S)SCM contingencies may be present in different industries such as mining and automotive [30].

Drawing on their research into complex mineral SCs [40,41] and previous MT-SSCM frameworks, Sauer and Seuring [28] proposed a three-dimensional framework for MT-SSCM in which the sub-supplier's direct environment is taken into consideration and proposed strategies for improving MT-SSCM depending on various contingencies. In other research [41], Sauer and Seuring focused on the specific SSCM issues in mineral SCs and added to previous approaches for conducting MT-SSCM [22,25,29,33] by proposing a further strategy: the cascaded approach, whereby FCs collaborate with mid-SC actors, who act as a sort of second FC to drive sustainability requirements into the upstream SC. Due to the enormous complexity (involving hundreds and thousands of mid-tier suppliers) downstream FCs have been found to "jump the chain" [51] to engage with key upstream sub-suppliers/chokepoints and extend beyond their "visibility boundary" [31].

The primary problem that becomes apparent for companies trying to engage in MT-SSCM is knowing who their sub-suppliers are, where the raw materials originate and the sustainability conditions throughout the SC [83]. At present, the ability to trace raw materials for MT-SSCM and have total SC visibility is a utopia [24,43]. While academic and theoretical progress has been made on MT-SSCM, what is often missing is the recognition that SC transparency is a key pre-requisite before MT-SSCM can occur [32]. As Wilhelm et al. stated, managing the sustainability of sub-suppliers "is still the exception, rather than the rule" [30]. Gong and Jia et al. focused on how FCs can orchestrate their resources to achieve sustainability knowledge transfer through an MT-SC [84]. Importantly, in their case study, they transcended the triad with findings across and up to six SC tiers. They also recognised the

role that supply chain mapping must play as a first step in MT-SSCM activities. Assuming that achieving transparency (and the resulting SC visibility) is the key factor for MT-SSCM [31,32,41,82,85,86], it is apparent that FCs find it exceptionally difficult to achieve transparency in their MT-SCs [87,88].

### 2.2. Transparency in Sustainable Supply Chain Management

The need for transparency in supply chains has been the focus of numerous authors [14,31,34,43, 87,88]. In some industries, such as food, agriculture and consumables, supply chain transparency has received a lot of attention and made progress [3,25,32,73]. Garcia-Torres et al. [24,89] responded to the challenges outlined above by conducting a systematic literature review of SSCM and traceability, with a focus on the apparel industry as an industry demonstrative of acute sustainability issues and characterised by MT-SC transparency challenges. They proposed an ambitious framework, the enabling cycle "traceability for sustainability—TfS" that explains how FCs implement TfS to increase transparency for improved sustainability in MT-SCs. Their framework builds on previous theoretical models and proposes three main dimensions that explain the occurrence of TfS: Governance, collaboration and tracking and tracing [24], as reproduced in Figure 1 below. Garcia-Torres et al. conceive of traceability as a meta-capability that can have self-reinforcing positive effects on MT-SSCM. Hence, they posit that TfS is applicable to SSCM in all industries and may be able to positively disrupt existing SSCM and encourage more truly sustainable SCs [24].

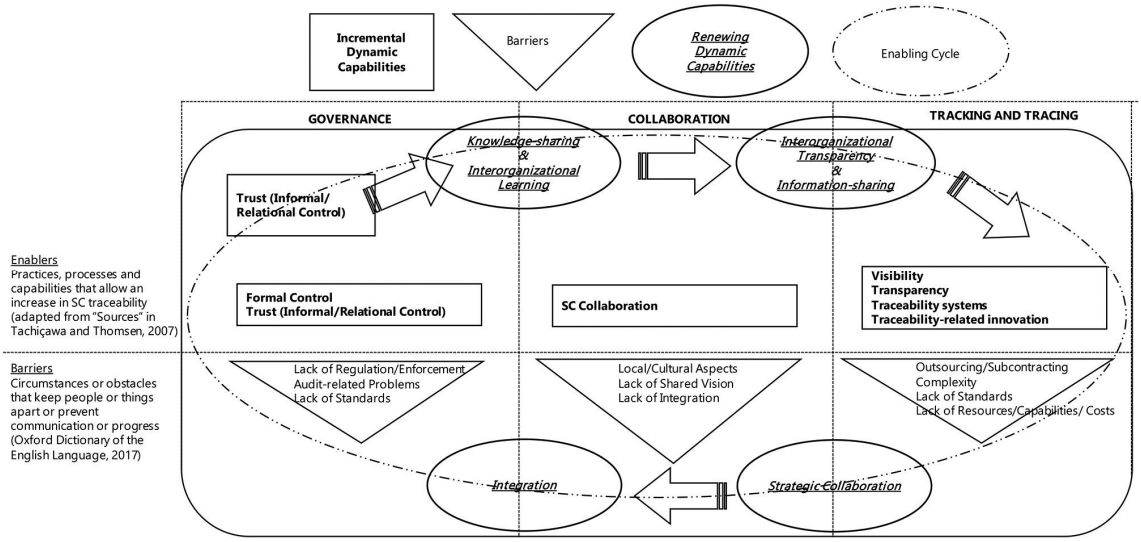


**Figure 1.** TfS cycle as proposed by Garcia-Torres et al. [24], reproduced with author's consent.

However, what is supply chain transparency? Trienekens and Wognum et al. define it as the extent to which all SC stakeholders share a common understanding of, and have common access to, product-related information that they request, without loss, noise, delay and distortion [73]. Hence the onus is on the stakeholder (whether FC, supplier, or parties affected by SC activities) to request transparency. Egel-Zandén et al. note that transparency expectations on FCs have extended into their supply chains, leading to the ascension of the concept "supply chain transparency", which they define as the "disclosure of information about supplier names, sustainability conditions at suppliers, and buyers purchasing practices" [43]. The OECD explicitly recommends that downstream companies implement a "supply chain transparency system" that enables the identification of key midstream SC actors and thereby countries of origin of all raw materials [86]. Some critical authors point out the potential for and documented misappropriation and abuse of purported supply chain transparency [45,87,88]. Notwithstanding, this research follows Gardner et al. in their neutral assessment of the term, namely that supply chain transparency alone is "neither inherently good, nor bad and that the impact of increased transparency depends . . . on *what information* is being made transparent, *how*, to *whom*, and

for *what purpose*" [38]. Furthermore, they highlight that transparency can "demystify" highly complex SCs, allowing risks to be identified and targeted improvements to be made [38]. Thus, in alignment with the logic of Garcia-Torres et al. [24], we argue that transparency in MT-SCs should not just be transparency for transparency's sake, but rather must be *transparency* for sustainability (TfS).

### 2.3. Differentiating between Supply Chain Traceability and Transparency

Garcia-Torres et al. [24] make a compelling case for focusing on traceability as the defining activity (the "doer") in their framework for improving SSCM's reach in complex MT-SCs. Still, as Young and Dias [42] clearly portray, it is important to understand the nuances and differences between tracking and tracing in MT-SSCM. Traceability is certainly a common transparency approach for FCs (see Figure 2) that aim to achieve more transparency in their upstream SCs, by tracing back "up" the supply chain to determine the origins of their products. Gardner et al. [38] build on the SC transparency framework of Egels-Zandén et al. [43] by proposing that SC-transparency consists of six types of information: traceability, transaction, impact, policy and commitment, activity, and effectiveness information [38]. This underlines our argument that traceability is a key measure that contributes to the *overarching concept* of SC transparency. Hence, we concur that traceability is one of a number of steps/approaches to achieving transparency for sustainability in MT-SSCM. Also, practically speaking, transparency is an indisputable precondition for undertaking traceability—an FC must know who it should interact with ("who is my Tier 2?") before it can begin tracing its products or raw materials up the SC. Depending on who is instigating MT-SC transparency (i.e., focal companies, raw materials producers, mid-stream players such as refineries and smelters, or third party actors), there will be different approaches to gain transparency for sustainability (see Figure 2). Material or product tracking is most relevant for upstream SC actors (such as raw material producers) or FCs that know the source of their materials and who want to "track" the supply routes that the materials/products take, down the supply chain. By contrast, traceability is the approach for SC stakeholders to uncover the origins of a product or raw material by retracing the route taken up the supply chain. Mid-stream SC members would employ both approaches to gain full SC transparency.

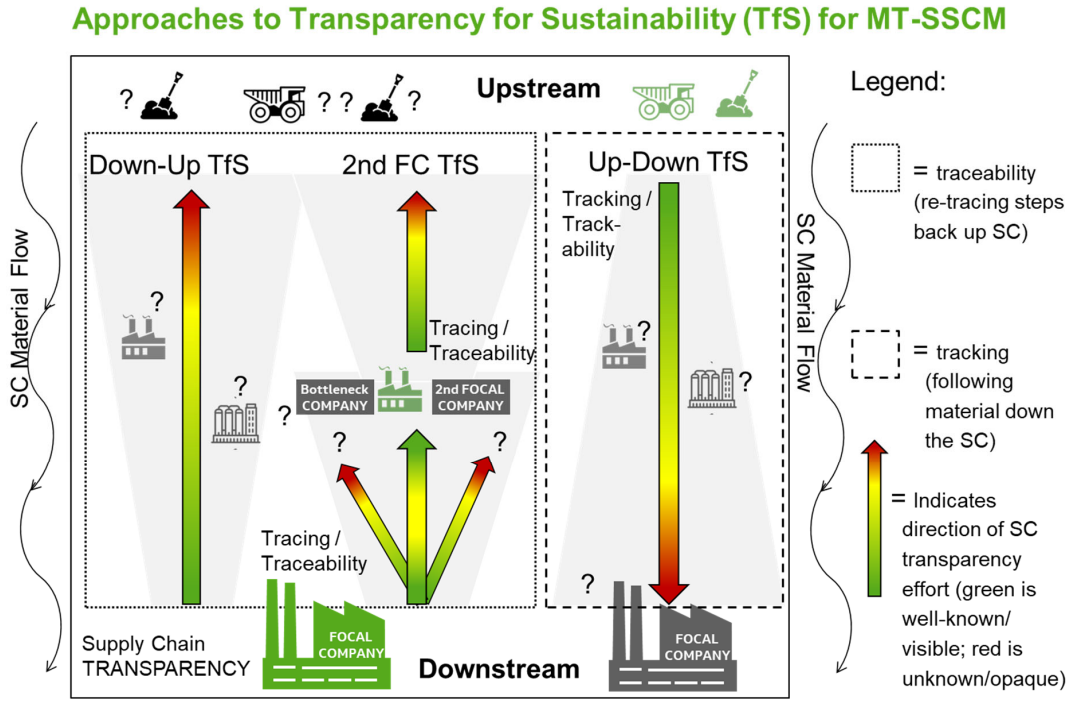


**Figure 2.** Different approaches to SC transparency (visibility, tracing and tracking)—authors' depiction, loosely based on Young and Dias [42].

In conclusion, we generally adopt the TfS framework [24]; however we substitute the term traceability with transparency in the title, thus rebranding the model "*Transparency* for Sustainability". Garcia-Torres et al. [24] actually propose that "visibility and transparency are preconditions for effective tracking" and suggest a four-step process: (1) Integration of visibility (access to / share information); (2) Transparency becomes core element—as a practice; (3) Integration of traceability systems; and (4) Traceability related innovation—extend transparency from SC actors to non-SC actors. Thus far MT-SSCM research has been primarily focused on the food and somewhat on the chemical and pharmaceutical industries. Although the TfS [24] framework is based on an analysis of the apparel industry, it has the potential to be applied generally, independent of a specific industry. Many other MT-SSCM frameworks imply knowledge about the necessary SC triads/sub-supply chain structure [22,25,26,29,30] or treat it as an unknown field (e.g., "Tier-n space" [28]) requiring supply chain mapping for SC sustainability learning [84] or coalition with key SC chokepoint actors to cascade requirements and extend FC reach [41]. The TfS model recognises the central necessity for the discovery of the MT-SC (traceability/transparency) and frames this on the same level as SC collaboration and SC governance. Hence, our abductive research sought a challenging, qualitative case study to further analyse the potential workings of this framework. We particularly focus on the crucial part (highlighted in Figure 3) of their TfS framework in our in-depth case study. The research contributes to moving beyond a theoretical proposition of processes, interdependencies, antecedents, drivers and barriers, to understanding how entities can operationalise transparency for sustainability in their SCs, to suggest how transparency for sustainability can be achieved in MT-SSCM.

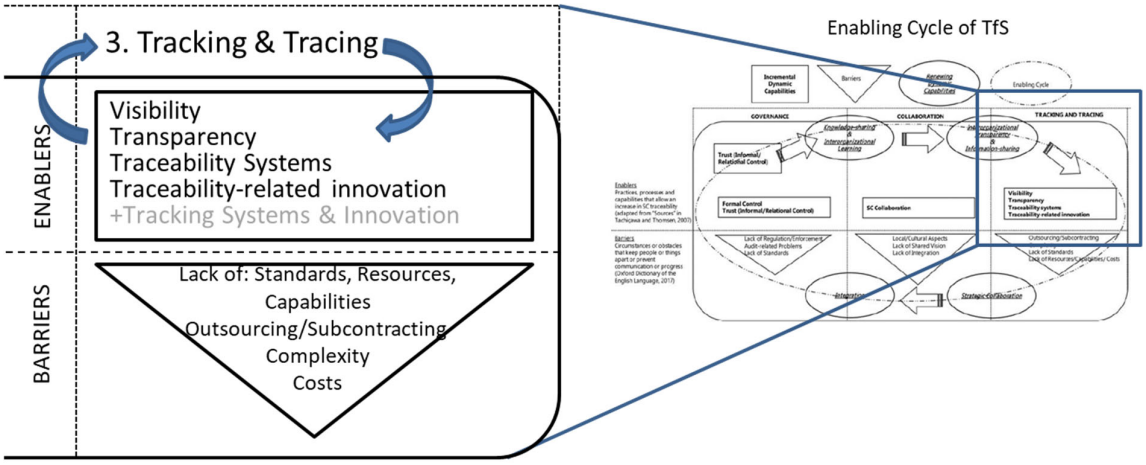


**Figure 3.** Research focus: tracking and tracing dimension of TfS cycle (reproduced with the explicit consent of the corresponding author) [24]..

## 3. Methods

Noting the calls from the literature for a more in-depth understanding of how SC transparency can be achieved, this research employs a qualitative, abductive research design [90–93]. This is because abductive analysis research "specifically aims at generating novel theoretical insights that reframe empirical findings in contrast to existing theories" [93]. With a grounding in the extant MT-SSCM literature summarised in Section 2 above, we discovered and gained access to a potentially interesting case of a project attempting to attain MT-SC transparency. We qualitatively analysed this case, suspecting to encounter "surprising empirical findings" in order to return to the pre-conceptualisations we had formed based on our review of the literature. Once the case study was underway, we returned to the literature, in an iterative sense to inform our analysis of the qualitative findings [93–95]. In such a manner, abductive research seeks to supplement or improve existing research and theory, with findings obtained from empirical idiosyncrasies [96–98]. The TfS-enabling cycle framework seemed promising but optimistic when imagining its application to an opaque, high-risk SC, such as the cobalt

SC in the automotive industry. Bitekine argues that research should not only explore "quantifiable aspects of … process explained by theory but also those … aspects … that cannot be adequately quantified" [99]. For this case study, the researchers gained access to a project, in which a global focal company, hitherto "FC1" (referred to as FC1 to distinguish it from the common abbreviation FC/FCs for any/all focal companies), and one of its suppliers attempted to obtain MT-SC transparency for sustainability purposes (such as to gain visibility, capture sustainable procurement practices, evaluate OECD due diligence compliance) in a complex cobalt SC. The selected mineral supply chain demonstrates characteristics [41] that set it apart from many of the previous supply chains (e.g., food, precious stones, pharmaceuticals, and apparel) that had served as the cases upon which previous frameworks and theories of MT-SSCM have thus far been based.

### *3.1. Case Study Research Design: Single Case—Within Case Analysis*

Due to the need for empirical examination of the TfS framework [24,89], we employ a case study research approach, to make participant observations [100] about the "real world phenomenon" [101] and process [102] of multi-tier SSCM. This research attempts to understand TfS in a case-context and to what extent the empirical findings correspond to the theory discussed in Section 2.2 above [103,104]. Cavaye points out that while there is a tendency towards positivism and deductive approaches among proponents of case study research (see, for example, Lee [105], Orlikowski and Baroudi [106], and Yin [100,104]) case study research may entail an unstructured, interpretive investigation of a single case [103]. Whilst numerous authors underline the importance of multi-case case study research, particularly for validating concepts [104,105,107,108], others point to the value and necessity of single-case case-study research [100,103,109,110].

As Eisenhardt explains, case studies can be useful for generating important new insights, particularly those concerning under-researched phenomena, where "current perspectives seem inadequate because they have little empirical substantiation" [108]. Cavaye [103] adds that the purpose of a single-case study can allow the researcher to understand the nuances of a phenomenon in depth. Previous research had called for an examination of the automotive industry for MT-SSCM and transparency [22,24,30,33]. With access to an illustrative FC project in the automotive industry, we decided on a single-case case study, employing within-case analysis. For this case study, the unit of analysis is the cobalt supply chain under examination.

### *3.2. Case Selection & Definition, Case Study Actors*

Our case study concerned the SSCM of the automotive company "FC1" and specifically the SC mapping and auditing work of an auditing and supply chain specialist consultancy "ASPC1", undertaken on behalf of FC1 and one of their strategic Tier-1 suppliers (hitherto "T1S") on their common cobalt SC. Increasing climate and environmental pressure, driving the ramp-up of electric vehicle production on the one hand, coupled with the shocking conditions presented in the media around cobalt mining on the other, make the cobalt supply chain a pressing candidate for SSCM research. Add to this, the particular brand and purchasing power of automotive OEMs to require more transparency in their SCs makes an automotive OEM an ideal candidate to be selected for an in-depth MT-SC transparency case study. In this case, SC transparency was understood to include finding out if the supposed knowledge about the sub-SC was extensive and complete and to determine the capacity of sub-suppliers at each stage for contributing to and achieving SC transparency as well as responsible sourcing, due diligence and other sustainability practices. However, the establishment of MT-SC transparency, in the sense of visibility of the sub-supplier ecosystem, remained the focus of this research, as we consider it to be the prerequisite for further sustainability/SSCM activities.

The initial project that constitutes the case ran for six months. In order to map the common supply chain of FC1 and T1S for upcoming models (start of production in the following year), ASPC1 implemented its due diligence and supply chain mapping audits methodology for cobalt on the respective FC1 cobalt SC. Supply chain mapping audits go beyond a typical supplier audit. They not

only focus on the supplier and the conditions and capabilities at the supplier's direct facility but also entail an explicit focus on the supplier's position in the supply chain and to uncover the supplier's supply sources and validate this information (see [111] for more information). In Section 4, we outline the background and setting of the case study, as well as providing a description how transparency was achieved through SC mapping audits.

### 3.3. Data Collection

Our research involved thorough observation and analysis of a single channel of data generated through the implementation of ASPC1's proprietary methodologies, which comprised multiple forms of qualitative data [100]. These included supply chain maps, audit responses, risk analyses, audit reports, researcher participant observation and project correspondences. ASPC1 was contracted by the multi-national automotive FC (herein referred to as FC1) and one of FC1's Tier-1 suppliers (T1S) to apply its methodology to the SC in question. The initial cobalt supply chain map was provided to FC1 and ASPC1 by T1S concerning the cobalt supply chain for relevant upcoming products based on T1S's MT-SC knowledge and what they were able and willing to provide at that point in time. This depiction of the MT-SC (see Figure 4) was taken as the baseline data, against which real and verified SC data was collected by ASPC1 and compared. Based on the original mapping, audits assessing the capacity for MT-SC due diligence were planned with ASPC1. One of the researchers participated in biweekly project calls, had access to project documents and correspondence, analysed ASPC1's audit reports and contributed to brainstorming about how to improve project processes.

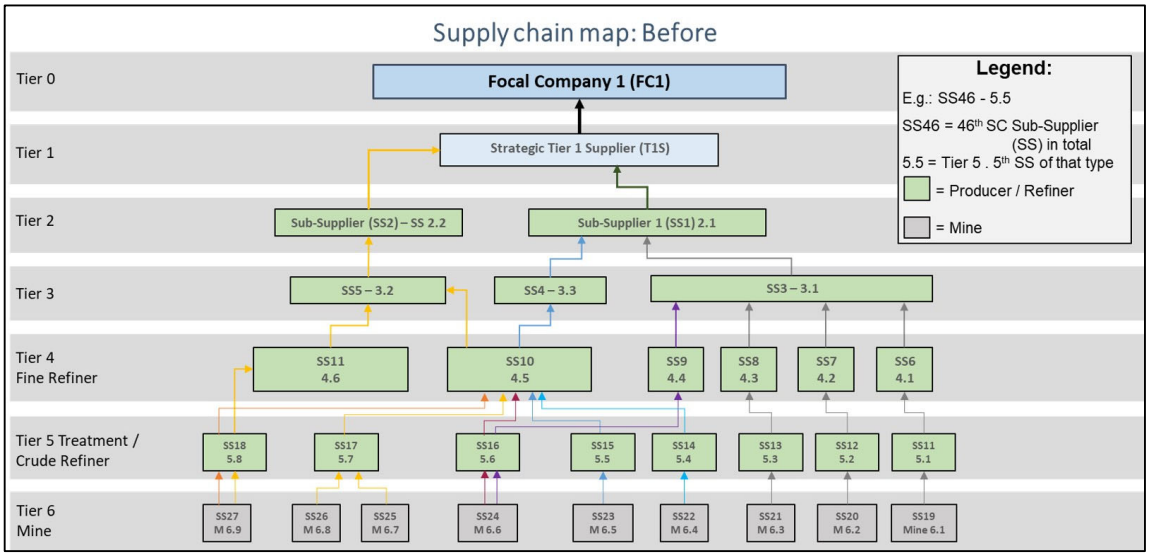


**Figure 4.** Initial map provided to FC1 by TS1 of FC1's cobalt supply chain.

### 3.4. Analysis

Our abductive research involved reviewing how MT-SC transparency has been understood in the literature and what approaches have been proposed. We then turned to our specific case to analyse "how" transparency for sustainability was operationalised in MT-SSCM from an FC's perspective. Hence, we set out to capture and then compare the MT-SC transparency knowledge (data) that a focal company could obtain by simply asking its Tier-1 supplier, with the transparency data gained by conducting SC mapping audits and due diligence/sustainability assessments using ASPC1's SC audit and mapping methodology. Based on the SC data, which ASPC1 enabled and uncovered for FC1 and T1S in the project, we identified and compared the disclosed/known number of SC (sub-)suppliers, to demonstrate how an FC's SC-transparency may be quantified and operationalised. Beyond this quantified data, we made observations about real-world processes, barriers and enablers that can affect

aspects of MT-SSCM, such as tracking and tracing, governance and collaboration, with reference to the TfS framework. Our particular analytical focus was on the implementation process, to identify what steps precluded what results, in order to demonstrate how to make progress towards MT-SC transparency. In our analysis of the data generated by ASPC1 for FC1 and T1S, we aimed to further operationalise the TfS framework and identify additional factors that may be necessary for the proposed TfS enabling cycle to work.

## 4. Case Study

### *4.1. Setting & Project Background*

As part of its SSCM strategy, FC1 is focussing on SC-transparency as a precondition for other sustainability activities in critical sub-supply chains. FC1, like numerous other focal companies that have cobalt in their final products, recognised the significant risks associated with the raw material. Critical stakeholders have increased pressure on global brands to improve their SC due diligence and address issues associated with cobalt supply. However, as FC1 did not source the raw material directly, the challenge was to improve transparency and find out where the cobalt in various parts and products came from. Thus, risk management was a driver for obtaining more transparency in such a high-risk SC. FC1 engaged in industry-wide discussions and followed the newest developments in cross-industry forums. There were various previous attempts to ascertain information about the sub-supply chain, including a pilot project involving a cobalt-specific questionnaire that was to be "cascaded" down the supply chain. Whilst this pilot made some progress (down to Tier 3 and 4 in a few instances), it was generally recognised that the methodology was not sufficient and relied heavily on the goodwill and honesty, as well as the capacity and knowledge, of suppliers about the structure of the sub-supply chain. Since 2016, FC1 had decided to engage in direct dialogue with strategic future suppliers of cobalt-containing products and carry out sustainability workshops in order to identify common areas of focus and risk and then to determine the next steps to address the identified risks.

One of the companies FC1 engaged in such a sustainability workshop was a strategic supplier, T1S. As part of this engagement, the need for more transparency in T1S's supply chains for FC1's products was determined. The culmination of several supplier sustainability engagement workshops between T1S and FC1 was an agreement to jointly commission ASPC1 to map and conduct supply chain mapping audits of the common cobalt supply chain for upcoming products.

### *4.2. Cobalt Supply Chain Mapping Project for Multi-Tier Supply Chain Transparency*

Our research team had access to the planning, execution and results of a supply chain mapping and auditing project, implemented by ASPC1 for FC1 and T1S. The scope of the project was focused on establishing T1S' multi-tiered supplier ecosystem (the complete picture of the sub-supply chain, including all supply chain partners) for cobalt material in FC1's products down to the mine level. This case study includes a description of the background, motivations and setting leading to such a supply chain transparency project, and the importance of the access to ASPC1's audit methodology to achieve the goal of the project. It also offers a description of the process of how transparency in this specific case was conceived, how the project was implemented, and to conclude, a comparison of the supply chain maps, before and after the project had been completed (representing the transparency achieved).

Supply chain mapping audits entail auditing a supplier to gain an exhaustive picture of the supplier's sources for the product concerned, in this case, cobalt. ASPC1 was selected by FC1 and T1S due to its successful implementation of supply chain mapping audits globally for other companies and the required expertise to complete the project. Both commissioning companies' management agreed to carry the cost of auditing sub-suppliers. This entailed the possibility of opening up the sub-supply chain and potentially being made aware of and exposed to more unknown risks. However, given the increasing (critical) interest in electric vehicles and the requirement that they be produced more sustainably, coupled with FC1's general increased emphasis on sustainability in procurement,

both companies decided to undertake the project. Following the co-ownership logic of the project and tri-partite implementation, and recognising that risks in the cobalt supply chain would affect both FC1 and T1S, the companies agreed to co-fund and manage the project. Moreover, as a direct supplier of FC1, T1S also reported that it saw participation in such a project as part of demonstrating a commitment to FC1's supplier requirements that they were motivated to fulfill.

To begin the mapping and auditing process, T1S provided FC1 and ASPC1 with an initial SC map, outlining T1S's understanding and knowledge about the cobalt SC, as far as it related to FC1's products. This "before" map was based on information provided to T1S by its suppliers and sub-suppliers. This initial map revealed the following initial, presumed MT-SC situation (see Figure 4).

According to the original SC map estimate, the SC involved the following sub-supplier levels: Tier 2—two cathode producers; Tier 3—three pre-cursor material producers; Tier 4—six fine refiners; Tier 5—eight crude refiners/treatment units; and at Tier 6—nine mines (see Figure 4).

### *4.3. SC Mapping, Auditing and Project Processes*

The scope of this initial project was decided based on the information regarding the SC structure and the number of sub-suppliers provided in the initial map to FC1 by T1S (recall Figure 4). Based on ASPC1's advisory, it was agreed to begin auditing and mapping the supply chain tier by tier. At all tiers in the supply chain, ASPC1 checked the relevant company's due diligence in sourcing, managerial awareness and responsibilities, and their due diligence system and site/company sustainability performance. They then proceeded upstream up the SC. The case data was primarily generated through the process of auditing sub-suppliers. The SC mapping audits followed a general supplier audit process for engagement, communication, execution and follow-up, as depicted in Figure 5.

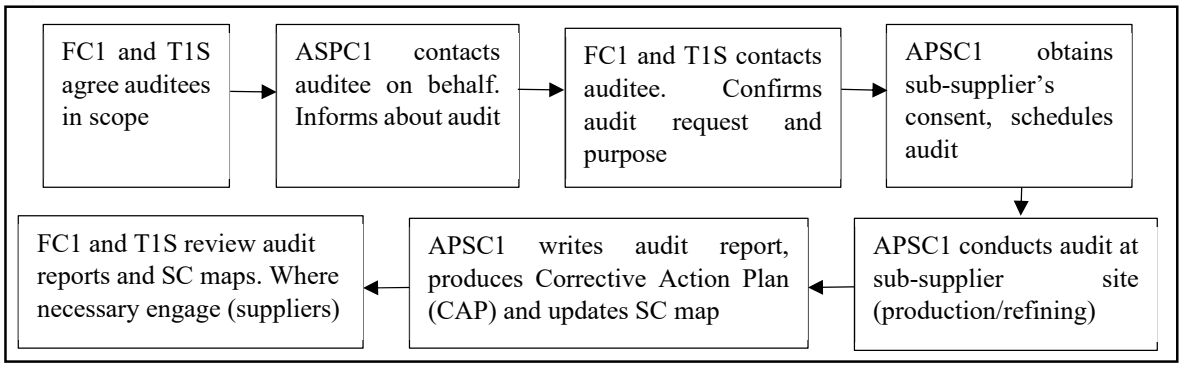


**Figure 5.** Supply chain auditing and mapping process.

The SC-mapping audits were announced and requested by ASPC1, explaining that the audit had been commissioned by FC1 and T1S. Follow up communication by FC1 and T1S was occasionally required to secure sub-supplier acceptance and participation. Each audit generated numerous types of data: process data; SC-mapping data (sub-supplier determination); general supplier sustainability performance data; and particularly, supply chain due diligence data (supplier practices and information measured against OECD guidance, 86). ASPC1 conducted the audits onsite at each of the concerned (sub-) suppliers' facilities, which included documentary and records reviews, management and employee interviews and a facility walk-through for observation. Beyond the supplier data, SC map updates, audit reports and correspondence, the corresponding author also made observations and gathered experience regarding the processes, communication and collaboration, involved in such an MT-SC transparency undertaking.

ASPC1 agreed to provide regularly updated SC maps together with audit reports to demonstrate progress made to T1S and FC1. Regular bi-weekly calls were held between FC1, T1S and ASPC1 in order to discuss progress, escalate issues, brainstorm communications for encouraging sub-supplier participation and acceptance of the audits, request and follow up on corrective action plans, and

begin responding to identified risks and issues. FC1, T1S and ASPC1 allowed one of the researchers to accompany an audit of one of T1S's plants, allowing the authors to gain an understanding of how such an SC mapping and due diligence audit is carried out in practice. By the end of an audit, the (sub-)supplier must prove to ASPC1 that they are able to exercise due diligence on the materials under scrutiny in their SC. FC1 decided to continue the SC transparency project in phase two, involving an extension of the auditing and mapping activities to cover discovered but not yet audited parts of the supply chain.

## 5. Case Study Findings and Analysis

In this section, we begin by describing the primary transparency findings of the MT-SC mapping project that constituted our case study, and then we present the findings of this project organised into abductively determined categories.

### *5.1. Case Study Findings*

Our qualitative case study of ASPC1's SC mapping and auditing methodology, implemented in FC1's and T1S's common SC, provided us with a rich picture of the complexity, challenges and required steps for obtaining MT-SC transparency. The primary finding of the case study was that the cobalt supply chain, which constituted the unit of analysis of our research, was in fact far more complex than either FC1 or T1S had anticipated and revealed many unknown SC actors, particularly in the midstream SC, as shown in Figure 6. Sub-suppliers are marked green, traders blue and mines grey.

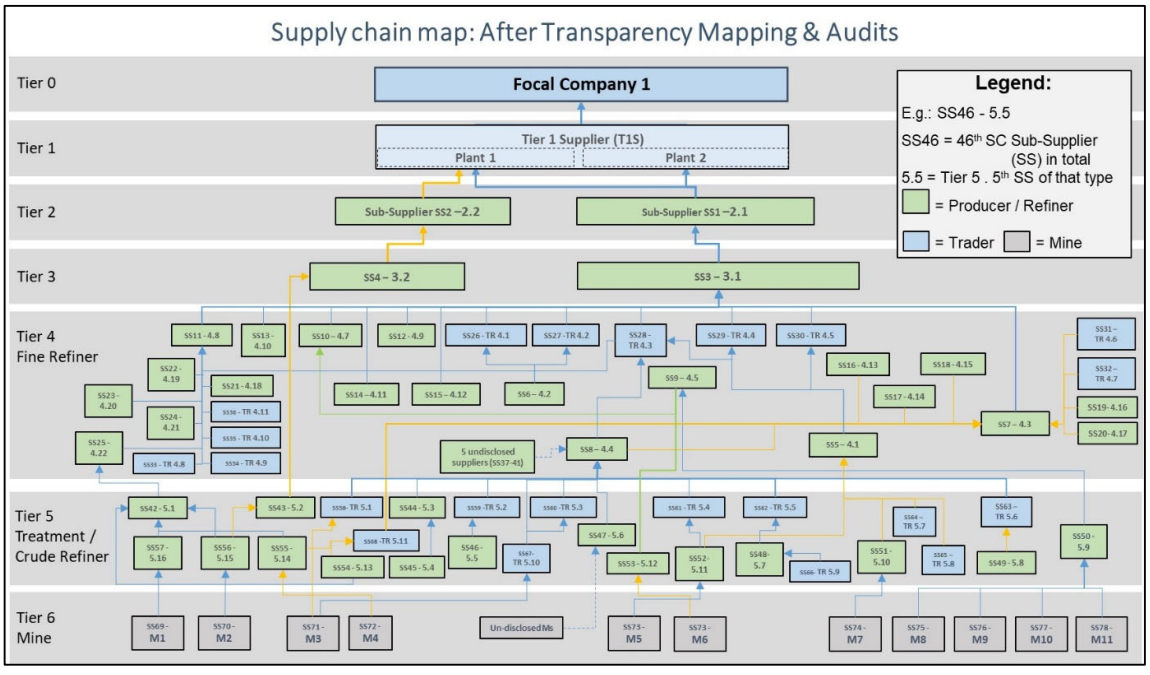


**Figure 6.** Updated supply chain map after the conclusion of Phase 1 of SC mapping and audits project.

A cursory comparison of the two SC maps (depicted in Figures 4 and 6) reveals that a clear and significant increase in MT-SC transparency was achieved and thereby a better understanding of the sub-supply chain. As portrayed in Table 1, the number of identified SC actors increased from 28 to at least 79, representing a 182% increase in visible, identified SC actors.

**Table 1.** Comparison of number of known/disclosed supply chain actors in FC1's cobalt SC.

| Supply Chain Tier | # SC Actors Initially Identified | # SC Actors Identified After Project |
|---|---|---|
| 2nd Tier—Cathode | 2 | 2 |
| 3rd Tier—Pre-Cursor | 3 | 2 |
| 4th Tier—Fine Refiner | 6 | 37 (21 + 11 Traders + 5 undisclosed) |
| 5th Tier—Crude Refiner | 8 | 27 (16 + 11 Traders) |
| 6th Tier—Mine | 9 | 11 (+X? undisclosed) |
| **Total** | **28** | **79** (+ X?) |

Having established these primary comparative findings, we continued with an abductive approach, iterating between the accumulated data, experiences, process knowledge and identified gaps learned in the project and the MT-SSCM literature. In so doing, we began to identify categories of issues to group our findings. These categories were as follows: unexpected sub-supply chain complexity (Section 5.1.1); distance of T1S to its upstream SC (Section 5.1.2); MT-SC collaboration and governance (Section 5.1.3); iterative nature of attempts to gain transparency in MT-SCs (Section 5.1.4); and finally, that transparency, once obtained, only represents a temporal snapshot of the MT-SC (Section 5.1.5).

#### 5.1.1. Complexity of Analysed Multi-Tier Supply Chain

The project for improved transparency in the cobalt supply chain was enlightening for both FC1 and T1S. Already after just a handful of supply chain mapping audits, it became abundantly clear that the cobalt supply chain was much more complex than initially understood by both commissioning parties. The prior knowledge, existing methodology and practical implementation experience of the implementation partner, ASPC1, were crucial to the project. The regular SC map updates, provided by ASPC1, clearly demonstrated that the initial supply map provided by T1S was insufficient and incomplete. Not only were many new sub-suppliers uncovered, but the number of traders at various tier-levels added to the complexity, as traders entertain supply relations to many more other SC partners. Even after only a dozen SC mapping audits, the SC complexity became so intense, that it was proving difficult to visualise using standard office computer tools.

#### 5.1.2. Distance of Tier 1 to Upstream Supply Chain

Partially owing to the complexity described above, like many Tier-1 suppliers, T1S is highly removed (6 tiers, not including middlemen functions/traders selling material within the same SC tier level) from the upstream SC (mining/extraction level). This case made it apparent that T1S was ill-informed about and/or ignorant of its own sub-supply chain. T1S's initial disclosure was dependent on information from their own direct suppliers. Hence, the case study was not only a wake-up call for T1S, it demonstrated to FC1 that their Tier-1 suppliers probably have decidedly limited transparency knowledge about their sub-supply chains. The project also helped T1S make the case to its management for more resources and organisational attention, in order to have a better picture about SC transparency in the future. The case demonstrated the pressing need to FC1 to engage its direct suppliers of critical raw materials in order to ensure that MT-SC transparency and due diligence would be improved.

#### 5.1.3. Multi-Tier Supply Chain Collaboration & Governance for Sustainability

Once the project began, it also became clear how an attempt to increase transparency (and work towards traceability) also impacted SC collaboration and SSCM governance. Through the thorough work of ASPC1, particularly in the cobalt ecosystem, FC1 and T1S were conducting audits that aligned with global institutional expectations, such as OECD due diligence requirements and Responsible Minerals Initiative (RMI) and Responsible Cobalt Initiative (RCI) governance expectations. Although sub-suppliers accepted the audits, they pointed out that similar audits were being conducted

frequently by different global FCs and that there was a pressing need for more standardisation and alignment. Such considerations around the frequency of audits led to ASPC1 and FC1 deepening their relationship to engage other companies in collective action processes with the objective to reduce overall costs and time spent without losing robustness of MT due diligence process. The combined, collaborative approach of FC1, T1S and ASPC1 pushing for more transparency in complex supply chains was effective. The collaboration between the three parties resulted in a high up-take rate of sub-suppliers agreeing to the audits, with only one sub-supplier refusing the audit, reportedly due to audit fatigue. This sub-supplier instead offered to share their third-party audit results with T1S and FC1. With FC1, T1S and ASPC1 working together, the combined weight/clout seemed to have positive effects in terms of ensuring participation and SC disclosure. Not just in the sense of "pressuring" sub-suppliers to agree to audits, but also in terms of engaging with sub-suppliers on the broader issues of transparency, sustainability, instituting management systems for responsible sourcing/due diligence and MT-SC sustainability risk management. Although initial engagement of some sub-suppliers took some recurring effort, once contact had been established, opportunities for increased engagement and cooperation became possible. The direct engagement led to more MT-SSCM exchange, also among FC1 and its ier 3, 4, and 5 sub-suppliers. The transparency obtained served as a foundation, upon which both FC1 and T1S could base further MT-SSCM measures and activities.

#### 5.1.4. Iterative Nature of Gaining Transparency in Multi-Tier Supply Chains

The initially contracted audits focused on those company types mentioned in the initial disclosure: pre-cursor and cathode producers as well as fine refiners and crude refiners, with a goal to find out the point of origin of raw materials (i.e., mine sources). Whilst the project led to making progress up the supply chain, it was also clear that more iterations would be necessary to uncover new "branches" in the mid-stream supply chain map. Both companies noted that attempts to trace the live material flows of raw material supplies from the origin through the SC (for example, with the help of blockchain technology) would be more fruitful when a comprehensive discovery and visibility of the majority of the supply chain has been achieved.

#### 5.1.5. Temporal Nature of Supply Chain Mapping

The case study was based on a disclosed "SC snapshot" from a set point in time. APSC1 audited supplier relations over the 12 months prior to the audit. Even throughout the relatively short, 6-month project, there were proclaimed changes to sub-supply chain structures. This meant that planned future audits were rejected by Tier 4, as they claimed that they no longer sourced from particular identified Tier 5/Tier 6. This posed a challenge in terms of FC1's and T1S's risk management, as the emerging supply chain map was static whereas supplier relations are dynamic. Also, it is possible that sub-suppliers will cancel purchasing contracts for some time (e.g., due to reputational risk) and then resume the supplier relationship later. Or they can simply claim to have cancelled business relationships when in fact this is not the case. For these reasons APSC1 encourages FCs and customers to invest in longer-term, recurrent auditing programmes, to drive continuous improvement and to ensure that this improvement is tracked over time, allowing such SC changes to be monitored and validated.

### *5.2. Within Case Analysis*

When surveying the academic literature on MT-SSCM, one could gain the impression that discovering and then interacting with the sub-supply chain is a rather straightforward undertaking. Garcia-Torres et al. [24] and other frameworks [22,28,29,33,41] appear to assume that knowledge about the other SC participants is available, accurate and exhaustive/complete. Or if it is not, that the information to be gained from direct suppliers about Tier 2 or key mid-stream sub-suppliers (such as smelters, refiners) is accurate. Our case study found that such assumptions would be ill-advised. Neither did the extant literature propose guidance on the "how-to" of achieving transparency/traceability. Even in the TfS framework, this seems to treated as self-explanatory. Our case study

findings shed light on an indicative process of how to achieve MT-SC transparency, and demonstrated that it can be a highly complex, demanding process, which may require significant resources and expertise (in this case, external expertise, such as that provided by ASPC1). Moreover, the process entails and requires extensive supplier coordination, cooperation and collaboration, which is neither a given nor self-explanatory. Obtaining transparency is resource-intensive and time-consuming (e.g., manpower, correspondence, activating multiple hierarchy levels within each company, contracting third-party experts). Such activities required attaining support and commitment from management in both participating companies, who aimed to achieve MT-SC transparency. However, once the process of supply chain mapping for transparency had begun, it led to a strengthening of the strategic partnership between FC1 and its supplier T1S as well as between both parties and ASPC1. This, in turn, helped to improve collaboration and communication with suppliers/sub-suppliers and eventually led to more trust among participating SC actors. This trust and collaboration seem to have laid the groundwork for more explicit governance in the supply chain under consideration. In the following, we discuss the implications of our findings and analysis for MT-SSCM in general.

## 6. Discussion

The case study provided numerous findings that are particularly interesting for MT-(S)SCM in a number of ways. The TfS model of Garcia-Torres et al. [24] was found to generally apply, insofar as the initial goal to *trace* the origin of the raw materials in an FC's products resulted in cyclical (iterative) improvements, including improved and increased collaboration among supply chain actors and the beginnings of governance of the MT-SC (recall Figure 1). However, the focus at the core of this research was the question of what barriers there are to achieving transparency in MT-SSCM, and how this could be operationalised, so that FCs may achieve transparency to enable such tracking and tracing, governance and collaboration in the future. In this discussionn we analyse the relevant findings from our case study that demonstrate how *transparency* (in place of column "traceability" in the original TfS framework, recall Figure 3) can be operationalised, before pointing to the limitations of our research and making suggestions about areas for further research.

Analogous to our findings, we structure our discussion of primary findings and their relevance for MT-SSCM into the following categories: underestimated complexity (6.1); distance of Tier-1 suppliers to their upstream SC (6.2); MT-SC collaboration and governance (6.3); the iterative nature of obtaining transparency (6.4); and the temporal nature of supply chain mapping (6.5).

### *6.1. Underestimated Complexity*

The case study demonstrates that sub-supply chains can potentially be significantly more complex than companies assume. Considering that the SC maps depicted in Figures 4 and 6 are only for the SC of one supplier supplying specific products to one FC, it is plausible that the entire cobalt supply chain is even more complex. It follows, that increasingly demanding or critical stakeholder expectations [15] will not change the fact that, at present, potentially many raw material supply chains are surprisingly more complex, and that this only becomes apparent, once they are systematically explored [83]. Furthermoren this underestimated, or at least unknown, complexity could pose a threat to FCs' and downstream suppliers' risk management, as it would mean that they do not have accurate or enough information to base risk management estimates on [31].

However, not only is the increased MT-SC complexity worth noting, but also how unexpected this was. Neither the T1S nor FC1 had anticipated an almost threefold increase in the number of sub-supply chain actors. Both practitioners and academics should take this into account when addressing complex SC. Undertaking MT-(S)SCM is more manageable when considering a supply chain with a total of approximately 30 actors. If this number significantly increases, i.e., to 80 (or higher), the amount of coordination, communication and risk management required can quickly become overwhelming. Thus, MT-SSCM research and frameworks should account for such eventualities. This underestimated (or unanticipated) complexity should not serve as a reason to not aim for SC transparency but should

be recognised and calculated in terms of managing expectations. One conclusion that can be drawn from our findings, in this regard, is that FCs should aim for sub-SC rationalisation in order to reduce complexity and the corresponding sustainability risk. Finally, this research lends weight to the concept of proactive supply chain leadership, in order to improve SSCM performance [81].

### *6.2. Distance of Tier-1 Suppliers to their Upstream Supply Chain*

This case study clearly showed that automotive (but also electronic) mineral supply chains are different from agricultural/produce/food and apparel supply chains. In earlier studies of MT-(S)SCM (e.g., [22,29,30,73]), the supply chain was conceived of as consisting of three tiers. In the SC maps depicted in our case study, we solely depict extraction, treatment, production, and processing steps. If we were to add transport/logistics service providers, there would be even more steps. Our case demonstrates that supply chain actors at the same tier level have business relations, meaning that sometimes transactions can occur at the same tier level. Hence, unsurprisingly, Tier-1 suppliers (often large multinational companies themselves) in such supply chains are far removed from the realities of mid-stream and upstream SCs and are correspondingly under-informed about the structure of the sub-supply chain. In this manner, they are forced to rely on the disclosure of their suppliers (Tier-2+) and thus it can be highly problematic for FCs purely relying on their Tier-1 for supply chain transparency. Such incomplete SC disclosure does not have to be deliberate, but could also be due to a lack of available knowledge and internal resources to improve the knowledge at T1S. On the other hand, previous research has pointed to the special "double role" of Tier-1 suppliers [33] and that such suppliers' compliance with the sustainability goals and expectations of FCs can depend on public attention and pressure on Tier-1 and the perceived risks of inactivity or non-compliance [26,27]. We argue that our research demonstrates how such mapping projects can significantly increase attention within Tier-1 suppliers' organisations for the need for more resources to address the topic of MT-SC transparency for SSCM. On the other hand, Tier-1 suppliers usually sign contracts in which they agree to adhere to FCs' code of conduct and enforce these further up the supply chain. Such transparency exercises could be seen as risky for Tier-1 suppliers, as it exposures their lack of knowledge.

### *6.3. Multi-Tier Supply Chain Collaboration & Governance*

Whilst the focus of this research has been on the transparency/traceability part of the TfS framework (rather than collaboration and governance), it became clear, as the framework suggests, how interconnected these three aspects [24,25] are (recall Figures 1 and 3). In the case at hand, the ability to co-conduct transparency and SC mapping resulted from a string of sustainability workshops and thus we can surmise that, without enough collaboration, a full supply chain transparency project does not have a high chance of success. The engagement, whilst often treated cautiously to begin with (which is an understandable reaction to being audited), in some cases was then used as a platform for more exchange between the mid- and up-stream sub-suppliers and T1S and/or FC1. Potentially, the direction of such a transparency push must not necessarily go from downstream FCs back up to the raw material but could, (conceivably) begin with mines/raw materials producers, who, together with treatment units, wish to work for more transparency in their downstream SC [45,53]. This might then also lead to more exchange, collaboration and eventually strengthened governance [41]. In many cases, the usefulness of achieving MT-SC transparency, undertaking due diligence for responsible sourcing and trying to improve sustainability through the supply chain was able to be "sold" as a benefit for all participating SC actors as it reduces their risks and positively differentiates them, making them a more attractive (sub-) supplier in the future. Finally, engaging third-party, subject matter experts, in the form of service providers or relevant organisations (e.g., international bodies, NGOs), with specific SC expertise, and who have no buyer-seller relation to the product at hand, is potentially a significant factor that lends legitimacy to the undertaking. Such third-parties can interact with auditees in a different manner to the FC or downstream direct/Tier-1 suppliers. We argue that companies attempting to undertake such supply chain mapping audits themselves will struggle due to the lack of resources

and, specifically, expertise in terms of the sub-supply chain mapping process and because their role as a buyer adds pressure to achieve and declare biased outcomes.

### *6.4. Iterative Nature of Gaining Transparency in MT-SCs*

Our case study demonstrates that SC transparency is not a static state, but rather something that needs to be worked towards. Thus, operationalising supply chain transparency in large, multi-national SCs probably requires an iterative process, which corresponds to the self-reinforcing cycle proposed by Garcia-Torres et al. [24]. One begins with an incomplete picture (an initial estimated supply chain map), that nonetheless provides a frame of reference and seeks to improve MT-SC visibility [31]. Gong et al. [84] remind us that MT-SSCM should be thought of in terms of processes. They see SC mapping as the first step in such a process toward the dissemination of sustainability throughout the MT-SC. This process could be done at product level, supplier level or perhaps for a raw material. Once mapping activities reveal new supply chain actors, these need to be included in the mapping process and integrated. We argue that proposing a traceability system before having conducted intensive mapping activities will be limited because such an SC map will most probably be incomplete and thus important parts of the supply chain could be missed in the tracking/tracing system. This problem would be intensified if there is not sufficient trust that (sub-) suppliers will proactively disclose that other materials, products or parts are entering the SC but that such sources are not currently in the tracing system. Thus, our case study findings suggest that tracking and tracing would first require multiple iterations of SC transparency and mapping undertakings before it can be effective.

### *6.5. Temporal Nature of Supply Chain Mapping*

One final major finding of the case study was the reminder that supply chains are temporal by nature, and that particularly further up the supply chain, sub-suppliers can change their sources without Tier-1 suppliers or FCs knowing. Moreover, new sources/sub-suppliers can be introduced after such SC mapping audits have taken place, rendering the supply chain map incomplete and the validity limited to a certain point in time. This necessitates re-audits to confirm if sub-suppliers have in fact been discontinued/removed from the supply chain and if new actors are now contributing to the SC. Increasingly technological solutions (such as blockchain) are emerging that could support high levels of complexity and enable real-time confirmation of SC material flows [112,113]. Such solutions would register discontinuation of certain sub-suppliers but new SC actors would have to be brought onboard. Nonetheless, supply chain mapping audits provide an effective method to understand the real structure of a supply chain at a point in time, which can then serve as a base for further activities and measures that enable real-time tracking and tracing. At present, to our knowledge, no technological solutions can also confirm the trustworthiness of the data entering the system, which means that audits are required to validate the SC sustainability data.

Finally, it is worth considering that attaining MT-SC transparency can be independent of sustainability objectives. However, currently, companies seem much more likely to collaborate on sustainability issues. Achieving more SC transparency could also open up an FC to a lot more risks, indirect impacts that are discovered and increased sub-supply chain responsibilities. Given the reputational risk associated with gaining transparency (knowing what is there) without having the resources to back up the process with SSCM (doing something about it), it is not entirely surprising that MT-SC transparency is not so widespread in such critical supply chains. Recognising the tendency to opacity, the researchers are grateful to FC1, T1S and ASPC1 for allowing such project insights to be subject to academic inquiry.

## 7. Conclusions

Progress in achieving SC *Transparency for Sustainability* must be made so that, just as eventually SSCM should become the norm in SCM [10], MT-SSCM should become the norm in SSCM. In this paper, we find evidence for the idea that SC transparency is the pre-requisite for all proceeding MT-SC

sustainability activities (whether understanding human rights risks and impacts, working conditions or environmental performance in the sub-supply chain). Our research builds on the framework of traceability for sustainability, uncovering challenges to obtaining transparency and demonstrating how transparency can be operationalised by focal companies. Obtaining transparency can begin an enabling cycle that can improve traceability of products, parts and raw materials, contributing to better collaboration throughout the supply chain and improved SC governance. However, we found that in certain complex supply chains, the process is a lot more complex than implied in the extant literature. By analysing an in-depth case involving MT-SC transparency, we identify potential factors that require more attention when considering the operationalisation of transparency for sustainability in MT-SSCM.

### *7.1. Implications of Our Research*

This research provides much needed empirical insights to academics writing on MT-SSCM approaches, frameworks and models. By demonstrating the unexpected complexity in an exemplary raw material SC, this should cause theoreticians to consider the complex reality that is not accounted for in dyadic or triadic, orderly conceptions of supply chains. Furthermore, whilst this research concerned itself with cobalt, authors have pointed out that various mineral SCs demonstrate similar characteristics [41]. We hope to contribute to a debate around transparency vs. traceability that needs to be better understood in terms of ordering/hierarchies. Technological advancement coupled with the pressure on FCs to demonstrate transparency in their MT-SCs is leading to increasing activities and a number of (pilot-)projects tracking/tracing materials and aiming for SC transparency. We concur with previous authors that such transparency activities contribute to improvements in other areas of SCM and our case study findings provide evidence for this.

For practitioners, our case study demonstrates the importance of FCs of being proactive and taking leadership to begin working towards MT transparency in the most critical SCs for improved SSCM. The research showed that SC complexity is underestimated and that this could have serious consequences for an FC's risk and reputation management. On the other hand, once such activities have been led by the FC, there can be positive reinforcing side-effects in terms of strengthening trust, collaboration and governance with strategic suppliers.

### *7.2. Limitations*

There are a number of limitations to the approach taken to SC transparency and to the research itself. The SC mapping audits were announced in advance, as contractually agreed upon. This approach is in contrast to some general supplier sustainability audits, which are unannounced and focus on the current state of sustainability at factory/supplier premises. The audits examined for this research were primarily concerned with due diligence mechanisms, responsible sourcing management systems and suppliers' SC mapping capabilities to generate upstream SC knowledge. Thus, contrary to a supplier sustainability audit, whereby underage workers can be removed from premises or fire extinguishers placed throughout the premise on audit day, such processes, responsibilities, mechanisms and systems cannot be easily "faked" even with some advance warning. There was a high degree of reliance on the quality of the auditing undertaken. Thus, one of our researchers participated in an audit of one of the T1S facilities and accompanied ASPC1 throughout the entire audit process. In this manner, we could be sure that uncomfortable questions were being asked, that spot checks were conducted and that ASPC1 checked the capacity of the (sub-)supplier to know their sub-supply chain and implement due diligence on their raw material sourcing.

As with all single-case case-study research, we are aware of the limitations to the generalisability of our findings. We selected this particular raw material SC transparency project as cobalt represents a particularly difficult, opaque and critical market. Our survey of the literature found no examples of MT-SSCM being documented and explained at the level of operationalisation for such a complex supply chain and in the automotive industry. Thus, given the opportunity to participate in this case study, we accepted the limited scope (one focal company, one tier one supplier) and the lack of cross-case

comparisons. Whilst much more information was gathered as part of the project, in the interest of fair anonymisation, our research primarily focused on the extent of supply chain visibility achieved (and not, e.g., the performance of (sub-)suppliers regarding due diligence).

### *7.3. Recommendations for Further Research*

As MT-(S)SCM is still a relatively new field of research, there are many options for building on the concept of transparency/traceability for sustainability. We commend the foundational work of Garcia-Torres et al. [24] and see the descriptive and explanatory potential of the model, particularly in that it proposes an enabling cycle, whereby the aspects traceability, collaboration and governance contribute to one another and depend on each other. We have attempted to shine a light on the workings of traceability within this model (preferring the term transparency) and demonstrate how such transparency might be operationalised and what challenges FCs may face in operationalising TfS. Further research could look at other aspects of the theoretical model to determine whether empirical/real-world experiences align with it. Particularly once more (focal) companies have begun to map entire supply chains and or industry cooperation leads to better integrated technological solutions to improve transparency in MT-SCs, then research could look at the generalisability of our findings and continue to learn from different types of industries and supply chains. Another potential field for future research could be at the intersection of SC sustainability risk management and transparency in MT-SSCM. As argued above, increased MT-SC transparency should lead to better and more realistic data about more probable and accurate risks, so that companies can advance to pre-empting likely risks in the sub-supply chain before they eventuate. Finally, different auditing standards and approaches for achieving transparency could be the subject of further inquiry, to better understand their effectiveness and role in MT-SSCM as a tool and process.

**Author Contributions:** M.M., J.S. and I.J.F. conceived of and designed the research; I.J.F. collected, visualised and analysed the data; I.J.F. wrote the paper; M.M. and J.S. reviewed, edited and supervised the paper. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Acknowledgments:** The article processing charge was partially funded by Ulm University. The authors are very grateful for the close cooperation with FC1, T1S and ASPC1 for enabling this research despite the sensitive nature of the topic. The authors would like to expressly thank RCS Global Ltd. (hitherto ASPC1) for their substantial contributions of auditing and mapping methodology that underpins the common project, which constitutes the case study at hand.

**Conflicts of Interest:** The authors declare no conflict of interest.

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