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Sustainability in supply chains: reappraising business process management

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ABSTRACT

In the context of sustainable supply chain management (SSCM), business processes that enable process integration have been explored in a limited way. This paper offers empirical data in response to this gap by evidencing business processes that create sustainability value in the context of the supply chain—and, the role of a phased approach as an enabler. The data are derived from a case study (of 52 organisations) based on a sustainable cocoa supply chain network and the key business processes across that network. Eight business processes were identified as critical to SSCM—strategic planning, design, governance, integration, collaboration, pre-competitive collaboration, stakeholder management, and performance monitoring and evaluation. We demonstrate how business processes become bespoke sustainability processes in relation to SCM through a phased approach of alignment, implementation and maintenance.

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Supply chains; sustainability; business process management; sustainable supply chain management; cocoa industry

Introduction

With the advent of demand to integrate sustainability into supply chain management (SCM), the conceptual understanding of sustainable supply chain management (SSCM) is expanding due to an emergent set of principles on how to manage supply chains sustainably. These principles include accounting for and reconciling sustainability dimensions (Carter and Rogers 2008, Seuring and Müller 2008, Morali and Searcy 2013); taking a fully integrated, holistic approach to vertical (Pagell and Wu 2009) and horizontal alignment (Carter and Rogers 2008; Seuring and Müller 2008), considering multiple stakeholders in decision-making (Seuring and Müller 2008; Vachon and Klassen 2008; Pagell and Wu 2009); greater collaboration with partners resulting in a change of mind-set from competitive to collaborative advantages (Vachon and Klassen 2008; Gold, Seuring, and Beske 2010; Gunasekaran, Subramanian, and Rahman 2015); and, extending the boundaries of responsibility for and the necessity of collaborative activities across supply chain networks (Vachon and Klassen 2008; Vurro, Russo, and Perrini 2009; Miemczyk, Johnsen, and Macquet 2012). A consequence of these imperatives is a growing body of literature on *business processes management practices* and *inter-organisational relationships* because existing models and processes of SSCM are being reappraised due to the impact of sustainability.

In order to integrate sustainability effectively, business process management (BPM), where activities are coordinated and performed to deliver value and achieve strategic goals, are being reorganised (Maddern et al. 2014; He et al. 2016; Di Vaio and Varriale 2020) and repurposed (Georgise, Wuest, and Thoben 2017; Cole and Aitken 2019). BPM tasks aim to improve information sharing and the integration process and range from production to communication (Trkman et al. 2007). Business process models, as an abstraction of supply chain management, enables the coordination and integration of inter-organisational processes to create business model value (Trkman et al. 2007). Due to the complexity of multiple stakeholder interrelationships and orientation, business model value can be created in varying ways (Bocken et al. 2014), leading to ambiguity concerning SSCM processes and network design (Eskandarpour et al. 2015).

A problematic aspect of the field of SSCM is its pluralistic and contested conceptualisations (Ahi and Searcy 2013) which stem from inherent tensions within each domain: both sustainability (Glavic and Lukman 2007; Johnston et al. 2007) and SCM (Burgess, Singh, and Koroglu 2006). While many definitions abound, for this paper, we rely on Ahi and Searcy (2013) definition as it reflects a rich and current understanding of SSCM literature:

> The creation of coordinated supply chains through the voluntary integration of economic, environmental, and social considerations with key inter-organizational business systems designed to efficiently and effectively manage the material, information, and capital flows associated with the procurement, production, and distribution of products or services in order to meet stakeholder requirements and improve the profitability, competitiveness, and

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> resilience of the organisation over the short- and long-term. (339).

This definition draws attention to the *inter-organisational relational* aspects of SCM. This is important as the relational business processes that facilitate the complex interrelationships and orientations of supply chains are critical (Maddern et al. 2014). From a business perspective, companies are increasingly held accountable for the sustainable performance of the whole supply chain by a raft of stakeholders. Thus, the sustainable supply chain can be conceptualised as operating within economic and environmental contexts that must co-exist (Geissdoerfer et al. 2017). The boundaries of responsibility are extended beyond traditional linear and myopic relationships that have traditionally been organisationally driven (Vachon and Klassen 2006; Seuring and Müller 2008) and, therefore, models and processes that create sustainability value in the context of this complexity are evolving (Lockamy and McCormack 2004a; Bai et al. 2012; Moazzam et al. 2018). One such recalibration is recognition of the criticality of relationship proximity given its documented impact on the effectiveness of collaboration (Ardito et al. 2019b).

Existing research provides insight into how production processes are being reconceptualised and repurposed to integrate sustainability (Georgise, Wuest, and Thoben 2017; Yazan, Petruzzelli, and Albino 2011a). A key driver is that the holistic management of an entire supply chain requires adaptability within the model: from how it is aligned through to how it implemented, and how value for multiple stakeholders can be created and maintained across its life-cycle. An example is the case of production where the outcome may be understood with the use of an input-output model and the identification and geo-location of material flow. Unfortunately, there is limited scrutiny of relational business processes that manage flows (Cole and Aitken 2019) and, certainly, few models that capture this complexity and diversity (Ardito et al. 2019b) even though we know that circular production models provide coordinated sustainability integration and performance (Batista et al. 2018). This demonstrates gaps in understanding of the relationship between sustainability imperatives and existing process management that this paper aims to address.

In the context of SSCM, an even more nuanced consideration of processes is required: namely that which emphasises the criticality of the cooperative dimensions of such networks and moves them from holistic viewpoints to more micro-level considerations (Barber, Beach, and Zolkiewski 2012). As with production processes, the business processes that support these must change too. Ghisellini, Cialani and Ulgiati call for "a comprehensive look at the design of radically alternative solutions, over the entire life cycle of any process" (2016, 12). Business processes provide the inter-organisational capability to meet the requirements of a business orientated towards sustainability goals (Korhonen et al. 2018, 37). Organisations require increased inter-organisational capability in multi-stakeholder collaborations dispersed across a disparate network to share knowledge of many different resources (Lim et al. 2017). In potentially dispersed and heterogeneous supply chains (e.g. organisationally, institutionally, cognitive, geographically, culturally and socially) technological proximity focuses on acquiring, reconciling and developing organisational management routines that facilitate inter-organisational collaboration (Knoben and Oerlemans 2006). Knoben and Oerlemans (2006, 77) define technology in this context as, "those tools, devices and knowledge that mediate between inputs and outputs (process technology) and/or that create new products or services (product technology)". Technology accommodates complex and diversified knowledge, skills and goals around which inter-organisational business processes are organised. However, there is no systematic scrutiny of what these business relationship processes are or how they are adapted and modified for SSCM. In response to these calls, we focus our research on a sustainable approach to business process models that captures the phases, circularity and variability required for effective SSCM.

It is important to analyse the conceptualisation and evolution of SSCM and related processes as they capture a critical feature of SCM: as organised sets of activities, they actualise the tenets of sustainability and its nexus with SCM. When implemented effectively, business processes can enable positive sustainability outcomes across organisational boundaries of entire supply chains (Georgise, Wuest, and Thoben 2017). These sustainability gains are important for orientation and alignment (Sarkis 2012), decision-making and strategy (Wu and Pagell 2011), and value creation and management (Kleindorfer, Singhal, and Wassenhove 2009). However, the literature remains essentially narrow in scope as no BPM model provides meaningful insight on the inter-organisational relationship processes required within these extended boundaries (Maddern et al. 2014) and complex, cooperative networks (Barber, Beach, and Zolkiewski 2012). This paper aims to propose a business process model for SSCM, moving beyond traditional management processes to incorporate those that further principles of sustainability.

The following sections of the paper provide an introduction to conceptual issues in the sustainability-supply chain management nexus. Key business process elements and themes in the extant SSCM literature are translated into sensitising concepts and search terms within the systematic review. The methodological rationale and framework for the literature review and case study are explained. This is followed by a presentation of results that reveals the theoretical commonalities amongst understanding of SSCM key business processes, how these are managed in practice and the theoretical propositions that emerge from an examination of SSCM business processes. Finally, we articulate our conclusions and the contribution this makes to expanding the body of SSCM knowledge—in tangent we consider limitations to the work and the potential scope of future research.

Sustainability and the supply chain

SSCM is grounded in a sustainability value proposition within an integrated business model that takes in stakeholder engagement, collaboration, and a network view that denotes

a new paradigm in managing supply chains (Seuring and Müller 2008, Ahi and Searcy 2013, Boons and Ludeke-Freund 2013, Beske and Seuring 2014). The resulting evolution of practice then occurs in terms of both the orientation and strategic management of the supply chain.

SCM strategies are being redesigned to integrate sustainability due to the established need for a holistic, systemic approach (Bocken et al. 2014). This requires a shift in mindset from shareholder (Friedman 1970) as to stakeholder value (Freeman 2010) due to increased emphasis on inter-relationships and the need for collective action. Therefore, focus shifts from the supply chain as linear to a system view of the network of relationships and the management processes (Evans et al. 2017). Traditional models, processes, and practices are no longer fit for purpose and companies are re-examining the factors that enable SSCM: for example, business models, stakeholders' roles, technology and information systems, and complementary capabilities and processes (Sarkis 2003, Lewandowski 2016). Repurposing the supply chain to embed sustainability also requires a similar integration of green imperatives in key inter-organisational business systems and stakeholder network relationships (Ahi and Searcy 2013). However, the gap this paper seeks to address remains—the absence of a model that captures how sustainability-oriented business process integration can reinforce inter-organisational business practice in terms of SSCM.

Business processes

In SCM literature, the terms 'process' and 'practice' have largely been used interchangeably; however, important distinctions exist. Practices are what people actually 'do' (what Spekman et al. call 'walking the walk') (Spekman, Kamauff, and Myhr 1998, 62) and are considered emergent and dynamic (Takahashi, Yates, and Herman 2010). Collectively they can stimulate communities of practice to emerge in which knowledge is constructed and shared (Wenger 2000). In comparison, Davenport and Short describe business processes as a "set of logically related tasks performed to achieve a defined business outcome" (1990, 12). The distinction between process and practice, therefore, exists in the characteristics of the organisation, linkage and organisational boundedness.

Supply chains can be described as a system of processes across an inter-organisational network which organises inputs flowing to produce and deliver output (Yazan, Petruzzelli, and Albino 2011a). Within this there are various lenses to understanding the embedded business systems and processes depending on theoretical perspective: the dominant research disciplines being management and engineering, with the ancillary fields of operations (Carter and Rogers 2008) and physical and social sciences (Sarkis 2003). These lenses include, for example, a system of inter-related production processes from a materials flow perspective (Yazan, Petruzzelli, and Albino 2011a)—which requires both logistical and technological integration (Vachon and Klassen 2006).

Ahi and Searcy (2013) explain that since the supply chain concept emerged, it has gradually broadened its scope of focus beyond product-focussed logistics and material flow. That expanded emphasis extended the focus of SCM beyond production systems into managing flows of information (Lambert and Cooper 2000). This further directs focus onto relationship management processes as it emphasises the need for relationship management, efficiency and value in a strategy and policy setting—and in business network processes via inter-organisational business systems, rather than just "core operational, primary or value-adding processes" or "support or value-enabling processes" (Van Looy, De Backer, and Poels 2011, 1122).

The extent to which processes are integrated across supply chains can then be determined by the focal firm's ability to collaborate with its partners as greater production integration requires increased information flow and collaboration (Frohlich and Westbrook 2001). This introduces relational and sociological consideration in a SC business context, whereby the level of integration is determined by the selection and management of partners and systems based on an organisation's needs/goals (Kim 2006). This, in turn, governs the inter-relational coordination mechanisms managers select (Garcia-Dastugue and Lambert 2003). Thus, within inter-organisational relational processes, the extent of collaboration has a moderating effect on the management of varying relationships whereby a phased approach is taken that determines the extent of collaboration in the context of SCM generally and SSCM specifically (Spekman, Kamauff, and Myhr 1998).

From either theoretical perspective (production or relational) the configuration of the process to meet an outcome is a key feature of process management. Each organisation in the supply chain affects the orientation and performance of other supply chain members and that of the supply chain overall (Cooper, Lambert, and Pagh1997). Therefore, the concept of business processes as an organised set of activities to align members is an important facet of SCM and new models of business process methodology capturing this first emerged in the 80 s and 90 s. They emphasised broader, holistic functionality and systematic partnership activities end-to-end across the supply chain (Cooper, Lambert, and Pagh 1997; Croxton et al. 2001; Huan, Sheoran, and Wang 2004; Lockamy and McCormack 2004a; Lambert 2008; Trkman, Budler, and Groznik 2015). However, today they reflect a historic conceptual bias that does not privilege sustainability. Since then, efforts have been made to develop similar models for SSCM (Zhu, Sarkis, and Geng 2005; Vachon and Klassen 2006; Morali and Searcy 2013; Beske and Seuring 2014), but none have emerged that specifically take account of processes, and as such, there is no SSCM process model.

Key processes concerning SSCM are presented in Table 1 and Appendix 1 (operational and logistical processes are omitted given the focus of the paper on relational business processes). Following the example of Burgess, Singh, and Koroglu (2006), in the absence of consensus on a common set of SSCM processes, the review consolidates the

Table 1. Key sustainability processes themes in SSCM from the literature.

Key sustainability business process	Associated themes in the literature	Sensitising concepts associated with themes
Governance	• Governance (Morali and Searcy 2013) • Standards (Morali and Searcy 2013) • Policy (Morali and Searcy 2013) • Risk management—standards (Beske et al. 2014)	• Governance • Corporate Social responsibility/CSR • Standard* • Policy • Code • Executive* • Legislat* • Regulat*
Strategic planning	• Looking forward on SSCM—plans, brief descriptions, or strategic objectives or goals (Morali and Searcy 2013) • Strategy (Morali and Searcy 2013) • Orientation (Beske et al. 2014) • Pro-activity (Beske et al. 2014)	• Strateg* • Plan* • Goal* • Objective* • Orientat*
Design	• SC re-conceptualisation—stakeholder view (Beske et al. 2014)	• Design* • Concept*

Integration	• Integration of (Morali and Searcy 2013)
	  • CSR practices
	  • Sustainability principles
	  • Performance measures
		• Integra*

Collaboration	• Collaboration (Zhu, Sarkis, and Geng 2005) • Collaboration (Morali and Searcy 2013) • Continuity (Beske et al. 2014) • Collaboration (Beske et al. 2014) • C-evolving (Beske et al. 2014) • Environmental collaboration (Vachon and Klassen 2006)	• Collaborat* • Cooperat* • Coordinat* • Partner* • Relation*
Performance monitoring & evaluation	• Performance measurement (Morali and Searcy 2013) • Monitoring (Morali and Searcy 2013) • Reporting (Morali and Searcy 2013) • Reflexive control (Beske et al. 2014) • Risk management—Individual monitoring and certification (Beske et al. 2014) • Pro-activity—life cycle assessment (Beske et al. 2014) • Knowledge assessment • Environmental monitoring (Vachon and Klassen 2006)	• Performance* • Monitor* • Evaluat* • Report* • Assess* • Indicat* • Certificat* • Life cycle assessment • LCA • Control

constructs proposed by focussing on theoretical commonalities. The outcome was an initial set of six themes (governance; strategic planning; design; integration; collaboration; and performance monitoring and evaluation).

Process management—a phased approach

Storey et al. (2006), states that the central underpinning ideas of the management function are alignment and integration of processes. However, this 'process' view is limited as it does not consider the necessity of collaboration, stakeholders and a network view that are core tenets of SSCM. Understanding how sustainability is embedded in SCM, suggests that the sustainability integration process maps onto the structural component while the collaboration process maps onto the relationship component of SCM. Furthermore, Kleindorfer, Singhal and Wassenhove (2009), Vachon and Klassen (2006), Cheng, Yeh, and Tu (2008), Beske and Seuring (2014) stress the importance of SSCM maintenance and practices such as trust and transparency that facilitate this. Alignment, implementation and maintenance are management mechanisms that explain the scope and character of how the processes are managed in practice across the supply chain network using a developmental approach (Lockamy and McCormack 2004b).

In conceptualising process management, authors consider dimensions that produce a moderating effect on how the processes are managed in practice. Research has also elucidated the proximity dimensions that affect integration and collaboration (Ardito et al. 2019b; Yazan, Petruzzelli, and Albino 2011a; Ardito, Ernst, and Messeni Petruzzelli 2020; Knoben and Oerlemans 2006). These studies explain why spatial and technological variables affect communication and collaboration capabilities as key features of relationship management. Therefore, SCM offers the opportunity "to capture the synergy of intra- and intercompany integration and management" within a network of multiple businesses and relationships" (Lambert and Cooper 2000, 65). However, it is not possible to meet the needs of all stakeholders (Wu and Pagell 2011) and stakeholders are not all equal (Ardito et al. 2019b). Furthermore, institutional, organisational, cultural, social and cognitive logics are frequently disparate (Knoben and Oerlemans 2006) and stakeholders have divergent priorities and values (Bocken et al. 2014). Strategic trade-offs need to be made in managing relationships effectively as the greater the level of proximity of the relationship to the business, then the greater the level of collaboration and investment (Spekman, Kamauff, and Myhr 1998). Therefore,

the management dimension in the context of the variability of stakeholder relationships to meet a firm's goals requires consideration. A baseline of generic processes presented in a model that captures issues of complexity, nuance and diversity, though scant within the extant literature (Ardito, Petruzzelli, and Albino 2016), provides intervention in improving inter-organisational competencies, capabilities and resources for knowledge sharing (Knoben and Oerlemans 2006).

When reconceptualising the SCM model to embed the sustainability dimension, two themes emerge—processes and relationship management. As Lambert explains, 'SCM is the integration of key business processes across the supply chain and the processes can be linked successfully only if the relationships with the other members of the supply chain are managed properly' (2008, 235). Research has considered the spatial dimension of relational proximity, particularly using the input-output model, to manage interdependences among organisations (Yazan et al. 2011b; Yazan, Petruzzelli, and Albino 2011a). Furthermore, consideration of the knowledge dimension reveals that the maturity of technology has different consequences depending on its stage of development (Ardito, Ernst, and Messeni Petruzzelli 2020) and needs to be handled appropriately depending on the level of maturity (Ardito, Petruzzelli, and Ghisetti 2019a). This requires an understanding of process maturity whereby, "the progress towards goal achievement comes in stages … [as] processes are now viewed as assets requiring investment and development as they mature" (Lockamy and McCormack 2004b, 272). As such, greater strategic focus on processes may increase overall performance. Business process maturity models are valuable frameworks for SCM as they provide lifecycles or developmental stages for processes and depict groups of practice and capabilities therein that result in better control, improvement, effectiveness and performance (McCormack, Ladeira, and de Oliveira 2008; Van Looy, De Backer, and Poels 2011). Within the context of SSCM, the concept of maturity is fundamental to the principle of sustainable development. As such, maturity models function as diagnostic and prescriptive tools for continuous SSCM performance and excellence (McCormack, Ladeira, and de Oliveira 2008).

Numerous maturity models exist, for example, those that demonstrate stages of development, such as levels of sustainability through types of business models (Bocken et al. 2014), stages of value creation in business models (Lubin and Esty 2010), levels of integration (Wiengarten and Longoni 2015), phases of collaboration (Gunasekaran, Subramanian, and Rahman 2015), responses to stakeholders from resistant to receptive (Banerjee 2001, Freeman 2017) and levels of embeddedness and governance (Vurro, Russo, and Perrini 2009). Sarkis (2003) has demonstrated a similar maturity model in a product life cycle, along with which strategic and process consideration is given to each stage of development. Such a maturity model presents a framework by which to analyse and measure capability and quality of processes (Wendler 2012)—and, in this instance an orientation towards sustainability. This requires a nuanced view of SSCM that privileges an orientation towards sustainability and is predicated on an organisation's commitment to it (Banerjee 2001; Vurro, Russo, and Perrini 2009; Lubin and Esty 2010; Bocken et al. 2014). This sustainability focus functions as a mechanism that requires each stage to implement certain principles and practices (Banerjee 2001; Vurro, Russo, and Perrini 2009; Gunasekaran, Subramanian, and Rahman 2015; Wiengarten and Longoni 2015) and demonstrate an understanding of capacity development through each of the phases as (Beske 2012; Lubin and Esty 2010). This determines the level of orientation of the supply chain towards sustainability, the degree to which sustainability is embedded in SCM, and leads to different sustainability practices and performance outcomes.

Technology-enabled process integration

SCM integration requires alignment between strategy, operations and performance via systems and practices (Kim 2006). The degree and direction of the 'arc of integration' (Frohlich and Westbrook 2001) dictates the strategic decisions that are taken—therefore, the greater the orientation towards sustainability, the higher the level of relevant process and practice integration. Effective integration also requires inter-organisational collaboration and monitoring of stakeholders (Vachon and Klassen 2008, Flynn, Huo, and Zhao 2010)—both of which are enabled by the managing and monitoring of information flows (Garcı a-Dastugue and Lambert 2003). Technological integration is a key aspect of SSCM as it can determine a company's capacity, competency, and capability to assess, monitor and collaborate. The ability to share technical experience and knowledge that enables flows inter-organisationally is referred to as technological proximity (Knoben and Oerlemans 2006). The greater the level of technological proximity the greater the level of process integration. This contributes to the construction and maintenance of cooperative, strategic networks (as opposed to conflictive, competitive ones) (Kim and Narasimhan 2002). Technology can, therefore, be a lever that enhances SCM efficiency, coordination, and commitment to furthering a sustainability-driven agenda.

Business process model conceptual framework

As discussed, across a supply chain network, there are issues of sustainability and stakeholder diversity that results in complexity and heterogeneity. Sustainability is characterised by generic dimensions (environmental, social and economic), that manifest in a myriad of specific complex and interdependent variables (Figure 1) depending on the foci of the industries and practices. Stakeholders extend the logic of inter-organisational collaboration, as commercial and non-commercial actors have varying stakes (and proximity) beyond a solely economic rationale that challenges goal setting, orientation and alignment. Therefore, the priorities and values of each organisation result in varying degrees of priority and proximity that need to be managed, as the process inputs and outputs will vary among organisations as these

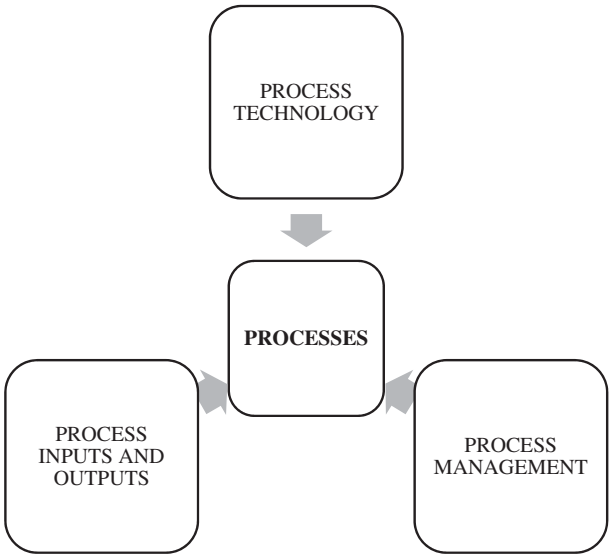

Figure 1. Conceptual attributes of a generic SSCM business process model.

knowledge inputs are dispersed (Ardito, Petruzzelli, and Albino 2016). Process management captures the level of commitment and maturity of an organisation in managing sustainability in its supply chain because the level of resource fitness, commitment and inputs will vary among organisations depending upon the strength of that sustainability orientation. Furthermore, the level of process integration will depend on what phase of management process a firm is committed to as a result of the variability of stakeholder relationships and sustainability priorities, values and proximity. Process technology mediates between inputs and outputs as it is these tools, devices and knowledge that are required to integrate sustainability into SCM. To effectively manage business processes, an understanding of basic and specialised techniques is required to facilitate the learning required for development and maturity embedded in this model (Knoben and Oerlemans 2006). The conceptual framework (Figure 1) describes the theoretical constructs that determine how processes are managed in practice.

Methodology

The methodology of the research underpinning this paper consisted of two parts—a systematic literature review (SLR) and an empirical case study. The purpose was to interrogate the research literature with practitioner experience to understand how business processes are adapted and modified to manage supply chains sustainably. The authors argue that despite the nascent nature of the SSCM knowledge domain (which emerged with the Brundtland Report by the World Commission on Environment and Development in 1987), a critical mass of research on sustainability processes does exist from which to create a comprehensive and formal model to be applied holistically across the whole supply chain. In "adopting a replicable, scientific and transparent process" (Tranfield, Denyer, and Smart 2003, 209), a SLR provides germane material from the extant literature prior to executing the case study in order "to map and to assess the existing intellectual territory" (Tranfield, Denyer, and Smart 2003, 208), provide thematic and theoretical sensitising concepts (Blaikie 2000), and develop theory to guide data collection and analysis (Yin 2014). Thematic analysis of the SLR data facilitated the identification of the commonalities across various process themes that is generalisable across the supply chain. The SLR also provided theoretical sensitising concepts that shaped the development of the conceptual framework so that the phenomenon's heterogeneity and complexity could be captured and investigated within a single case. This is a novel study as it creates a process model that was constructed using a systematic protocol and was developed through a case study of an end-to-end supply chain from which theoretical propositions were developed.

The SLR followed the approach prescribed by Tranfield, Denyer, and Smart (2003) (Appendix 2). The literature revealed both a nomothetic aspect to the study, i.e. the process model, and an idiographic feature, i.e. the moderating effect of multiple dimensions on the application of the model in practice across complex, heterogeneous environments within the supply chain network. A systematic protocol was used to capture and describe SSCM processes (Table 1). Two test strings were compared to allow the interrogation of SSCM process integration features (Search String 1) and themes (Search Strong 2) (Appendix 3 – Table 3.1). Two databases—'Web of Science' and 'EBSCO: Business Source Premier'—were used to trial the search strings (Appendix 3, Tables 3.2 and 3.3). Furthermore, filter processes were applied to refine the quality and suitability of the literature in each interrogation. As a result, over 4,500 papers were identified. This was refined to the review of 201 academic articles published since 1987 (Appendix 3, Tables 3.2 and 3.3) and the acknowledged emergence of sustainability in the context of SCM. 78 articles in search string 1 were analysed in-depth to identify the key processes discussed in SSCM process literature. A further 148 articles were reviewed in search string 2, to provide statistical insights into the frequency of these processes across SSCM literature. The SLR demonstrated the relevance of producing such a model given the critical mass of articles within this nascent field and provided insights into how the process literature is classified (as well as its thematic and theoretical content). For a full list of referenced articles please refer to Appendix 2. The classification framework presents a critical meta-analysis of the highest referenced and cited articles selected for this review (Taticchi et al. 2015). The results contributed to the aggregate mapping and analysis of process themes and features (Appendix 3, Table 3.1). The content analysis revealed relationships amongst processes and established patterns in what constitutes key processes in SSCM—as well as themes and trends in process management. Finally, in the synthesis phase, thematic and theoretical concepts were developed to create an understanding of how to manage sustainable supply chains.

The case study method is appropriate for investigating contemporary complex phenomenon (i.e. complex, heterogeneous environments across supply chains, and the contemporary, nascent nature of the field) (Yin 2014); analysing

context and processes that illuminate theoretical issues (Hartley 2004); and, revealing deep processes and instrumental insights into the phenomenon to develop theory (Stake 1995). The data this paper reports on are derived from a case study based on an end-to-end supply chain network and the key business processes across that network. The case study allowed for multiple sources of evidence to be examined that captured both the objective general processes and their subjective application in practice. The blurred boundaries embedded in the variations of context of across the chosen supply chain network were a good fit with the case study method and its capacity to support the development of theoretical propositions and conceptual frameworks (Yin 2014).

The study of a network requires the examination of nodes so that the relationship between stakeholders, and the processes required to manage these, can be understood. Therefore, the unit of analysis was the network node, i.e. network members, specifically those organisations working to embed sustainability. Diverse stakeholder groups, and their experience or expertise with the phenomenon, provided maximum variation within the case (Creswell 2009). These actors provided insights into the practices and capabilities that provide the improvement road map for the business process maturity model (Van Looy, De Backer, and Poels 2011). We took a semi-structured approach to the structural classification of the business process maturity model (Van Looy, De Backer, and Poels 2011) using the SLR themes and features to guide the nomothetic aspect to the study and the conceptual framework to guide the ideographic aspect identified in the extant literature that was required for theoretical and methodological alignment and rigour (Tranfield, Denyer, and Smart 2003). For example, the case study was bounded by the theoretical dimensions outlined in the conceptual framework (Figure 1); i.e. the need for flexibility for multiple stakeholders (Ahi and Searcy 2013) within a network of relationships (Evans et al. 2017) to re-examining the technology, inputs, outputs, practices, capabilities and processes (Sarkis 2003, Lewandowski 2016) and repurpose the supply chain to embed sustainability, while providing a structure for alignment and collaboration. Eligibility criteria were: (i) operate in the cocoa sector, (ii) committed to embedding sustainability across the supply chain, and, (iii) a member of an industrial network.

The case selected provides a substantive context to explore the theoretical propositions that emerged from the SLR as it sufficed the following criteria: it provided sufficient access to data; is considered an exemplar of SSCM (given its activities, certification standards and the longevity of its activities); provided suitable conditions within which to explore the theoretical concepts of the study; provided the breadth of context within which to explore the chosen unit of analysis. Historically, external pressure on the cocoa supply chain network commercial members to address sustainability impacts came from the Harkin-Engel Protocol on Child Labour in 2001, while internal impetuses included stability and security of supply in a growth market. The contextual factors are numerous and complex, but one pertinent fact remains: the sector is facing a crisis of growing demand and declining cocoa production due to complex and inter-dependent sustainability impacts (Barometer Consortium 2016).

The supply chain network was mapped using a maximum variation approach including key informants, snowball sampling and multiple sources of evidence to capture both the diverse variations and similarities in process management across a supply chain network, consistent with the theoretical boundaries of the study (Patton 2002). The total number of nodes mapped and analysed numbered 52 (Appendix 4). The data were collected between July 2015 and October 2017 and comprise: 265 pieces of (internal and external) secondary documentation from 52 node organisations across the cocoa supply chain network and 36 interviews (with individuals representing 33 organisations). Interviewees were purposively selected as having experience of or expertise in the phenomenon under study (Marshall et al. 2015). They included those in managerial roles responsible for SSCM (e.g. directors, corporate strategists, supply chain manager and/or sustainability manager). The data collection methods provided the scope of sources to enable the analysis of key business processes relevant to SSCM across the whole supply chain network.

An inductive approach to theoretical development was taken to build a rich narrative that explains the meanings, complexities and relationships of processes relative to SSCM (Eisenhardt 1989; Chalmers 2013). The process model was developed from the sensitising concepts generated in the literature which were then used to code and compare empirical results from the case study. Construct validity was ensured through the rigours of the case study protocol, the triangulation of multiple sources of evidence, and the resulting convergence of themes, relationships and patterns (Yin 2014). Interviews were transcribed and analysed alongside the secondary documentation using the qualitative data analysis software NVivo. Processes were identified and refined using thematic analysis (Braun and Clarke 2006) via NVivo, and in parallel with Sobh and Perry (2006) protocol for replication, by assessing their explanatory power relative to the emerging process model.

Descriptive and illustrative levels of analysis were undertaken (Miles and Huberman 1994) and both axial and selective coding occurred (Neuman 2014). In the initial axil coding phase, codes were generated from the sensitising concepts identified in the literature to compare with the empirical data. A literal replication logic to predict key business processes in SSCM was used. Nomothetic analysis manifested descriptions of processes and sub-processes via the categorical coding of key characteristics to identify patterns (Crotty 1998). This process was satisfied once saturation occurred.

The analytical findings are presented in the form of a SSCM process model that describes the processes and sub-processes revealed through axial coding (Figure 2). This is complemented by a table of theoretical properties that outlines the key process definitions, concepts, and sub-processes revealed through selective coding (Table 2). Thick

Figure 2. SSCM Process Model.

descriptions were used to capture the rich detail and complexity of the structure of the network (Geertz 1973).

The limitations of the paper are primarily that it is a single case study situated in a single industry—however, both were purposively selected for the advantages outlined earlier in this section. Whilst this affords distinct advantages in terms of the data, it also represents a limitation in scope. Further research in other sectors will enable the proposed framework to be tested. Additional empirical work may also extend our conceptualisation to include business functions/practices and empirical data gathering that is bound by a continuous supply chain.

Findings

Overview of case study

The world consumes over three million tonnes of chocolate every year. There has been an annual 3% increase in demand over the last 100 years, making it one of the strongest performers in the snacking category (Statista 2016). However, there are inherent tensions across the supply chain in terms of demand and supply. Recent trends demonstrate the precarity of cocoa markets. Between 2012 and 2016, consumer markets grew, and 3.5 million tonnes of cocoa beans are produced annually to meet this growth trend (Barometer Consortium 2016). Yet with climate change, uneven value distribution, unsustainable farming livelihoods, political instability, and decreasing quality and yield of plant stocks yield has critically diminished. Since 2017, prices have steeply declined due to oversupply and stalled demand (Fountain and Hütz-Adams, 2018).

It is these issues of sustainability that are shown in stark relief as companies seek to grow their business whilst also attempting to scale up sustainability in their supply chain. The cocoa industry is facing a crisis—growing demand and declining cocoa production. Action is being taken, particularly through industry initiatives such as the World Cocoa Foundation's CocoaAction strategy with government and non-government organisations to address these challenges. This is also reflected in the commitments of business to sustainable development goals with opportunities to create new products, increase their consumer base, and build market leadership, brand image and customer loyalty (Euromonitor International 2017). The Global Reporting Initiative states that for the cocoa sector, progress on environmental and social issues is affected by economic performance, market presence, indirect economic impacts, procurement/sourcing practices and overall disclosure. Oxfam endorses this position: it believes leading companies have the size and reach via global supply chains to affect change in sustainable practices and drive sustained improvements economically (Smith 2014). The United Nations Global Compact echoes this with its estimation that 80% of global trade passes through supply chains. However, the challenge remains as to how to translate that potential into practice—but, knowledge can be gained by analysing what processes are critical for successful practice implementation.

A SSCM process model

Drawing on the primary and secondary data, eight business processes were identified and cross-validated as being critical to SSCM (Table 2). The following sections describe each process (and its sub-processes) via thick descriptions of both constructs and relationships to capture the complexities of multiple stakeholders. These were then formalised into the model itself (Figure 2) with a description of its theoretical properties which outlines the key process definitions, concepts, and sub-processes (Table 2).

The processes themselves are not unique to SSCM, but what is novel is our conceptualisation of them as connecting to form a business process maturity model and the empirical data analysis that evidence their management and integration in service of sustainability goals. In so doing, we reconceptualise, refine, and extended existing process constructs—and, in a novel development, apply them in the context of SSCM and BPM.

Each process was thematically generated from multiple sources of data and triangulated to verify the convergence of themes, relationships and patterns (e.g. in the pre-competitive collaboration—Table 2). Sensitising concepts were used (Figure 1) to explain the maturity of how these

Table 2. Key processes' definitions, concepts & sub-processes in SSCM and frequency of themes across multiple sources of empirical data coded using NVivo.

Key process	Definition:	Concept	Sub-processes	Sources	References
STRATEGIC PLANNING	The object or aim of action and on which its effects can be examined on task performance.	It is a key process as it identifies sustainable & ethical aims within and across the SC and aligns them with corporate strategy.	• Impact Mapping & Analysis • Goal Setting • Making the Business Case	**52** 47 40 23	**273** 159 135 54
DESIGN	The organisation of materials, information and resources through product and business processes and systems.	Design considers three features: 1. Re-designing product sustainability through product coordination and SC design, 2. Re-conceptualising the SC business processes for enhanced sustainability performance, 3. 3. Re-engineering business processes (BPR) analytically and radically to change activities across the SC.	• Re-designing • Re-conceptualising • Re-engineering	**29** 3 1 1	**58** 4 6 2
GOVERNANCE	The object or aim of action and on which its effects can be examined on task performance.	It is a key process as it identifies sustainable & ethical aims within and across the SC and aligns them with corporate strategy.	• Executive • Policy, Standards & Reporting • Legislative & Regulatory	**54** 21 24 46	**261** 37 42 153
INTEGRATION	The structural coordination of intra- and inter-organisational processes.	Effective integration requires the knowledge and skills exchange, resource coordination and an alignment (reduction in goal discrepancy) of capabilities and priorities through both the product and process	• Integrating Business Functions • Aids to Integration • Maintaining Integration	**46** 26 22 23	**251** 64 47 64
COLLABORATION	The process by which partners cooperate and work jointly.	Due to the scale of sustainability issues they require collective action thus it builds collaborative advantage across the network and that is characterised by time and resources and as boundary-spanning	• Goal Alignment; • Coordination & Cooperation • Enhanced Communication & Information Sharing • Joint Development	**63** 14 14 50 24	**517** 23 26 278 49
PRE-COMPETITIVE COLLABORATION	The structural coordination of business, public and civil activities.	Experience and the scale of issues have taught practitioners the necessity for collective action and shared responsibility.	• Common Language, Principles & Goals • Knowledge & Information Sharing • Engage in Workgroups, Programmes & Activities	**51** 42 20 10	**345** 172 37 19
STAKEHOLDER MANAGEMENT	All entities that have a stake in the supply chain but that the company is not in collaboration with including commercial and non-commercial actors and organisations, the planet and its ecosystems.	Increased sustainability orientation requires greater consideration of stakeholders	• Identify & Analyse • Stakeholder Engagement	**52** 29 46	**215** 70 162
PERFORMANCE MONITORING & EVALUATION	The process of assessing and improving the implementation of strategic goals.	It provides important information about the business case for integrating sustainability and improving efficiency, effectiveness and innovation while meeting strategic goals	• Monitoring Management Systems & Tools • Cross-Functional Teams • External Audits & Compliance Systems	**57** 33 23 41	**376** 69 63 150

Table 3. Triangulation from multiple sources of evidence to evaluate the pre-competitive collaboration process.

Source of evidence	Findings	Conclusion
Observation	Innovation Forum's 'Sustainable Smallholder Development' event focussing on issues including 'pre-competitive collaboration—active debate about how businesses can facilitate greater collaboration and knowledge sharing across agri-supply chains'	A multi-stakeholder platform facilitates the initial stage of knowledge exchange and debate to explores ways of working pre-competitively.
Interview	'First of all, you need a consensus on where the priorities are and some of those priorities are reasonably well defined now. Then you need to find consensus on what's appropriate for setting reasonable collaborative goals in ways that can get stuff done and also be appropriate in terms of anti-trust regulation and so on for a combination of ethics and scope for collaborative action' Manufacturing respondent	The initial 'alignment' phase establishes the goals and principles of pre-competitive collaboration within the remit of anti-trust regulation.
Document	'What makes the CocoaAction approach to cocoa sustainability strong is the alignment and consistency around a common metrics framework. Beyond sending a powerful message to government and other actors in the sector, it helps to build a culture of accountability. The effect of a common approach, common metrics and common KPIs should be farther-reaching and more impactful.' Cocoa Action Annual Report 2015	Describes the purpose of the 'alignment' phase to find common objectives and metrics, while building collaborative capacity and creating buy-in.

processes are managed by multiple stakeholders with varying values, priorities and proximities. In this example, the researchers were seeking to understand how the process is managed in the initial alignment phase of process management. The evidence converges on a single reality of alignment whereby the sub-processes emerge from the data (Table 3).

Process 1: strategic planning

Strategic planning has become a core process, which respondents have learnt and takes time to do properly. Companies report that planning has taken up to three years and seeking alignment in terms of goal setting and a shared vision with partners is critical. For example, the WCF's *CocoaAction* strategy took two years to develop amongst its members (who represent nine of the world's major cocoa and chocolate companies). Strategic planning processes also provide robust, scientific and objective data to evidence the business case for sustainability investment; develop a new value proposition; re-orientate the business model; create buy-in internally and externally; and, provide objective criteria for measuring performance and improvement.

Data also revealed the importance of the scale and impact of materials concerning sustainability. One trade association respondent explained how the construction of a resilient business model relies on understanding where impact areas are:

> Who would you rather sort entrust your business to? To cope with stuff or somebody who thought about it and has got resilience design and built it into their ways of operating? And therefore, the business case is all about that continuity of supply, in a world of increasing volatility and increasing sort of resource scarcity.

Barry Callebaut and Marks & Spencer (M&S) described the importance of scaling-up activity for collective action, and how plans and goals can be used as 'calls to action'. Planning also provides the underpinning framework for continuous improvement for the organisation and others to learn from.

Impact mapping and analysis. The strategic planning process with this particular supply chain network is increasingly based on scientific data gathered from impact mapping and analysis. As a sustainability director of a MNC manufacturing brand said: 'We look to see where the biggest [sustainability] impacts are and, therefore, the biggest opportunities to make a difference.' Impact mapping includes deciding the impact areas an organisation wants to address and is often achieved by assessing materiality across the supply chain against sustainability measures. To assess these impacts companies have developed self-assessment tools and surveys or used standardised models such as WRAP, life-cycle assessment (LCA) or forecasting—alongside scientific data and benchmarking against industry. Technology is instrumental in addressing complexity, scale and strategic decision-making when undertaking such activities. For example, Oxfam's Behind the Brands campaign which mapped 20 key raw materials and risk mapping those using the standardised WRAP tool.

Goal setting. One of the key features of goal setting in SSCM is getting partners to agree. As one manufacturing respondent explained,

> Often, it's about identifying the agenda. So, we don't necessarily work directly with other Consumer Goods Forum colleagues on deforestation but by defining the agenda and agreeing on the priorities, it means that we pursue through our engagement with our suppliers. We might be working on an increasingly harmonised agenda. Therefore, we clearly manage all our relationships with our direct suppliers ourselves but by being signed up to a global agenda on deforestation it means that increasingly complex questions are being asked.

This quote illustrates how a key process like goal setting is necessary for collective action, yet also allows for diverse practices depending on individual company agendas. Respondents explained how they focussed strategically on scales of impact and identifying the right priorities based on analysis, which is then used to build the business case,

develop buy-in from stakeholders, and create value in the business model. For example, a manufacturing sustainability director explains,

> So, for environmental footprints, we do Lifecycle Assessment company-wide and that tells us where the biggest carbon and water footprints are, for example. That helps us then to focus down onto where we see the need for most opportunity … I think it is important that we approach sustainability as a business strategy and therefore we seek to engage and inspire colleagues [network members] in the way we do business because we see that as the way we make the fastest progress. And to do that it means there's a challenge upfront that we have appropriately identified the right priorities. In other words, we focus on where we think we can make the biggest difference and we base that on analysis.

Making the business case. The business case can create buy-in both within the company (particularly from the executive) to both mandate and mobilise activities, as well as act as a tool for communicating with partners. Based on drivers, scientific data, and analysis of impact, potential partners, market research, economic costs and benchmarking, it provides evidence for the importance of embedding sustainability in SCM. As a manufacturing respondent explained,

> We focus on where we think we can make the biggest difference and we base that on analysis. Then we are finding ways to embed the actions within our business model rather than, if you like, running counter to our business model. So, you identify the right focused actions and then finding ways to implement them which can be efficient and effective.

The strategic planning process was reported as being closely aligned with other processes. For example, it is important for facilitating stakeholder management; provides parameters for design; measures for performance monitoring and evaluation; creates buy-in for collaborative and pre-competitive action; determines the level of integration; and, informs governance mechanisms.

Process 2: design

Integrating sustainability into the SCM results in the reconfiguration of global supply networks to respond to the new business model and to increase their resilience to risk. One manufacturing respondent explained the type of trade-offs, complexities and sustainability business case that can result from a global restructuring programme:

> Yeah, there's a moving forward in that direction. I'll just finish a little bit about that. So, we've invested £75 million in the factory next door. That has resulted in new, faster lines but lines that require less people to run them. So, I think the numbers have been bandied around in the press. I think it's between 100 & 200 less people in the organisation. But [we're sustaining product] lines for the future. Some of the lines we were operating were 30 years old. So, we were investing there as well as the marketing, to ensure that we're producing a bar of chocolate … And we weren't looking externally enough and ensuring that we were keeping to the most efficient and effective ways of doing everything we did.

Re-conceptualisation. Organisations are strategically developing new protocols that integrate sustainability by sourcing certified commodities; using green energy to offset carbon footprints and developing sustainable and ethical policies, standards and guidelines that are incorporated operationally and contractually.

Companies are also reconceptualising the supply chain by forming new partnerships (at both individual supply chain and sectoral levels, and especially pre-competitively). As such, all the companies in the case study supply chain are designing innovative or alternative business models to respond to sustainability impacts. Traditional stakeholder resistant business models that were focussed on shareholder value are reorienting value propositions towards stakeholders and becoming receptive and responsive to diverse stakeholder groups. Companies are considering how to create value for and from stakeholders, seeking collaborative advantages with commercial and non-commercial partners, and becoming more nuanced in how relationships are managed. For example, Danone announced a restructuring in 2014 to manage sustainability risks and performance, continuing to scale-up their RESPECT program by 10% that year. The RESPECT program is Danone's responsible procurement program and is structured around social, environmental and ethical values built into contracts along the supply chain. Stakeholders are identified by carrying out a materiality assessment across the supply chain, from which related stakeholders can be identified and value assessed.

Restructuring the supply chain network. In restructuring supply chains for sustainability, respondents described a fine balance between globalisation, centralisation and mass standardisation versus localised strategies, decentralisation and modularity. For example, in 2015, Mondeléz implemented a radical supply chain strategy by overhauling its entire global operations and supply chain to meet the long-term growth strategy of the company. In meeting the current challenges, it set out to focus its business model on delivering sustainable profitable growth. At the supply chain level, this meant transforming manufacturing processes, re-engineering lines, and restructuring the end-to-end network as part of an ongoing restructuring program (at a cost of over £2.7 billion). In comparison, Unilever has traditionally operated under a decentralised structure so that they build in resilience through modularity and can optimise managers who have a good understanding of local markets. However, they have redesigned the structure to a matrix-based organisation based on a comprehensive and in-depth materiality analysis of their whole product portfolio to streamline operations and reduce materiality.

Business process re-engineering (BPR). Those organisations that had implemented BPR reflected a highly developed approach to embedding sustainability. For example, Unilever and M&S both radically changed activities within business functions (and across the supply chain) to embed sustainability more firmly with numerous examples of embedded structural and relational activities (e.g. more intense alignment amongst supply chain and operations functions, including cross-functional teams, supplier network platforms, and sectoral workgroups). While the trader, ADM described how

processes are being redesigned to reduce waste via both technology and partnership-driven approaches, with process improvements over £276 million.

The most commonly reported BPR activity was the use of impact analysis. It involves processes such as risk assessment, foot-printing and LCA, and performance monitoring—as well as evaluation tasks such as self-assessment tools, management systems, traceability, and external audit and compliance systems. All were enabled and enhanced by information and communication technology.

Process 3: governance

Corporate social responsibility has extended the governance of an organisation beyond its direct realm of influence and control, and across boundaries into the supply chain network.

Executive. The executive function occupies a central and powerful position, internally and externally, in determining the degree to which sustainability is embedded in the organisation's business model, and therefore its supply chain. Internally, respondents discussed how leadership provides the mandate, strategic direction, policy, and resources. In terms of external relations, individuals are strategically placed across market and sectoral networks to drive a sustainability agenda and influence others. In support of this sub-process, having a champion within the organisation (particularly at the board of director and CEO level) is critical.

Respondents explained how it is the executive level integrity and commitment to sustainability that determines its embeddedness and, in turn, how the company relates to its stakeholders. CEOs such as Unilever's Paul Polman, Danone's Emmanuel Faber and M&S's Steve Roe were held up as exemplars of principled and transformative leaders with the power to influence others. Companies with a commitment to sustainability are changing their attitude to stakeholders and this is evident at an executive level. Companies also sought the input of external experts at a strategic level (many of whom traditionally would have met resistance when engaging with such companies, such as watchdogs and NGOs). For example, these type of individuals now contributes to the General Mills, M&S, Mondeléz, Nestlé, Tesco and Unilever's independent, external advisory panel/boards and the Co-op's members advisory panel.

Policy, standards and reporting. Companies take responsibility for inter-organisational processes related to the supply chain by providing codes of conduct (i.e. standards and principles) and policy as guiding documents. Experience has taught those engaged in sustainability programmes that 'they can't just throw money at it … it's going to be about policies' (manufacturing respondent). Such guidelines also become a contractual supplier lever; provide boundaries and clarity for action; and, aid in coordinating collective efforts at a sectoral level geared towards reform.

Formal reporting mechanisms are proxies for trust and, therefore, are also mechanisms of legitimation. Whilst legislation obliges companies to report on what they are doing, there is no requirement for improvement—that is at the discretion of the executive. Some companies, such as Mars, are changing how they report, using the document as a 'call to action' rather than merely a tool to communicate performance measures. Increasingly, ethical guidelines are also being included in reporting platforms (for example by the Co-op, Unilever and M&S).

Legislation and regulation. There is recognition sector-wide that affecting sustainability impact requires shared responsibility—and this extends to working with government. For example, the World WCF's CocoaAction strategy tackles priority issues in cocoa sustainability via such initiatives as the Harkin-Engel Protocol on child labour. As one trade association respondent explained,

> We have been able to work the ministries to understand the regulations, to provide better insights and information back to the companies and to help them accelerate the process. So that's been a great win and a great piece of progress for us even though the process is still hard, we were able to streamline the burden on the governments to just having to just talk to about fifteen companies versus just talking to us. Also helping the companies navigate what is a pretty complicated and convoluted set of regulatory requirements … You know that doesn't mean that we will ever take away the relationship that's companies have individually with these governments, they need to maintain those.

Process 4: integration

Respondents believe that for sustainability to be successfully managed in the supply chain it needs to be fully integrated.

Integrating business functions. Respondents explained that the greater the depth of integration of sustainability within business functions the broader the subsequent degree of integration across the supply chain. Multiple interviewees cited Unilever as the exemplar of such a practice. For example, in terms of integrating sustainability into the marketing function, respondents explained that it is important for the marketing team to understand the sustainability value proposition and communicate that. Examples included site visits by the procurement and marketing teams to communities, farms and production facilities to understand the issues and impacts of their supply and demand decisions holistically. Greater synergies and buy-in are being created, and siloed thinking is being forestalled.

Aids in integration. Respondents described specific aids to integration, including key performance indicators and the role of technology. KPIs are a critical aspect of performance and, by extension, aligned with goal setting. They support the implementation of sustainability in practice, and strategically ease the burden of trade-offs between different sustainability priorities. There is a synergy between KPIs and governance policy and standards in providing clarity and unity for full integration—rather than activities being fragmented operationally. Other integration aids include those

that are structural (e.g. a clear and focussed business case and strategy, strategic alignment with a fully integrated business model, resource investment, communication platforms, and technology) and relational (e.g. capacity development, CEO as champion, dedicated executive, expert staff and enhanced communication and knowledge exchange). A combination of structural and relational supports, coupled with appropriate organisational values and culture, enables greater integration in terms of both depth and breadth.

Maintaining integration. As recently as 10 years ago, sustainability was treated as an add-on by the majority of businesses in the sample. Now, certification, reducing carbon emissions, eliminating waste and energy efficiency are standard business activities. As a result, a trade association respondent explained, 'now the time is right for this more, this big larger scale and more integrated approach which brings resilience and sustainability together'. To do so requires continued innovation grounded in mature interpretations of the benefits of sustainability. An example of this is a sustainability strategy that is well integrated with the company's strategy and business model, allowing systemic, broader reach and impact. Increasingly, companies, such as Olam and Morrisons, have merged their sustainability reports with the annual strategic report. Respondents explained that how sustainability is integrated structurally is reflected in the company culture through the attitudes and behaviours of employees. For example, attributes such as flexibility/adaptiveness, accountability, empowerment/agency, patience, trust, honesty, creativity, aspiration and leadership were lauded. However, it is also a challenge to understand to what degree integration should occur. As one trade association respondent summarised,

> Oh god, the battles we had to sort of separate out what was community investment or charitable giving from corporate responsibility from sustainability and everything else; or whether you put it all together and integrate it into a company. You know I think that's sort of changing and the more efficient ways are to embed it throughout, you know, like the writing in Brighton Rock.

Process 5: collaboration

To build partnerships, companies need to understand that the rationale for doing so extends beyond the traditional financial/market-based reasoning. As a retailer explained,

> We can achieve more by working together on this [sustainability] with the term 'below the line'. It's not designed to be customer-based [value proposition]. It's not designed to give differentiation to companies. So, you need to get agreement on that and very often the message that can shift that is if you look at the ability to get cuts through differentiation in the markets. I mean, let's face it, we are dealing with a lot of sustainability challenges. Our customers can't even start to get their head around all of them and marketing pace, effective marketing takes a lot of money, a lot of investment and very, very simple messaging. So, you've got to kind of look at it in that context. You've got to get to where we can achieve more for businesses through this not being a competitive space and by this being a collaborative space.

Goal alignment between partners. As sustainability can be conceptualised differently, and strategic priorities can vary among partners, different approaches to collaboration and goal alignment can be taken within a supply chain. Respondents reported that more is achieved by supply chain partners working together. Furthermore, because sustainability challenges are many, complex, resource-intensive and expensive, a pragmatic and simple approach with clear goals is advised. The co-creation of the collaborative processes is considered a sensible and equitable way to achieve this. A manufacturer explained,

> We spent a lot of time evaluating concepts and ideas, and then co-developing narrative to go with that and the right metrics that are sustainable for the business to manage and use. In the long-term as opposed to just, sort of, the short-term … We are doing things and showing we mean collaboration.

Coordination and cooperation. For organisations to develop their capacity to collaborate, they also develop the capability to coordinate and cooperate. Beyond collaborating, this takes a change in mindset, ability to communicate multi-lingually, and a willingness to become more accountable to partners along the chain. For example, a farming association respondent described the cooperative process as:

> Businesses are learning the easy or the hard way that they need to work outside their borders to make things happen because they're accountable beyond their borders and their resources are beyond their borders. So, they need to be much more effective.

Respondents explained that the greater the level of structural sustainability integration, then the higher the levels of these types of capability and willingness is evident in the organisational culture and management behaviours. As a retailer described, 'We have a way of being cooperative now, in terms of our behaviours. I know every organisation has a corporate set of behaviours.'

Enhanced communication and information sharing. A company has less control over stakeholders who they are not in contracted relationships with (e.g. NGOs, community groups, watchdogs, trade associations, government agencies etc.). Respondents discussed examples of partnership best practice (e.g. learning from partners, transferring knowledge and sharing experience for more effective and efficient sustainable supply chain integration). However, poor communication was also repeatedly discussed as one of the greatest challenges and evidenced by: siloed thinking; activity and functional unit arrangements resulting in project/activity duplication; resource inefficiency resulting in duplicate knowledge management processes; high costs; and, confusion. Examples of good practices reported were: events; advisory boards; focus groups; site visits; cross-functional committees; and training and coaching.

Joint development. Collective decision-making and clear mutual agreements provide a vision and enable collaborative processes to progress to implementation and maintenance. A manufacturing respondent described it as, 'all working together and trying to get to a point where we can deliver on this community action plan. That's one of the key priorities'. For example, M&S developed its *Sustainability Scorecard*

and *Farming for the Future* as capacity building initiatives in joint development to aid suppliers to 'understand the business case for sustainability through progressively reducing their environmental impacts, increasing their efficiency and positively benefiting their workforce' (M&S 2017). However, sometimes there are disputes as to the best way: as one retailer put it (describing a manufacturer they collaborate with), 'They do really good stuff but they're a pain to work with because they always think that their way is the best way'.

Process 6: pre-competitive collaboration

Proactive companies across the sector have learnt the value of pre-competitive collaboration, with the most common example being trade association initiatives directed at anti-trust and codes of conduct. A primary benefit of this process is managing risk via commodity security and stability through the promotion of standards that scale impact through collective action. Network positioning plays a highly influential role in this process. As an isomorphic mechanism, pre-competitive collaboration strengthens the network positions of powerful MNCs (such as traders, manufacturers and retailers) by leveraging the sector for scale of impact, reducing resource duplication, and orientating the network towards its sustainability agenda. For example, collaboration created aligned frameworks such as the WCF's CocoaAction and WRAP's Courtauld Commitment. But, pre-competitive collaboration does necessitate informed personnel engaging knowledgeably in a series of sub-processes whilst also being constrained by anti-trust laws. A manufacturer explained this as,

> We've all got our programmes going working with our supply chains, but we all want the cocoa sector as a whole to flourish and therefore, let's seek to establish common principles. CocoaAction isn't a programme, it's a framework and the idea is that as people build their programmes they increasingly work to an aligned framework which hopefully means that we can scale-up and get leverage across the sector as a whole … First of all, you need a consensus on where the priorities are and some of those priorities are reasonably well defined now. Then you need to find consensus on what's appropriate for setting reasonable [pre-competitive] collaborative goals in ways that can get stuff done and also be appropriate in terms of anti-trust regulation and so on. So, it's that combination of ethics and scope for collaborative action.

Data indicates a spectrum of levels of commitment to pre-competitive collaboration that is directly correlated with the organisational orientation towards sustainability. For example, two companies go 'below the line' [denoting the bottom line in the business model] and are proactive: taking the role as leaders and seeking ethical impact over and beyond financial rationale (denoting a responsible business model). In this instance, sustainability is a unique selling point to their brand and that shared value adds value to their market share. In these instances, they are not only leading and fully engaged but also established pre-competitive associations and initiatives.

Process 7: stakeholder management

All node organisations described the importance of identifying, analysing, and engaging with stakeholders—whilst acknowledging that not all can be satisfied.

Identify and analyse stakeholders. When discussing the range of stakeholders, interests were broad: ranging from a large variety of NGOs interested in the impact of downstream focal companies on sustainable development in developing countries, through to consumer groups and local communities downstream. The list was extensive and included inter-governmental organisations, governments, trade associations, trade unions, activists, NGOs, local communities across the developed and developing world, financial institutions, academic and research organisations, private sector providers, the media, and religious organisations. Mapping these is a subjective exercise, as is determining the power these groups have to affect the organisation through its supply chain. Respondents said that they find this a challenge, as is finding the balance in managing their expectations and supporting key stakeholders. For example, the Co-op respondent explained that,

> The challenge we have sometimes is that they [employees] care so much that we can't do the things they want us to! So, I guess we're quite the other end in terms of managing our stakeholders to maybe someone who just cares about the share price.

Engagement. All respondents discussed the value in engaging with stakeholders and the myriad of ways to do so. Managing reputation and expectations, alignment, coordination, consultation, and providing guidance and support were also described as being important. Communication exercises included press releases, workshops, meetings, forums, advisory panels, education programs and literature, and feedback channels. The reported channels of communication with stakeholders were two-way, fluid, and open –and underpinned by long-term commitment and increased accountability. It is also imperative that they are constructive, rather than disruptive, in terms of the supply chain itself.

Process 8: performance monitoring and evaluation

Respondents described how monitoring and evaluation subprocesses are important for numerous reasons. Having the correct procedures and measures enables verification, self-assessment, consequence management and accountability. Activities are designed to comply with certification and regulations and provide the information for accreditation, auditing, compliance, reporting and transparency. They also provide information for internal company reports and external reporting systems such as GRI.

Monitoring activities. Monitoring activities and mechanisms are strategically designed to address complex challenges that take time to solve and required a phased approach. For example, Barry Callebaut reports,

> Tackling poverty is a long-term solution to child labour, but in the short term, we need to put in place solid monitoring and

> remediation systems, in order to identify and forever eliminate child labour. (Barry Callebaut 2017, 12)

As such, the company developed a management system that aligned its policies with the International Cocoa Initiative's position on child labour. The monitoring process was dependent on other key processes, i.e. it identified key goals and metrics in the strategic planning process and collaborated with multiple stakeholders to educate and enforce standards and achieve scale.

External auditing and compliance systems. Respondents reported that the scale and complexity of issues produce multiple criteria, often with conflicting trade-offs, such as short-term vs. long-term or economic vs. environmental/social—for which developing measures is challenging. Therefore, technology, transparency, impact mapping and scientific data are important in identifying hot spots.

External auditing and verification of certification systems are of benefit, particularly by leading organisations such as Fairtrade International, the Rainforest Alliance and UTZ. Their recognition rates are high for product placement and their systems are legitimate and credible, providing simple and traceable procedures and pathways. They also advocate on ethical issues, that are not generally considered by business. However, for all its strengths, participants also acknowledge certification limitations: organisations are learning by experience; each commodity has its contextual constraints; the programmes are fallible if they are not verified regularly; companies have to go beyond certification; and, each company across the supply chain is at a different level of development.

Discussion

Management of SSCM business process maturity model

An abstract theme that emerged from the empirical analysis was the identification of causal mechanisms that capture the variability of approaches in embedding sustainability. The alignment, implementation, and maintenance of SSCM are similar to that recommended by Croxton et al. (2001) in SCM. The objective remains to create value for the entire network and the coordination of activities among partners by echoing He et al. (2016, 391), but the model explains how business processes are 'renovated and reorganised' in an inter-organisational system, i.e. the supply chain network, from the perspective of sustainability value. With the inclusion of sustainability, identifying members becomes more critical given the scope of stakeholders and potential partnerships to create value beyond the customer. This precedence can be seen by the inclusion of mapping as a subprocess in strategic planning. Our model expands that of Croxton et al. to include alignment and maintenance, and extends the findings of Kleindorfer, Singhal, and Wassenhove (2009), Storey et al. (2006), Vachon and Klassen (2006), Cheng, Yeh, and Tu (2008) and Beske and Seuring (2014) by identifying a maturity model of phases of management. It describes how business processes are managed through structured yet flexible sequential phases, and the inputs (practices, capabilities, and technologies) to achieve any given phase of management or advance to the next (Van Looy, De Backer, and Poels 2011). The alignment phase is synonymous with developing an initial understanding of sustainability (Boons, Baumann, and Hall 2012; Sarkis 2012). These phases are the management mechanisms that prescribe the degree to which sustainability becomes embedded. However, for a more comprehensive understanding of how business processes are actualised in practice through these mechanisms, a study of sustainability practices themselves would be required. Practices have been conceptualised as the selection of links that facilitate the management of processes (Lambert and Cooper 2000). Given the finding that there is a range of dynamic variables, it can be assumed that there is a style of practice as regards how processes are actualised that is dependent on how an organisation characterises sustainability. Therefore, this would require an understanding of the links appropriate for each phase of management—such as the ones demonstrated by Lambert's (2008) management component of their SCM process model.

The inputs for each phase of management varied, as the level of knowledge required to learn and develop is different in each stage. For example, in the pre-competitive collaboration process (Figure 2), the inputs for alignment are sharing basic knowledge to establish a common language, principles and goals. To move to the implementation stage, organisations share greater levels of pre-competitive knowledge and information to implement processes and technology. Subsequently, to mature to the maintenance phase requires the greatest resource commitment so that that knowledge can be shared to engage in workgroups, programmes and activities. Higher levels of responses to stakeholders (Rowley 1997; Banerjee 2001), collaboration (Spekman, Kamauff, and Myhr 1998; Gunasekaran, Subramanian, and Rahman 2015), integration (Frohlich and Westbrook 2001; Wiengarten and Longoni 2015), governance (Vurro, Russo, and Perrini 2009), and embeddedness (Rowley 1997) result in greater levels of inputs.

Technology and SSCM

Technology is critical to SSCM as it provides solutions to entrenched issues such as complexity, scale, visibility, and innovation (Frohlich and Westbrook 2001). In each of the eight processes we identified, technology was a core component that helped realise both purpose and scope. For example, technology-enabled: the amelioration of financial and sustainability trade-offs created by tight margins in the business model; the identification of efficiencies across the supply chain through impact mapping; and, the facilitation of analysis that creates win-win scenarios instead of business-driven win-lose outcomes. Specific examples of technology-related value include: materiality impacts resulting in smarter and dematerialised packaging; sharing best practices across rurally dispersed farming communities using mobile phone technology and videos (rather than long, complex

pieces of text to potentially illiterate users); and, by providing technical support, and the use of information and communication technologies to scale-up sustainability impact (Knoben and Oerlemans 2006). As such, technological capability is a core component of the maturity model (Ardito et al. 2019c) as firms must develop basic and specialised techniques required to facilitate the SSCM performance and excellence (Knoben and Oerlemans 2006). Our study provides a thick description of the techniques deployed to advance these developmental stages.

The predominant themes regard business process technologies are structural and relational management components (Lambert and Cooper 2000). In terms of structural enhancing technologies, big data is being effectively and efficiently deployed to map the network, assess materiality, determine strategic impact, and identify stakeholders associated with the level of activity across the supply chain. We extended the work of Ardito, Petruzzelli, and Albino (2016), Ardito, Petruzzelli, Panniello and Garavelli (2019) and Ardito, Ernst, and Messeni Petruzzelli (2020) on the use of technology to enhance information and communication by developing the process knowledge beyond value-adding and value-enabling processes to the use of technology in management processes across business networks. For example, concerning inter-organisational collaboration, one manufacturing respondent described how technology was instrumental in re-engineering the whole communication model, while another described re-engineering the business model.

Aligned with extant literature (Ardito et al. 2019c; Luthra and Mangla 2018), there were numerous examples of technology in mapping the supply chain network, which results in greater traceability and transparency—both critical practices for successful sustainable supply chain integration. Our study shows this is creating a trend across leading sustainability organisations for publishing their supply chain network maps online. Another technology-driven SSCM outcome is how the network information is used in conjunction with online and mobile social network technologies to share information and improve decision making (Tseng et al. 2019). This includes activities such as open-source, events, platforms, digital media, workshops/training, and building globally dispersed communities. For example, M&S and Tesco have created online supplier networks and management systems to enhance collaboration and integration, while Solidaridad uses Facebook to share train and develop isolated and illiterate farmers.

The value of technology to SCM is evident by the number of studies dedicated to this line of inquiry (Nunez-Merino et al. 2020; da Silva, Kovaleski, and Pagani 2019; Fatorachian and Kazemi 2021). We extend this discourse to SSCM, providing the accounts of technical experts recruited across all types of respondent organisations in a cocoa supply chain. Benefits are being realised end-to-end across the supply chain. For example, a non-profit organisation working in partnership with downstream multinational companies to support farming suppliers described how technology is at the nexus of the programme using information and communication technologies to scale and provide technical support to a huge number of suppliers at a lower cost. Technologies are helping integrate sustainability by making the business case for sustainability clearer, providing the rationale for sustainability investment, increasing profitability and creating shared value resulting in greater economic sustainability.

Concurrent with extant literature (Ardito et al. 2019c), there are concerns about the large investment needed in technology and how this hinders supply chains transformation. However, respondents claim that once the technology has been developed successfully and has been scaled, costs are market competitive without the need for subsidisation or intervention. The sector is also evolving in its understanding of the role of technologies and how investment in innovating and maturing technologies can create long-term benefits. However, generally, technologies are in an embryonic stage and organisations are taking an incremental approach and investing highly in innovation—while dealing with both short and long-term associated uncertainties related to technology development (particularly relating to cost).

Theoretical development of the SSCM process model

Business process management has contributed greatly to the body of knowledge around SSCM. But, its focus on production practices has come at the expense of a more nuanced consideration of the role of business processes. As such, the generic inter-organisational business process model has certain features, based on theoretical propositions set forth as follows (Figure 1):

> Proposition 1. The set of eight business processes are a set of logically organised tasks that collectively stimulate communities of sustainable practice to emerge in which knowledge is constructed and shared beyond organisational boundaries within complex, heterogeneous environments.
>
> Proposition 2.a Process management requires a phased approach to aligning, implementing and maintaining the eight business processes to facilitate sustainable practices in complex, heterogeneous environments.
>
> Proposition 2.b. The phased approach to managing processes denotes a sustainable maturity model as a result of varying values, priorities and proximities across complex, heterogeneous environments.
>
> Proposition 3.a. Process technology enables the flow of information required for sustainable process integration.
>
> Proposition 3.b. The greater the level of technological proximity the greater the level of sustainable process integration.
>
> Proposition 4. The process inputs and outputs will vary among organisations in complex, heterogeneous environments as a result of various levels of maturity in sustainable practices.

In order to understand these propositions, it is necessary to clarify the concept of *business process management*:

Business process management has contributed greatly to the body of knowledge around SSCM. But, its focus on production practices has come at the expense of a more nuanced consideration of the role of business processes.

Building on the work of Sureeyatanapas, Yang, and Bamford (2015), we propose a holistic SSCM business process model that is specifically oriented towards sustainability

integration via practice and process. We also contextualise our model for corporate sustainability assessment by integrating strategic planning, governance, and performance monitoring and evaluation processes. We also offer a significantly different interpretation of the concept of the arc of integration in terms of sustainability and organisational embeddedness. Marshall et al. (2015) focus on the depth of integration regards the delineation of environmental and social practices and importantly provide specific measures. However, our data goes beyond that by considering the breadth of integration concerning the broader strategic agenda of sustainability across the supply chain, rather than focussing n singular or specific dimensions.

Similar to Gopal and Thakkar (2016), Georgise, Wuest, and Thoben (2017) and Cole and Aitken (2019), our study has shown that a new era of process type is emerging. The paper has deliberately developed the dialogue concerning how traditional processes are being reappraised (Cole and Aitken 2019), particularly concerning inter-organisational relationships (Di Vaio and Varriale 2020). Where Gopal and Thakkar provided a model of critical success factors in embedding sustainability and Georgise, Wuest, and Thoben (2017) reappraised the SCOR model in the supply chain, we have considered the necessary processes for inter-organisational relational management within the theoretical constructs described in Figure 1. As such, we have responded to Ardito, Petruzzelli, and Albino (2016) call for more generic solutions to technical problems of inter-organisational knowledge exchange (cf. propositions 3a and 3 b). Concurrent themes emerged such as the interdependent/interrelated relationships within SSCM models, due to the need for holistic, integrated, aligned and collaborative activities—as well as the importance of planning, standards & policy, integration, collaboration, sectoral coordination and improvements. We also address their identification of a gap regards the 'absence of sector or industry-specific guidelines' (Gopal and Thakkar 2016, 1015) by describing pre-competitive collaboration (hitherto ignored in the literature). We also acknowledge their call for consideration of the design-stage of SSCM by describing the design processes and its sub-processes as a result of strategic planning that addresses complexity.

Further, we also corroborate Luthra and Mangla (2018) recommendation that continuous supervision is required (through performance monitoring and evaluation process) to maintain, scale, build resilience and continuously improve sustainability aspects. Focussing on the strategic planning process, Macchion et al. (2018) demonstrated how SSSCM practices can be aligned with existing models, i.e. the SCOR model, while also demonstrating how different strategies emerge as a result if divergent values, inputs, and contextual factors (propositions 1–4). This finding is consistent with ours regards the dynamic variables resulting in variations in processes (Figure 1), but we extend the claim by identifying specific critical variables that influence the dynamics, namely: collaboration, embeddedness, integration, organisational values, and the sustainability orientation itself.

Our data, and model, have also linked and extended the work of Kleindorfer, Singhal, and Wassenhove (2009), Storey et al. (2006), Vachon and Klassen (2006), Cheng, Yeh, and Tu (2008) and Beske and Seuring (2014) by identifying a maturity model of phases of management that describe how business processes are managed through sequential phases (propositions 2 & 4). The alignment phase is synonymous with developing an initial understanding of sustainability (Boons, Baumann, and Hall 2012; Sarkis 2012). These phases are the management mechanisms that describe the degree to which sustainability is embedded due to the level of inputs committed to achieving the relevant process goal as described in proposition 4. The four propositions along with the eight business processes and their sub-processes presented in this paper could be used as a guide for practitioners in aligning, implementing and monitoring sustainable industry practices. However, for a more comprehensive understanding of how business processes are actualised in practice through these mechanisms an in-depth study of sustainability practices will be required. Practices have been conceptualised as the selection of links that facilitate the management of processes (Lambert and Cooper 2000). Given the finding that there is a range of dynamic variables, it can be assumed that there will be a style of practice in relation to process actualisation that will be dependent on how an organisation conceptualises sustainability within its context.

Conclusion

This paper presented a logical, data-informed case that evidences how an orientation towards sustainability fundamentally alters SCM: producing a new paradigm of SSCM that requires bespoke models, processes and practices that move beyond the field's origins in the principles of planning, production and control. It makes a theoretical contribution by proposing a SSCM specific business process model in the context of a global chocolate supply chain network. Similar to the work of Georgise, Wuest, and Thoben (2017), this paper does not provide a comprehensive review of business processes. It does, however, contribute to relational, rather than production, conceptualisations of BPM. Previous studies, captured in the systematic literature review, have recognised the importance of specific processes included in the model, excepting pre-competitive collaboration; however, none have formally recognised these processes collectively in a unified model, nor explained their unique relationship with respect to sufficing the principles of sustainability and how these are managed through maturity phases.

The proposed SSCM process model described in this paper responds to the call for holism and addresses the issues of complexity and variability and the absence of process-oriented conceptualisations of how a supply chain can become sustainable (via the business processes that inform production practices). Within the model, a justification for the criticality of each named process is offered that narrates the centrality of sustainability in each and, overall, across the supply chain. Furthermore, the processes, and their sub-processes, are described in-depth to explain how processes are

managed in practice at an organisational systems level. This knowledge is enhanced by consideration of how phases of management address the complex, holistic and coordinated features of sustainability.

This study is exploratory nature in identifying new business processes for sustainable supply chain practices, and hence the readers must be vigilant in interpreting the results. Although the findings are based on a single network of entities operating in the cocoa supply chain, the proposed model is evidenced by rich data collected from various entities in the network. The research acts as a springboard case from which researchers can undertake further case studies on a larger scale to consolidate and generalise the findings. More research relying on survey methodologies could also be used to evaluate and test the propositions presented here. Given the rapid nature of technological developments, i.e. IoT, social media, big data, (Nudurupati, Tebboune, and Hardman 2016) it will be interesting via future research to see how they can contribute to developing sustainable supply chains. Our model is not intended to replace existing SCM process models, rather complement them. We hope it contributes to extending the discourse of SSCM beyond the traditional transactional view and reinforces the position that value in the supply chain is being created that extends far beyond that of an economic nature—and, that such value is critical in shoring up the ambitions of the sustainability.

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Zhu, Q. H., J. Sarkis, and Y. Geng. 2005. "Green Supply Chain Management in China: Pressures, Practices and Performance." *International Journal of Operations & Production Management* 25 (5): 449–468. doi:10.1108/01443570510593148.

Appendix 1. Summary of key SSCM practices in the literature.

Definition	Focus of article	Criteria	Authors
'Practices related to environmental issues and performance encompass both internal and external activities, whether related to preventing pollution before it is generated, recycling waste and spent products, extracting resources and raw materials, or capturing harmful pollutants followed by proper disposal.' (2006, 797)	Product stewardship—green practices across the supply chain	• Environmental monitoring • Environmental collaboration	Vachon and Klassen (2006)
'We take a broad perspective of GSCM and include internal and external practices that play a role in greening the supply chain.' *(2004, 267)*	Green management practices	• Internal environmental management • Green purchasing* • Customer collaboration including environmental requirements* • Investment recovery • Eco-design	Zhu and Sarkis (2004) Zhu, Sarkis, and Geng (2005)

'SSCM has emerged as a result of marrying the three pillars of sustainability with core business practices, such as procurement, logistics, management, marketing, and operations' (2012, 637)	Measuring supplier performance	• Governance
		• Policy
		• Standards
		• Integration of
		  • CSR practices
		  • Sustainability principles
		  • Performance measures
		• Performance measurement
		• Monitoring
		• Reporting
		• Collaboration
		• Strategy
		• Looking forward on SSCM
			Morali and Searcy (2013)

'Practices [as] basic routines … [Also,] that e.g. enhance relationships between the partners, the flow of goods and information or issues of sustainability … ' (2014, 132)	Dynamic capabilities	SSCM practices • Orientation • Continuity • Collaboration • Risk management • Pro-activity SSCM dynamic capabilities • SC re-conceptualisation • Knowledge management • SC partner development • Reflexive SC control • Co-evolving	Beske et al. (2014, 132)

Appendix 2. List of SLR articles.

Reference no.	Reference	Search sting 1—features	Search sting 2—themes
(1)	Adhitya, A., Halim, I. and Srinivasan, R. (2011) 'Decision Support for Green Supply Chain Operations by Integrating Dynamic Simulation and LCA Indicators: Diaper Case Study.' *Environmental Science & Technology*, 45(23) pp. 10178–10185.	x	x
(2)	Agi, M. A. N. and Nishant, R. (2017) 'Understanding influential factors on implementing green supply chain management practices: An interpretive structural modelling analysis.' *Journal of Environmental Management*, 188, Mar, pp. 351–363.	x	
(3)	Ahmad, W., Rezaei, J., Sadaghiani, S. and Tavasszy, L. A. (2017) 'Evaluation of the external forces affecting the sustainability of oil and gas supply chain using Best Worst Method.' *Journal of Cleaner Production*, 153(1), Jun, pp. 242–252.		x
(4)	Ala-Harja, H. and Helo, P. (2015) 'Reprint of "Green supply chain decisions – Case-based performance analysis from the food industry".' *Transportation Research: Part E*, 74 pp. 11–21.		x
(5)	Al-e-Hashem, S., Baboli, A. and Sazvar, Z. (2013) 'A stochastic aggregate production planning model in a green supply chain: Considering flexible lead times, nonlinear purchase and shortage cost functions.' *European Journal of Operational Research*, 230(1), Oct, pp. 26–41.		x
(6)	Alvarez, G., Pilbeam, C. and Wilding, R. (2010) 'Nestlé Nespresso AAA sustainable quality program: an investigation into the governance dynamics in a multi-stakeholder supply chain network.' *Supply Chain Management-an International Journal*, 15(2) pp. 165–182.		x
(7)	Ameknassi, L., Ait-Kadi, D. and Rezg, N. (2016) 'Integration of logistics outsourcing decisions in a green supply chain design: A stochastic multi-objective multi-period multi-product programming model.' *International Journal of Production Economics*, 182, Dec, pp. 165–184.	x	x
(8)	Arnette, A. N., Brewer, B. L. and Choal, T. (2014) 'Design for sustainability (DFS): the intersection of supply chain and environment.' *Journal of Cleaner Production*, 83 pp. 374–390.		x
(9)	Azadi, M., Shabani, A., Khodakarami, M. and Farzipoor Saen, R. (2015) 'Reprint of "Planning in feasible region by two-stage target-setting DEA methods: An application in green supply chain management of public transportation service providers".' *Transportation Research: Part E*, 74 pp. 22–36.		x
(10)	Azadi, M., Jafarian, M., Saen, R. F. and Mirhedayatian, S. M. (2015) 'A new fuzzy DEA model for evaluation of efficiency and effectiveness of suppliers in sustainable supply chain management context.' *Computers & Operations Research*, 54, Feb, pp. 274–285.		x
(11)	Azevedo, S. G., Carvalho, H., Duarte, S. and Cruz-Machado, V. (2012) 'Influence of Green and Lean Upstream Supply Chain Management Practices on Business Sustainability.' *Ieee Transactions on Engineering Management*, 59(4), Nov, pp. 753–765.	x	
(12)	Azevedo, S. G., Carvalho, H. and Machado, V. C. (2011) 'The influence of green practices on supply chain performance: A case study approach.' *Transportation Research Part E-Logistics and Transportation Review*, 47(6), Nov, pp. 850–871.	x	x
(13)	Babazadeh, R., Razmi, J., Pishvaee, M. S. and Rabbani, M. (2017) 'A sustainable second-generation biodiesel supply chain network design problem under risk.' *Omega-International Journal of Management Science*, 66, Jan, pp. 258–277.		x
(14)	Bai, C. G., Sarkis, J., Wei, X. P. and Koh, L. (2012) 'Evaluating ecological sustainable performance measures for supply chain management.' *Supply Chain Management-an International Journal*, 17(1) pp. 78–92.		x
(15)	Beske, P., Land, A. and Seuring, S. (2014) 'Sustainable supply chain management practices and dynamic capabilities in the food industry: A critical analysis of the literature.' *International Journal of Production Economics*, 152, Jun, pp. 131–143.	x	
(16)	Beske-Janssen, P., Johnson, M. P. and Schaltegger, S. (2015) '20 years of performance measurement in sustainable supply chain management - what has been achieved?' *Supply Chain Management-an International Journal*, 20(6) pp. 664–680.		x
(17)	Bhattacharya, A., Mohapatra, P., Kumar, V., Dey, P. K., Brady, M., Tiwari, M. K. and Nudurupati, S. S. (2014) 'Green supply chain performance measurement using fuzzy ANP-based balanced scorecard: a collaborative decision-making approach.' *Production Planning & Control*, 25(8) pp. 698–714.		x
(18)	Bhattacharya, A., Dey, P. K. and Ho, W. (2015) 'Green manufacturing supply chain design and operations decision support.' *International Journal of Production Research*, 53(21), Nov, pp. 6339–6343.		x
(19)	Blome, C., Paulraj, A. and Schuetz, K. (2014) 'Supply chain collaboration and sustainability: a profile deviation analysis.' *International Journal of Operations & Production Management*, 34(5) pp. 639–663.		x
(20)	Bostrom, M., Jonsson, A. M., Lockie, S., Mol, A. P. J. and Oosterveer, P. (2015) 'Sustainable and responsible supply chain governance: challenges and opportunities.' *Journal of Cleaner Production*, 107, Nov, pp. 1–7.		x
(21)	Boukherroub, T., Ruiz, A., Guinet, A. and Fondrevelle, J. (2015) 'An integrated approach for sustainable supply chain planning.' *Computers & Operations Research*, 54, Feb, pp. 180–194.	x	x
(22)	Bourlakis, M., Maglaras, G., Gallear, D. and Fotopoulos, C. (2014) 'Examining sustainability performance in the supply chain: The case of the Greek dairy sector.' *Industrial Marketing Management*, 43(1), Jan, pp. 56–66.		x
(23)	Brandenburg, M. and Rebs, T. (2015) 'Sustainable supply chain management: a modelling perspective.' *Annals of Operations Research*, 229(1), Jun, pp. 213–252.	x	
(24)	Busse, C., Meinlschmidt, J. and Foerstl, K. (2017) 'Managing Information Processing Needs in Global Supply Chains: A Prerequisite to Sustainable Supply Chain Management.' *Journal of Supply Chain Management*, 53(1), Jan, pp. 87–113.	x	
(25)	Buyukozkan, G. and Berkol, C. (2011) 'Designing a sustainable supply chain using an integrated analytic network process and goal programming approach in quality function deployment.' *Expert Systems with Applications*, 38(11), Oct, pp. 13731–13748.	x	x

(*continued*)

Appendix 2. Continued.

Reference no.	Reference	Search sting 1—features	Search sting 2—themes
(26)	Chan, R. Y. K., He, H. W., Chan, H. K. and Wang, W. Y. C. (2012) 'Environmental orientation and corporate performance: The mediation mechanism of green supply chain management and moderating effect of competitive intensity.' *Industrial Marketing Management*, 41(4), May, pp. 621–630.	x	x
(27)	Chardine-Baumann, E. and Botta-Genoulaz, V. (2014) 'A framework for sustainable performance assessment of supply chain management practices.' *Computers & Industrial Engineering*, 76, Oct, pp. 138–147.	x	x
(28)	Chavez, R., Yu, W. T., Feng, M. Y. and Wiengarten, F. (2016) 'The Effect of Customer-Centric Green Supply Chain Management on Operational Performance and Customer Satisfaction.' *Business Strategy and the Environment*, 25(3), Mar, pp. 205–220.		x
(29)	Chen, Y. J. and Sheu, J. B. (2009) 'Environmental-regulation pricing strategies for green supply chain management.' *Transportation Research Part E-Logistics and Transportation Review*, 45(5), Sep, pp. 667–677.		X
(30)	Chiarini, A. (2014) 'Strategies for Developing an Environmentally Sustainable Supply Chain: Differences Between Manufacturing and Service Sectors.' *Business Strategy and the Environment*, 23(7), Nov, pp. 493–504.		X
(31)	Chiu, J. Z. and Hsieh, C. C. (2016) 'The Impact of Restaurants' Green Supply Chain Practices on Firm Performance.' *Sustainability*, 8(1), Jan, pp. 1–14.		X
(32)	Chung, C. J. and Wee, H. M. (2008) 'Green-component life-cycle value on design and reverse manufacturing in semi-closed supply chain.' *International Journal of Production Economics*, 113(2), Jun, pp. 528–545.		X
(33)	Clarke, T. and Boersma, M. (2017) 'The Governance of Global Value Chains: Unresolved Human Rights, Environmental and Ethical Dilemmas in the Apple Supply Chain.' *Journal of Business Ethics*, 143(1) pp. 111–131.		X
(34)	Coskun, S., Ozgur, L., Polat, O. and Gungor, A. (2016) 'A model proposal for green supply chain network design based on consumer segmentation.' *Journal of Cleaner Production*, 110, Jan, pp. 149–157.		X
(35)	Curkovic, S. and Sroufe, R. (2010) 'Using ISO 14001 to promote a sustainable supply chain strategy.' *Business Strategy and the Environment*, 20(2) p. 71.		X
(36)	de Brito, M. P., Carbone, V. and Blanquart, C. M. (2008) 'Towards a sustainable fashion retail supply chain in Europe: Organisation and performance.' *International Journal of Production Economics*, 114(2), Aug, pp. 534–553.		X
(37)	De Giovanni, P. and Vinzi, V. E. (2012) 'Covariance versus component-based estimations of performance in green supply chain management.' *International Journal of Production Economics*, 135(2), Feb, pp. 907–916.		X
(38)	Del Borghi, A., Gallo, M., Strazza, C. and Del Borghi, M. (2014) 'An evaluation of environmental sustainability in the food industry through Life Cycle Assessment: the case study of tomato products supply chain.' *Journal of Cleaner Production*, 78, Sep, pp. 121–130.		x
(39)	Devika, K., Jafarian, A. and Nourbakhsh, V. (2014) 'Designing a sustainable closed-loop supply chain network based on triple bottom line approach: A comparison of metaheuristics hybridisation techniques.' *European Journal of Operational Research*, 235(3), Jun 16, pp. 594–615.		x
(40)	Ding, H., Zhao, Q., An, Z. and Tang, O. (2016) 'Collaborative mechanism of a sustainable supply chain with environmental constraints and carbon caps.' *International Journal of Production Economics*, 181 pp. 191–207.	x	X
(41)	Ding, H. P., Zhao, Q. L., An, Z. R., Xu, J. and Liu, Q. (2015) 'Pricing strategy of environmental sustainable supply chain with internalising externalities.' *International Journal of Production Economics*, 170, Dec, pp. 563–575.		X
(42)	Ding, H. P., Liu, Q. and Zheng, L. (2016) 'Assessing the economic performance of an environmental sustainable supply chain in reducing environmental externalities.' *European Journal of Operational Research*, 255(2), Dec, pp. 463–480.		X
(43)	Drake, M. J. and Schlachter, J. T. (2008) 'A Virtue-Ethics Analysis of Supply Chain Collaboration.' *Journal of Business Ethics*, 82(4), Nov, pp. 851–864.	x	X
(44)	Dubey, R., Gunasekaran, A. and Ali, S. S. (2015 b) 'Exploring the relationship between leadership, operational practices, institutional pressures and environmental performance: A framework for green supply chain.' *International Journal of Production Economics*, 160, Feb, pp. 120–132.	x	X
(45)	Dues, C. M., Tan, K. H. and Lim, M. (2013) 'Green as the new Lean: how to use Lean practices as a catalyst to greening your supply chain.' *Journal of Cleaner Production*, 40, Feb, pp. 93–100.	x	X
(46)	Elhedhli, S. and Merrick, R. (2012) 'Green supply chain network design to reduce carbon emissions.' *Transportation Research Part D-Transport and Environment*, 17(5), Jul, pp. 370–379.		X
(47)	Erol, I., Sencer, S. and Sari, R. (2011) 'A new fuzzy multi-criteria framework for measuring sustainability performance of a supply chain.' *Ecological Economics*, 70(6), Apr, pp. 1088–1100.		X
(48)	Esfahbodi, A., Zhang, Y. F., Watson, G. and Zhang, T. (2017) 'Governance pressures and performance outcomes of sustainable supply chain management - An empirical analysis of UK manufacturing industry.' *Journal of Cleaner Production*, 155, Jul, pp. 66–78.		x
(49)	Esfahbodi, A., Zhang, Y. F. and Watson, G. (2016) 'Sustainable supply chain management in emerging economies: Trade-offs between environmental and cost performance.' *International Journal of Production Economics*, 181, Nov, pp. 350–366.		X
(50)	Fahimnia, B., Sarkis, J. and Eshragh, A. (2015) 'A trade-off model for green supply chain planning: A leanness-versus-greenness analysis.' *Omega-International Journal of Management Science*, 54, Jul, pp. 173–190.		X
(51)	Formentini, M. and Taticchi, P. (2016) 'Corporate sustainability approaches and governance mechanisms in sustainable supply chain management.' *Journal of Cleaner Production*, 112, Jan, pp. 1920–1933.	X	X

(*continued*)

Appendix 2. Continued.

Reference no.	Reference	Search sting 1—features	Search sting 2—themes
(52)	Geng, R. Q., Mansouri, A. and Aktas, E. (2017) 'The relationship between green supply chain management and performance: A meta-analysis of empirical evidences in Asian emerging economies.' *International Journal of Production Economics*, 183, Jan, pp. 245–258.		X
(53)	Glover, J. L., Champion, D., Daniels, K. J. and Dainty, A. J. D. (2014) 'An Institutional Theory perspective on sustainable practices across the dairy supply chain.' *International Journal of Production Economics*, 152 pp. 102–111.	X	
(54)	Golicic, S. L. and Smith, C. D. (2013) 'A Meta-Analysis of Environmentally Sustainable Supply Chain Management Practices and Firm Performance.' *Journal of Supply Chain Management*, 49(2) pp. 78–95.	X	X
(55)	Golpira, H., Najafi, E., Zandieh, M. and Sadi-Nezhad, S. (2017) 'Robust bi-level optimisation for green opportunistic supply chain network design problem against uncertainty and environmental.' *Computers & Industrial Engineering*, 107, May, pp. 301–312.		X
(56)	Gosling, J., Jia, F., Gong, Y. and Brown, S. 'The role of supply chain leadership in the learning of sustainable practice: Towards an integrated framework.' *Journal of Cleaner Production*, 140(0), Oct, pp. 239–250.	X	X
(57)	Govindan, K., Jafarian, A. and Nourbakhsh, V. (2015a) 'Bi-objective integrating sustainable order allocation and sustainable supply chain network strategic design with stochastic demand using a novel robust hybrid multi-objective metaheuristic.' *Computers & Operations Research*, 62, 10//, pp. 112–130.	X	X
(58)	Govindan, K., Khodaverdi, R. and Vafadarnikjoo, A. (2015 b) 'Intuitionistic fuzzy based DEMATEL method for developing green practices and performances in a green supply chain.' *Expert Systems with Applications*, 42(20), Nov, pp. 7207–7220.	X	X
(59)	Govindan, K., Seuring, S., Zhu, Q. H. and Azevedo, S. G. (2016) 'Accelerating the transition towards sustainability dynamics into supply chain relationship management and governance structures.' *Journal of Cleaner Production*, 112, Jan, pp. 1813–1823.		X
(60)	Govindan, K. (2013) 'Embedding sustainability dynamics in supply chain relationship management and governance structures.' *Journal of Cleaner Production*, 59, 11/15/, pp. 1–2.		X
(61)	Green, K. W., Jr., Zelbst, P. J., Meacham, J. and Bhadauria, V. S. (2012) 'Green supply chain management practices: impact on performance.' *Supply Chain Management-an International Journal*, 17(3), 2012, pp. 290–305.	X	X
(62)	Gunasekaran, A., Subramanian, N. and Rahman, S. (2015) 'Green supply chain collaboration and incentives: Current trends and future directions.' *Transportation Research: Part E*, 74 pp. 1–10.		X
(63)	Haghighi, S. M., Torabi, S. A. and Ghasemi, R. (2016) 'An integrated approach for performance evaluation in sustainable supply chain networks (with a case study).' *Journal of Cleaner Production*, 137, Nov, pp. 579–597.	X	X
(64)	Handfield, R. B., Walton, S. V., Seegers, L. K. and Melnyk, S. A. (1997) '"Green" value chain practices in the furniture industry.' *Journal of Operations Management*, 15(4) pp. 293–315.	X	
(65)	Hoejmose, S. U., Grosvold, J. and Millington, A. (2014) 'The effect of institutional pressure on cooperative and coercive 'green' supply chain practices.' *Journal of Purchasing and Supply Management*, 20(4), 12//, pp. 215–224.	X	
(66)	Hsu, C. C., Tan, K. C. and Zailani, S. H. M. (2016) 'Strategic orientations, sustainable supply chain initiatives, and reverse logistics Empirical evidence from an emerging market.' *International Journal of Operations & Production Management*, 36(1) pp. 86–110.		X
(67)	Hsueh, C. F. (2015) 'A bilevel programming model for corporate social responsibility collaboration in sustainable supply chain management.' *Transportation Research Part E-Logistics and Transportation Review*, 73, Jan, pp. 84–95.		X
(68)	Hu, M. C., Chen, Y. H. and Huang, L. C. (2014) 'A sustainable vegetable supply chain using plant factories in Taiwanese markets: A Nash-Cournot model.' *International Journal of Production Economics*, 152, Jun, pp. 49–56.		X
(69)	Irani, Z., Kamal, M. M., Sharif, A. and Love, P. E. D. (2017) 'Enabling sustainable energy futures: factors influencing green supply chain collaboration.' *Production Planning & Control*, 28(6–8) pp. 684–705.		X
(70)	Jabbour, A. B. L. d. S., Jabbour, C. J. C., Latan, H., Teixeira, A. A. and de Oliveira, J. H. C. (2015) 'Reprint of "Quality management, environmental management maturity, green supply chain practices and green performance of Brazilian companies with ISO 14001 certification: Direct and indirect effects".' *Transportation Research: Part E*, 74 pp. 139–151.	x	x
(71)	Jakhar, S. K. (2015) 'Performance evaluation and a flow allocation decision model for a sustainable supply chain of an apparel industry.' *Journal of Cleaner Production*, 87, Jan, pp. 391–413.		X
(72)	Ji, P., Ma, X. and Li, G. (2015) 'Developing green purchasing relationships for the manufacturing industry: An evolutionary game theory perspective.' *International Journal of Production Economics*, 166 pp. 155–162.		X
(73)	Jin, S. H., Jeong, S. J. and Kim, K. S. (2017) 'A Linkage Model of Supply Chain Operation and Financial Performance for Economic Sustainability of Firm.' *Sustainability*, 9(1), Jan, pp. 1–23.		X
(74)	Kadzinski, M., Tervonen, T., Tomczyk, M. K. and Dekker, R. (2017) 'Evaluation of multi-objective optimisation approaches for solving green supply chain design problems.' *Omega-International Journal of Management Science*, 68, Apr, pp. 168–184.		x
(75)	Kannan, D., Khodaverdi, R., Olfat, L., Jafarian, A. and Diabat, A. (2013) 'Integrated fuzzy multi criteria decision making method and multi-objective programming approach for supplier selection and order allocation in a green supply chain.' *Journal of Cleaner Production*, 47, May, pp. 355–367.	x	X
(76)	Kim, J. and Rhee, J. (2012) 'An empirical study on the impact of critical success factors on the balanced scorecard performance in Korean green supply chain management enterprises.' *International Journal of Production Research*, 50(9), 2012, pp. 2465–2483.		X

(*continued*)

Appendix 2. Continued.

Reference no.	Reference	Search sting 1—features	Search sting 2—themes
(77)	Kretschmer, A., Spinler, S. and Van Wassenhove, L. N. (2014) 'A School Feeding Supply Chain Framework: Critical Factors for Sustainable Program Design.' *Production and Operations Management*, 23(6), Jun, pp. 990–1001.		X
(78)	Kuei, C. H., Madu, C. N., Chow, W. S. and Chen, Y. (2015) 'Determinants and associated performance improvement of green supply chain management in China.' *Journal of Cleaner Production*, 95, May, pp. 163–173.		X
(79)	Kusi-Sarpong, S., Bai, C. G., Sarkis, J. and Wang, X. P. (2015) 'Green supply chain practices evaluation in the mining industry using a joint rough sets and fuzzy TOPSIS methodology.' *Resources Policy*, 46, Dec, pp. 86–100.	x	
(80)	Kusi-Sarpong, S., Sarkis, J. and Wang, X. P. (2016) 'Assessing green supply chain practices in the Ghanaian mining industry: A framework and evaluation.' *International Journal of Production Economics*, 181, Nov, pp. 325–341.	x	X
(81)	Laari, S., Toyli, J. and Ojala, L. (2017) 'Supply chain perspective on competitive strategies and green supply chain management strategies.' *Journal of Cleaner Production*, 141, Jan, pp. 1303–1315.		X
(82)	Laari, S., Toyli, J., Solakivi, T. and Ojala, L. (2016) 'Firm performance and customer-driven green supply chain management.' *Journal of Cleaner Production*, 112, Jan, pp. 1960–1970.		X
(83)	Lam, J. S. L. (2015) 'Designing a sustainable maritime supply chain: A hybrid QFD-ANP approach.' *Transportation Research Part E-Logistics and Transportation Review*, 78, Jun, pp. 70–81.		x
(84)	Laosirihongthong, T., Adebanjo, D. and Tan, K. C. (2013) 'Green supply chain management practices and performance.' *Industrial Management & Data Systems*, 113(8) pp. 1088–1109.	x	X
(85)	Le, T. N. and Wang, C. N. (2017) 'The Integrated Approach for Sustainable Performance Evaluation in Value Chain of Vietnam Textile and Apparel Industry.' *Sustainability*, 9(3), Mar, pp. 1–21.		X
(86)	Lee, S. M., Kim, S. T. and Choi, D. (2012) 'Green supply chain management and organisational performance.' *Industrial Management & Data Systems*, 112(8–9) pp. 1148–1180.		X
(87)	Lee, S. Y. (2015) 'The effects of green supply chain management on the supplier's performance through social capital accumulation.' *Supply Chain Management-an International Journal*, 20(1) pp. 42–55.		X
(88)	Li, Q. Y. and Shen, B. (2016) 'Sustainable Design Operations in the Supply Chain: Non-Profit Manufacturer vs. For-Profit Manufacturer.' *Sustainability*, 8(7), Jul, pp. 1–19.		X
(89)	Lin, R. J. (2013) 'Using fuzzy DEMATEL to evaluate the green supply chain management practices.' *Journal of Cleaner Production*, 40, Feb, pp. 32–39.	x	X
(90)	Liu, C. C., Yu, Y. H., Wernick, I. K. and Chang, C. Y. (2015) 'Using the Electronic Industry Code of Conduct to Evaluate Green Supply Chain Management: An Empirical Study of Taiwan's Computer Industry.' *Sustainability*, 7(3), Mar, pp. 2787–2803.		X
(91)	Liu, P. and Yi, S. P. (2016) 'New Algorithm for Evaluating the Green Supply Chain Performance in an Uncertain Environment.' *Sustainability*, 8(10), Oct, pp. 1–21.		x
(92)	Liu, S. F., Kasturiratne, D. and Moizer, J. (2012) 'A hub-and-spoke model for multi-dimensional integration of green marketing and sustainable supply chain management.' *Industrial Marketing Management*, 41(4), May, pp. 581–588.	X	x
(93)	Liu, X., Yang, J., Qu, S., Wang, L., Shishime, T. and Bao, C. (2012) 'Sustainable Production: Practices and Determinant Factors of Green Supply Chain Management of Chinese Companies.' *Business Strategy and the Environment*, 21(1), Jan, pp. 1–16.	x	
(94)	Luo, J., Chong, A. Y.-L., Ngai, E. W. T. and Liu, M. J. (2015) 'Reprint of "Green Supply Chain Collaboration implementation in China: The mediating role of guanxi".' *Transportation Research: Part E*, 74 pp. 37–49.		X
(95)	Luthra, S., Mangla, S. K., Xu, L. and Diabat, A. (2016) 'Using AHP to evaluate barriers in adopting sustainable consumption and production initiatives in a supply chain.' *International Journal of Production Economics*, 181, Nov, pp. 342–349.		X
(96)	Luzzini, D., Brandon-Jones, E., Brandon-Jones, A. and Spina, G. (2015) 'From sustainability commitment to performance: The role of intra- and inter-firm collaborative capabilities in the upstream supply chain.' *International Journal of Production Economics*, 165, Jul, pp. 51–63.		X
(97)	Madani, S. R. and Rasti-Barzoki, M. (2017) 'Sustainable supply chain management with pricing, greening and governmental tariffs determining strategies: A game-theoretic approach.' *Computers & Industrial Engineering*, 105, Mar, pp. 287–298.		X
(98)	Mallidis, I., Dekker, R. and Vlachos, D. (2012) 'The impact of greening on supply chain design and cost: a case for a developing region.' *Journal of Transport Geography*, 22, May, pp. 118–128.		X
(99)	Mari, S. I., Lee, Y. H. and Memon, M. S. (2016) 'Sustainable and Resilient Garment Supply Chain Network Design with Fuzzy Multi-Objectives under Uncertainty.' *Sustainability*, 8(10), Oct, pp. 1–22.		X
(100)	Mari, S. I., Lee, Y. H. and Memon, M. S. (2014) 'Sustainable and Resilient Supply Chain Network Design under Disruption Risks.' *Sustainability*, 6(10), Oct, pp. 6666–6686.		X
(101)	Marshall, D., McCarthy, L., McGrath, P. and Claudy, M. (2015) 'Going above and beyond: how sustainability culture and entrepreneurial orientation drive social sustainability supply chain practice adoption.' *Supply Chain Management-an International Journal*, 20(4) pp. 434–454.	X	
(102)	Mathivathanan, D., Govindan, K. and Haq, A. N. (2017) 'Exploring the impact of dynamic capabilities on sustainable supply chain firm's performance using Grey-Analytical Hierarchy Process.' *Journal of Cleaner Production*, 147, Mar, pp. 637–653.	X	X
(103)	Mathiyazhagan, K., Diabat, A., Al-Refaie, A. and Xu, L. (2015) 'Application of analytical hierarchy process to evaluate pressures to implement green supply chain management.' *Journal of Cleaner Production*, 107, Nov, pp. 229–236.		X

(*continued*)

Appendix 2. Continued.

Reference no.	Reference	Search sting 1—features	Search sting 2—themes
(104)	Matos, S. and Hall, J. (2007) 'Integrating sustainable development in the supply chain: The case of life cycle assessment in oil and gas and agricultural biotechnology.' *Journal of Operations Management*, 25(6), 11//, pp. 1083–1102.	X	X
(105)	Meneghetti, A. and Monti, L. (2015) 'Greening the food supply chain: an optimisation model for sustainable design of refrigerated automated warehouses.' *International Journal of Production Research*, 53(21), Nov, pp. 6567–6587.		X
(106)	Metta, H. and Badurdeen, F. (2013) 'Integrating Sustainable Product and Supply Chain Design: Modelling Issues and Challenges.' *Ieee Transactions on Engineering Management*, 60(2), May, pp. 438–446.	X	X
(107)	Mirhedayatian, S. M., Azadi, M. and Saen, R. F. (2014) 'A novel network data envelopment analysis model for evaluating green supply chain management.' *International Journal of Production Economics*, 147, Jan, pp. 544–554.		X
(108)	Mitra, S. and Datta, P. P. (2014) 'Adoption of green supply chain management practices and their impact on performance: an exploratory study of Indian manufacturing firms.' *International Journal of Production Research*, 52(7), Apr, pp. 2085–2107.	X	X
(109)	Mohammed, A. and Wang, Q. (2017) 'The fuzzy multi-objective distribution planner for a green meat supply chain.' *International Journal of Production Economics*, 184, Feb, pp. 47–58.		X
(110)	Mohsen, A. and Sharmin, A. (2007) 'Collaborative supply chain management.' *Business Process Management Journal*, 13(3), 2007/06/12, pp. 390–404.		X
(111)	Mota, B., Gomes, M. I., Carvalho, A. and Barbosa-Povoa, A. P. (2015) 'Towards supply chain sustainability: economic, environmental and social design and planning.' *Journal of Cleaner Production*, 105, Oct, pp. 14–27.		X
(112)	Murata, K. (2016) 'Analysing Environmental Continuous Improvement for Sustainable Supply Chain Management: Focussing on Its Performance and Information Disclosure.' *Sustainability*, 8(12), Dec,		X
(113)	Nurjanni, K. P., Carvalho, M. S. and Costa, L. (2017) 'Green supply chain design: A mathematical modelling approach based on a multi-objective optimisation model.' *International Journal of Production Economics*, 183, Jan, pp. 421–432.		X
(114)	Osterle, I., Aditjandra, P. T., Vaghi, C., Grea, G. and Zunder, T. H. (2015) 'The role of a structured stakeholder consultation process within the establishment of a sustainable urban supply chain.' *Supply Chain Management-an International Journal*, 20(3) pp. 284–299.	X	
(115)	Olson, E. L. (2013) 'Perspective: The Green Innovation Value Chain: A Tool for Evaluating the Diffusion Prospects of Green Products.' *Journal of Product Innovation Management*, 30(4), Jul, pp. 782–793.		X
(116)	Ortas, E., Moneva, J. M. and Alvarez, I. (2014) 'Sustainable supply chain and company performance A global examination.' *Supply Chain Management-an International Journal*, 19(3) pp. 332–350.		X
(117)	Perotti, S., Zorzini, M., Cagno, E. and Micheli, G. J. L. (2012) 'Green supply chain practices and company performance: the case of 3PLs in Italy.' *International Journal of Physical Distribution & Logistics Management*, 42(7) pp. 640–672.	X	X
(118)	Piercy, N. and Rich, N. (2015) 'The relationship between lean operations and sustainable operations.' *International Journal of Operations & Production Management*, 35(2), 2015, pp. 282–315.	X	
(119)	Pishvaee, M. S., Razmi, J. and Torabi, S. A. (2014) 'An accelerated Benders decomposition algorithm for sustainable supply chain network design under uncertainty: A case study of medical needle and syringe supply chain.' *Transportation Research: Part E*, 67 pp. 14–38.		X
(120)	Reefke, H. and Sundaram, D. (2017) 'Key themes and research opportunities in sustainable supply chain management - identification and evaluation.' *Omega-International Journal of Management Science*, 66, Jan, pp. 195–211.		X
(121)	Rezaee, A., Dehghanian, F., Fahimnia, B. and Beamon, B. (2017) 'Green supply chain network design with stochastic demand and carbon price.' *Annals of Operations Research*, 250(2) pp. 463–485.		X
(122)	Ribeiro, I., Kaufmann, J., Schmidt, A., Pecas, P., Henriques, E. and Gotze, U. (2016) 'Fostering selection of sustainable manufacturing technologies - a case study involving product design, supply chain and life cycle performance.' *Journal of Cleaner Production*, 112, Jan, pp. 3306–3319.		X
(123)	Roehrich, J. K., Hoejmose, S. U. and Overland, V. (2017) 'Driving green supply chain management performance through supplier selection and value internalisation.' *International Journal of Operations & Production Management*, 37(4) pp. 489–509.		X
(124)	Sardar, S., Lee, Y. H. and Memon, M. S. (2016) 'A Sustainable Outsourcing Strategy Regarding Cost, Capacity Flexibility, and Risk in a Textile Supply Chain.' *Sustainability*, 8(3), Mar, pp. 1–19.		X
(125)	Sari, K. (2017) 'A novel multi-criteria decision framework for evaluating green supply chain management practices.' *Computers & Industrial Engineering*, 105 pp. 338–347.	X	X
(126)	Sarkis, J. (2003) 'A strategic decision framework for green supply chain management.' *Journal of Cleaner Production*, 11(4), 2003, pp. 397–409.		X
(127)	Schaltegger, S. and Burritt, R. (2014) 'Measuring and managing sustainability performance of supply chains Review and sustainability supply chain management framework.' *Supply Chain Management-an International Journal*, 19(3) pp. 232–241.		X
(128)	Schmidt, C. G., Foerstl, K. and Schaltenbrand, B. (2017) 'The Supply Chain Position Paradox: Green Practices and Firm Performance.' *Journal of Supply Chain Management*, 53(1), Jan, pp. 3–25.	X	X
(129)	Schoggl, J. P., Fritz, M. M. C. and Baumgartner, R. J. (2016) 'Towards supply chain-wide sustainability assessment: a conceptual framework and an aggregation method to assess supply chain performance.' *Journal of Cleaner Production*, 131, Sep, pp. 822–835.	X	X

(*continued*)

Appendix 2. Continued.

Reference no.	Reference	Search sting 1—features	Search sting 2—themes
(130)	Schouten, G. and Bitzer, V. (2015) 'The emergence of Southern standards in agricultural value chains: A new trend in sustainability governance?' *Ecological Economics*, 120, Dec, pp. 175–184.		X
(131)	Scur, G. and Barbosa, M. E. (2017) 'Green supply chain management practices: Multiple case studies in the Brazilian home appliance industry.' *Journal of Cleaner Production*, 141, Jan, pp. 1293–1302.	X	
(132)	Seles, B. M. R. P., de Sousa Jabbour, A. B. L., Jabbour, C. J. C. and Dangelico, R. M. (2016) 'The green bullwhip effect, the diffusion of green supply chain practices, and institutional pressures: Evidence from the automotive sector.' *International Journal of Production Economics*, 182 pp. 342–355.	X	
(133)	Seuring, S. and Müller, M. (2008) 'From a literature review to a conceptual framework for sustainable supply chain management.' *Journal of Cleaner Production*, 16(15), 10//, pp. 1699–1710.	X	
(134)	Sharma, V. K., Chandna, P. and Bhardwaj, A. (2017) 'Green supply chain management related performance indicators in agro industry: A review.' *Journal of Cleaner Production*, 141, Jan, pp. 1194–1208.		X
(135)	Sheu, J. B. (2014) 'Green Supply Chain Collaboration for Fashionable Consumer Electronics Products under Third-Party Power Intervention-A Resource Dependence Perspective.' *Sustainability*, 6(5), May, pp. 2832–2875.		X
(136)	Sheu, J. B., Chou, Y. H. and Hu, C. C. (2005) 'An integrated logistics operational model for green-supply chain management.' *Transportation Research Part E-Logistics and Transportation Review*, 41(4), Jul, pp. 287–313.		X
(137)	Soleimani, H., Govindan, K., Saghafi, H. and Jafari, H. (2017) 'Fuzzy multi-objective sustainable and green closed-loop supply chain network design.' *Computers & Industrial Engineering*, 109 pp. 191–203.		X
(138)	Stefanelli, N. O., Jabbour, C. J. C. and Jabbour, A. (2014) 'Green supply chain management and environmental performance of firms in the bioenergy sector in Brazil: An exploratory survey.' *Energy Policy*, 75, Dec, pp. 312–315.		X
(139)	Stindt, D. (2017) 'A generic planning approach for sustainable supply chain management - How to integrate concepts and methods to address the issues of sustainability?' *Journal of Cleaner Production*, 153(1), Jun, pp. 146–163.	X	X
(140)	Svensson, G. (2007) 'Aspects of sustainable supply chain management (SSCM): conceptual framework and empirical example.' *Supply Chain Management-an International Journal*, 12(4) pp. 262–266.	X	
(141)	Svensson, G. and Baath, H. (2008) 'Supply chain management ethics: conceptual framework and illustration.' *Supply Chain Management-an International Journal*, 13(6) pp. 398–405.	X	
(142)	Tachizawa, E. M. and Wong, C. Y. (2015) 'The Performance of Green Supply Chain Management Governance Mechanisms: A Supply Network and Complexity Perspective.' *Journal of Supply Chain Management*, 51(3), Jul, pp. 18–32.	X	X
(143)	Tachizawa, E. M., Gimenez, C. and Sierra, V. (2015) 'Green supply chain management approaches: drivers and performance implications.' *International Journal of Operations & Production Management*, 35(11) pp. 1546–1566.		X
(144)	Taghaboni-Dutta, F., Trappey, A. J. C. and Trappey, C. V. (2010) 'An XML based supply chain integration hub for green product lifecycle management.' *Expert Systems with Applications*, 37(11), Nov, pp. 7319–7328.	X	X
(145)	Tajbakhsh, A. and Hassini, E. (2015) 'A data envelopment analysis approach to evaluate sustainability in supply chain networks.' *Journal of Cleaner Production*, 105, Oct, pp. 74–85.		X
(146)	Taticchi, P., Garengo, P., Nudurupati, S. S., Tonelli, F. and Pasqualino, R. (2014) 'A review of decision-support tools and performance measurement and sustainable supply chain management.' *International Journal of Production Research,* 53(21) pp. 6473–6494.		X
(147)	Testa, F. and Iraldo, F. (2010) 'Shadows and lights of GSCM (Green Supply Chain Management): determinants and effects of these practices based on a multi-national study.' *Journal of Cleaner Production*, 18(10–11), Jul, pp. 953–962.	X	
(148)	Tippayawong, K. Y., Niyomyat, N., Sopadang, A. and Ramingwong, S. (2016) 'Factors Affecting Green Supply Chain Operational Performance of the Thai Auto Parts Industry.' *Sustainability*, 8(11), Nov, pp. 1–9.		X
(149)	Tiwari, A., Chang, P. C., Tiwari, M. K. and Kandhway, R. (2016) 'A Hybrid Territory Defined evolutionary algorithm approach for closed loop green supply chain network design.' *Computers & Industrial Engineering*, 99, Sep, pp. 432–447.		X
(150)	Tsai, W. H. and Hung, S. J. (2009) 'A fuzzy goal programming approach for green supply chain optimisation under activity-based costing and performance evaluation with a value-chain structure.' *International Journal of Production Research*, 47(18) pp. 4991–5017.		X
(151)	Tseng, M. L. and Chiu, A. S. F. (2013) 'Evaluating firm's green supply chain management in linguistic preferences.' *Journal of Cleaner Production*, 40, Feb, pp. 22–31.		X
(152)	Tseng, S. C. and Hung, S. W. (2014) 'A strategic decision-making model considering the social costs of carbon dioxide emissions for sustainable supply chain management.' *Journal of Environmental Management*, 133, Jan, pp. 315–322.		X
(153)	Uygun, O. and Dede, A. (2016) 'Performance evaluation of green supply chain management using integrated fuzzy multi-criteria decision making techniques.' *Computers & Industrial Engineering*, 102, Dec, pp. 502–511.	X	X
(154)	Vachon, S. (2007) 'Green supply chain practices and the selection of environmental technologies.' *International Journal of Production Research*, 45(18–19) pp. 4357–4379.	X	X

(*continued*)

Appendix 2. Continued.

Reference no.	Reference	Search sting 1—features	Search sting 2—themes
(155)	Vachon, S. and Klassen, R. D. (2006) 'Extending green practices across the supply chain - The impact of upstream and downstream integration.' *International Journal of Operations & Production Management*, 26(7) pp. 795–821.	X	
(156)	van der Vorst, J. G. A. J., Tromp, S.-O. and Zee, D.-J. v. d. (2009) 'Simulation modelling for food supply chain redesign; integrated decision making on product quality, sustainability and logistics.' *International Journal of Production Research*, 47(23) pp. 6611–6631.	X	X
(157)	van Hoof, B. and Thiell, M. (2014) 'Collaboration capacity for sustainable supply chain management: small and medium-sized enterprises in Mexico.' *Journal of Cleaner Production*, 67, Mar, pp. 239–248.		X
(158)	Vanalle, R. M., Ganga, G. M. D., Godinho, M. and Lucato, W. C. (2017) 'Green supply chain management: An investigation of pressures, practices, and performance within the Brazilian automotive supply chain.' *Journal of Cleaner Production*, 151, May, pp. 250–259.	X	X
(159)	Vanpoucke, E., Quintens, L. and Van Engelshoven, M. (2016) 'The role of motivation in relating green supply chain management to performance.' *Supply Chain Management-an International Journal*, 21(6) pp. 732–742.		X
(160)	Varsei, M. and Polyakovskiy, S. (2017) 'Sustainable supply chain network design: A case of the wine industry in Australia.' *Omega-International Journal of Management Science*, 66, Jan, pp. 236–247.		X
(161)	Vermeulen, W. J. V. and Kok, M. T. J. (2012) 'Government interventions in sustainable supply chain governance: Experience in Dutch front-running cases.' *Ecological Economics*, 83, Nov, pp. 183–196.		X
(162)	von Geibler, J. (2013) 'Market-based governance for sustainability in value chains: conditions for successful standard setting in the palm oil sector.' *Journal of Cleaner Production*, 56, Oct, pp. 39–53.		X
(163)	Vurro, C., Russo, A. and Perrini, F. (2009) 'Shaping Sustainable Value Chains: Network Determinants of Supply Chain Governance Models.' *Journal of Business Ethics*, 90 pp. 607–621.		X
(164)	Waller, M. A., Fawcett, S. E. and Johnson, J. L. (2015) 'The Luxury Paradox: How Systems Thinking and Supply Chain Collaboration Can Bring Sustainability Into Mainstream Practice.' *Journal of Business Logistics*, 36(4) pp. 303–305.	X	
(165)	Wang, F., Lai, X. F. and Shi, N. (2011) 'A multi-objective optimisation for green supply chain network design.' *Decision Support Systems*, 51(2), May, pp. 262–269.		X
(166)	Wang, Z. G., Mathiyazhagan, K., Xu, L. and Diabat, A. (2016) 'A decision making trial and evaluation laboratory approach to analyse the barriers to Green Supply Chain Management adoption in a food packaging company.' *Journal of Cleaner Production*, 117, Mar, pp. 19–28.		X
(167)	White, G. R. T., Wang, X. J. and Li, D. (2015) 'Inter-organisational green packaging design: a case study of influencing factors and constraints in the automotive supply chain.' *International Journal of Production Research*, 53(21), Nov, pp. 6551–6566.		X
(168)	Wiengarten, F. and Longoni, A. (2015) 'A nuanced view on supply chain integration: a coordinative and collaborative approach to operational and sustainability performance improvement.' *Supply Chain Management-an International Journal*, 20(2) pp. 139–150.	X	X
(169)	Winter, M. and Knemeyer, A. M. (2013) 'Exploring the integration of sustainability and supply chain management Current state and opportunities for future inquiry.' *International Journal of Physical Distribution & Logistics Management*, 43(1) pp. 18–38.	X	X
(170)	Wolf, J. (2011) 'Sustainable Supply Chain Management Integration: A Qualitative Analysis of the German Manufacturing Industry.' *Journal of Business Ethics*, 102(2), Aug, pp. 221–235.	X	X
(171)	Wolf, J. (2014) 'The Relationship Between Sustainable Supply Chain Management, Stakeholder Pressure and Corporate Sustainability Performance.' *Journal of Business Ethics*, 119(3), Feb, pp. 317–328.		X
(172)	Wu, C. and Barnes, D. (2016) 'An integrated model for green partner selection and supply chain construction.' *Journal of Cleaner Production*, 112, Jan, pp. 2114–2132.	X	X
(173)	Wu, G. C. (2013) 'The influence of green supply chain integration and environmental uncertainty on green innovation in Taiwan's IT industry.' *Supply Chain Management-an International Journal*, 18(5) pp. 539–552.	X	X
(174)	Wu, K.-J., Liao, C.-J., Tseng, M.-L. and Chiu, A. S. F. (2015) 'Exploring decisive factors in green supply chain practices under uncertainty.' *International Journal of Production Economics*, 159, Jan, pp. 147–157.	X	
(175)	Xia, D., Yu, Q., Gao, Q. L. and Cheng, G. P. (2017) 'Sustainable technology selection decision-making model for enterprise in supply chain: Based on a modified strategic balanced scorecard.' *Journal of Cleaner Production*, 141, Jan, pp. 1337–1348.		X
(176)	Xie, G. (2016) 'Cooperative strategies for sustainability in a decentralised supply chain with competing suppliers.' *Journal of Cleaner Production*, 113, Feb, pp. 807–821.		X
(177)	Xie, G. (2015) 'Modelling decision processes of a green supply chain with regulation on energy saving level.' *Computers & Operations Research*, 54, Feb, pp. 266–273.	X	
(178)	Xu, J. P., Jiang, X. L. and Wu, Z. B. (2016) 'A Sustainable Performance Assessment Framework for Plastic Film Supply Chain Management from a Chinese Perspective.' *Sustainability*, 8(10), Oct, pp. 1–23.		X
(179)	Yan, M. R., Chien, K. M. and Yang, T. N. (2016) 'Green Component Procurement Collaboration for Improving Supply Chain Management in the High Technology Industries: A Case Study from the Systems Perspective.' *Sustainability*, 8(2), Feb, pp. 1–16.		X
(180)	Yang, C. S., Lu, C. S., Haider, J. J. and Marlow, P. B. (2013) 'The effect of green supply chain management on green performance and firm competitiveness in the context of container shipping in Taiwan.' *Transportation Research Part E-Logistics and Transportation Review*, 55, Aug, pp. 55–73.		X

(*continued*)

Appendix 2. Continued.

Reference no.	Reference	Search sting 1—features	Search sting 2—themes
(181)	Yu, W. T., Chavez, R., Feng, M. Y. and Wiengarten, F. (2014) 'Integrated green supply chain management and operational performance.' *Supply Chain Management-an International Journal*, 19(5–6) pp. 683–696.	X	X
(182)	Zahiri, B., Zhuang, J. and Mohammadi, M. (2017) 'Towards an integrated sustainable-resilient supply chain: A pharmaceutical case study.' *Transportation Research: Part E*, 103 pp. 109–142.		X
(183)	Zhalechian, M., Tavakkoli-Moghaddam, R., Zahiri, B. and Mohammadi, M. (2016) 'Sustainable design of a closed-loop location-routing-inventory supply chain network under mixed uncertainty.' *Transportation Research Part E-Logistics and Transportation Review*, 89, May, pp. 182–214.		X
(184)	Zhang, C.-T., Wang, H.-X. and Ren, M.-L. (2014) 'Research on pricing and coordination strategy of green supply chain under hybrid production mode.' *Computers & Industrial Engineering*, 72, 6//, pp. 24–31.		X
(185)	Zhang, Q., Tang, W. S. and Zhang, J. X. (2016) 'Green supply chain performance with cost learning and operational inefficiency effects.' *Journal of Cleaner Production*, 112, Jan, pp. 3267–3284.		X
(186)	Zhang, S. Z., Lee, C. K. M., Wu, K. and Choy, K. L. (2016) 'Multi-objective optimisation for sustainable supply chain network design considering multiple distribution channels.' *Expert Systems with Applications*, 65, Dec, pp. 87–99.		X
(187)	Zhang, X. L., Xu, Z. S. and Liu, M. F. (2016) 'Hesitant Trapezoidal Fuzzy QUALIFLEX Method and Its Application in the Evaluation of Green Supply Chain Initiatives.' *Sustainability*, 8(9), Sep, pp. 1–17.		X
(188)	Zhang, Z. H. and Awasthi, A. (2014) 'Modelling customer and technical requirements for sustainable supply chain planning.' *International Journal of Production Research*, 52(17) pp. 5131–5154.		X
(189)	Zhu, Q. and Cote, R. P. (2004) 'Integrating green supply chain management into an embryonic eco-industrial development: a case study of the Guitang Group.' *Journal of Cleaner Production*, 12(8–10) pp. 1025–1035.	X	X
(190)	Zhu, Q. H., Feng, Y. T. and Choi, S. B. (2017) 'The role of customer relational governance in environmental and economic performance improvement through green supply chain management.' *Journal of Cleaner Production*, 155, Jul, pp. 46–53.		X
(191)	Zhu, Q. H., Sarkis, J., Cordeiro, J. J. and Lai, K. H. (2008) 'Firm-level correlates of emergent green supply chain management practices in the Chinese context.' *Omega-International Journal of Management Science*, 36(4), Aug, pp. 577–591.	X	
(192)	Zhu, Q., Sarkis, J. and Lai, K.-h. (2012) 'Examining the effects of green supply chain management practices and their mediations on performance improvements.' *International Journal of Production Research*, 50(5), 2012, pp. 1377–1394.	X	X
(193)	Zhu, Q., Sarkis, J. and Lai, K.-H. (2008) 'Confirmation of a measurement model for green supply chain management practices implementation.' *International Journal of Production Economics*, 111(2), Feb, pp. 261–273.	X	
(194)	Zhu, Q., Sarkis, J. and Lai, K.-h. (2007) 'Green supply chain management: pressures, practices and performance within the Chinese automobile industry.' *Journal of Cleaner Production*, 15(11–12), 2007, pp. 1041–1052.	X	X
(195)	Zhu, Q. H., Sarkis, J. and Geng, Y. (2005) 'Green supply chain management in China: Pressures, practices and performance.' *International Journal of Operations & Production Management*, 25(5–6), 2005, pp. 449–468.	X	X
(196)	Zhu, Q., Sarkis, J. and Lai, K.-h. (2013) 'Institutional-based antecedents and performance outcomes of internal and external green supply chain management practices.' *Journal of Purchasing & Supply Management*, 19(2) pp. 106–117.	X	X
(197)	Zhu, Q. H. and Sarkis, J. (2004) 'Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises.' *Journal of Operations Management*, 22(3), Jun, pp. 265–289.	X	X
(198)	Zhu, Q. and Sarkis, J. (2007) 'The moderating effects of institutional pressures on emergent green supply chain practices and performance.' *International Journal of Production Research*, 45(18–19) pp. 4333–4355.	X	X
(199)	Zhu, Q. H. and Sarkis, J. (2006) 'An inter-sectoral comparison of green supply chain management in China: Drivers and practices.' *Journal of Cleaner Production*, 14(5), 2006, pp. 472–486.	X	
(200)	Zhu, Q., Geng, Y., Sarkis, J. and Lai, K.-h. (2011) 'Evaluating green supply chain management among Chinese manufacturers from the ecological modernisation perspective.' *Transportation Research Part E-Logistics and Transportation Review*, 47(6), Nov, pp. 808–821.		X
(201)	Zohal, M. and Soleimani, H. (2016) 'Developing an ant colony approach for green closed-loop supply chain network design: a case study in gold industry.' *Journal of Cleaner Production*, 133, Oct, pp. 314–337.		X

Appendix 3. Tables of search strings filters

Table 3.1. Key word search strings.

TOPIC	SEARCH STRING 1—FEATURES	SEARCH STRING 2—THEMES	CONJOINED LISTS
	sustainab* or "triple bottom line" or green or ethic*	sustainab* or "triple bottom line" or green or ethic*	
AND	"Supply chain" OR "Value Chain"	"Supply chain" OR "Value Chain"	
AND	process* or mechanism* or concept* or practice* or integrat*	governance or strategy* or plan* or design* or performance or evaluat* or monitor* or collaborat* or integrat*	
Results			
(filter process 2)			
BSP	64	135	158
WoS	69	157	180
Aggregate	78	174	201
Papers in common	55	118	158
Between databases:			51
Between search strings:			

CODE: BSP: BUSINESS SOURCE PREMIER DATABASES; WOS: WEB OF SCIENCE DATABASE.

Table 3.2. SLR filter process of articles referencing key process features.

Search string 1—features			
Search process using truncated search terms, English and academic journals since 1987			
BSP: 2,155		WoS: 2,692	
Filter process 1: Check overall relevance using title—papers			
BSP: 138		WoS: 132	
Filter process 2: Quality (ABIS or not), relevance (check abstracts), duplicates, or not available online- papers			
BSP: 64		WoS: 69	
Filter process 3: Contains definitions &/or measures—papers			
BSP: 56		WoS: 59	
Filter process 4a: Definitions—papers		*Filter process 4b: Measures—papers*	
BSP: 22	WoS: 24	BSP: 42	WoS: 46

CODE: BSP: BUSINESS SOURCE PREMIER DATABASES; WOS: WEB OF SCIENCE DATABASE.

Table 3.3. SLR filter process of articles referencing key process themes.

Search String 2—Themes											
Search process using truncated search terms, English and academic journals since 1987											
BSP: 2,364						WoS: 4,512					
Filter process 1: Check overall relevance using title—papers											
BSP: 210						WoS: 241					
Filter process 2: Quality (ABIS or not), relevance (check abstracts), duplicates, or not available online- papers											
BSP: 135						WoS: 160					
Filter process 3: Contains process theme in title											
BSP: 112						WoS: 133					
Filter process 4: Frequency of process themes in title											
BSP:						WoS:					
G	S	D	I	C	P	G	S	D	I	C	P
12	18	25	19	14	75	17	23	33	21	14	94

Codes: BSP: BUSINESS SOURCE PREMIER DATABASES; WOS: WEB OF SCIENCE DATABASE; G: Governance; S: Strategic planning; D: Design; I: Integration; C: Collaboration; P: Performance monitoring & evaluation.

Appendix 4. Categories and list of organisations in network case study

Primary category	Subcategory	Quantity of nodes	Ref No. List of organisations
Commercial	Farming Association	1	Colcocoa*
	Processor/Traders	5	Barry Callebaut
			Blommer
			Cargill
			Olam
			ECOM Agrindustrial
	Brand Manufacturers	7	Danone*
			Ferrero
			Hersheys
			Mars*
			Mondeléz*
			Nestlé
			Unilever*
	Retailers	7	Aldi
			Asda
			Co-op*
			M&S*
			Morrison
			Sainsbury
			Tesco*
	Packaging Company	1	Amcor*
Non-commercial	Trade Associations	10	Business Social Compliance Initiative (BSCI)*
			Cabisco
			Ceflex
			Consumer Goods Forum (CGF)*
			International Cocoa Initiative (ICI)
			Institute of Grocery Distribution (IGD)*
			Sustainable Agriculture Initiative (SAI) Platform*
			World Business Council for Sustainable Development (WBCSD)
			World Cocoa Foundation (WCF)*
	NGO	15	Carbon Trust*
			Care International*
			Cocoa Barometer*
			IDH Sustainable Trade Initiative
			Oxfam*
			Proudly Made in Africa*
			Save the Children
			Solidaridad*
			Sustainable Food Lab
			Traidcraft*
			The Forest Trust
			Voluntary Services International
			World Vision
			Waste and Resources Action Programme (WRAP)*
			World Wildlife Fund (WWF)
	Certifiers	6	Bonsucro
			Fairtrade International*
			International Sustainability & Carbon Certi41fication (ISCC)
			Rainforest Alliance*
			Roundtable on Sustainable Palm Oil (RSPO)*
			Round Table on Responsible Soy (RTRS)*
			UTZ*

*Denotes 36 organisations that participated as interviewees in this study.

Appendix 5. Tables of SLR data on business process themes and features

Table 5.1. Identification of key governance process and associated themes in the SLR.

Search string	Process & sub-processes		Total number of articles	Reference articles*
1—Features *(78 articles analysed)*	GOVERNANCE		77 *(99%)*	All articles *excluding* 57
	Sub-processes	Standards, policy & reporting	71	All articles *excluding* 11, 45, 57, 108, 125, 140, 144, 153,155, 170, 173
		Legislation & regulation	67	All articles *excluding* 11, 45, 57, 108, 125, 140, 144, 153, 155, 170, 173
		Executive function	30	*Including* articles no. 1, 7, 11, 23, 25, 26, 27, 43, 44, 51, 56, 58, 61, 79, 101, 102, 108, 118, 128, 129, 139, 14, 147, 164, 168, 189, 192, 194, 197, 199
2—Themes *(174 articles reviewed)*	GOVERNANCE		97 *(56%)*	*Including* articles no. 1–6, 10, 12, 14, 16, 17, 22, 25-28, 31, 32, 35-38, 42, 44, 46–50, 52, 54, 58, 61, 63, 70, 71, 73, 74, 76, 78, 80, 82, 84–91, 95, 96, 102, 103, 107-109, 112, 113, 115–117, 122, 123, 125, 127-129, 134, 138, 142–146, 148–151, 153, 158, 159, 166, 168, 171, 178-181, 1785, 187, 190, 192, 194–198, 200

*See Appendix 2.

Table 5.2. Identification of Key Strategic Planning Process and Associated Themes in the SLR.

Search string	Process & associated themes		Total number of articles	Reference articles*
Features *(78 articles analysed)*	STRATEGIC PLANNING		78 *(100%)*	All articles
	Associated themes	Aims & objectives	71	All articles *excluding* 54, 63, 104, 128, 169, 196, 199
		Planning	57	All articles *excluding* 11, 24, 26, 45, 51, 54, 57, 58, 70, 117, 118, 128, 131, 140, 156, 170, 192-196
		Orientation	34	*Including* articles no. 1, 2, 7, 11, 23, 24, 43, 51, 56, 57, 61, 64, 79, 89, 92, 102, 106, 118, 128, 129, 131, 133, 140, 141, 147, 153, 156, 164, 169, 170, 173, 192, 194, 197
Themes *(174 articles reviewed)*	STRATEGIC PLANNING		23 *(13%)*	*Including* articles 5, 9, 21, 29, 30, 35, 40, 51, 66, 67, 81, 97, 111, 124, 126, 139, 150, 152, 165, 175, 177, 186, 188

*See Appendix 2.

Table 5.3. Identification of Key Design Process and Associated Themes in the SLR.

Search string	Process & associated themes		Total number of articles	Reference articles*
1—Features *(78 articles analysed)*	DESIGN		52 *(67%)*	All articles *excluding* 11, 23, 25, 43, 44, 45, 63, 70, 75, 79, 89, 102, 104, 118, 129, 139, 140, 142, 147, 153, 158, 176, 181, 191, 192, 196
	Associated themes	Re-conceptualising the supply chain	16	*Including* articles 1, 11, 12, 25, 27, 58, 64, 84, 101, 108, 139, 154, 155, 168, 195, 198
		Re-designing supply chain, system, network	30	*Including* articles 1, 11, 12, 15, 21, 25, 27, 41, 56, 58, 64, 65, 93, 106, 108, 125, 128, 131, 144, 147, 153, 155, 156, 170, 172, 173, 193, 195, 197, 198
		Re-engineering processes	45	All articles *excluding* 23, 27, 41, 43-45, 54, 56, 63, 64, 70, 75, 84, 89, 93, 102, 104, 118, 129, 139, 140, 142, 144, 174, 156, 158, 170, 172, 181, 192, 193, 196
2—Themes *(174 articles reviewed)*	DESIGN		35 *(20%)*	*Including* articles 7, 8, 13, 18, 25, 34, 39, 46, 55, 57, 74, 77, 83, 88, 92, 98, 99, 100, 105, 106, 111, 113, 119, 121, 122, 137, 149, 156, 160, 165, 167, 172, 183, 186, 201

*See Appendix 2.

Table 5.4. Identification of Key Integration Process and Associated Themes in the SLR.

Search string	Process & associated themes		Total number of articles	Reference articles*
1—Features *(78 articles analysed)*	INTEGRATION		76 *(97%)*	All articles *excluding* 54, 104
	Associated themes	Sustainability	55	All articles *excluding* 2, 11, 12, 25, 44, 51, 54, 57, 80, 104, 108, 117, 125, 128, 131, 139, 144, 155, 170, 191, 193, 196, 197
		Internal	24	*Including* articles 2, 11, 12, 21, 24, 43, 57, 61, 70, 80, 89, 118, 125, 129, 132, 133, 139, 141, 164, 176, 189, 191, 198, 199
		External	35	*Including* articles 1, 2, 11, 21, 24-26, 43, 45, 57, 58, 61, 65, 70, 80, 89, 93, 118, 125, 129, 132, 133, 142, 147, 153, 164, 168, 176, 181, 189, 191, 195, 198
		Multiple perspectives	18	*Including* articles 1, 7, 24, 25, 26, 57, 65, 70, 75, 93, 129, 131, 133, 139, 153, 176, 198
		Process	59	All articles *excluding* 25, 27, 41, 44, 45, 53, 54, 64, 89, 92, 104, 117, 128, 139, 141, 158, 168, 172, 192
		Standards	10	*Including* articles 15, 23, 24, 43, 45, 63, 70, 102, 131, 164
2—themes *(174 articles reviewed)*	INTEGRATION		24 *(14%)*	*Including* articles 1, 7, 21, 25, 56, 57, 63, 75, 85, 92, 104, 106, 135, 139,

*See Appendix 2.

Table 5.5. Identification of Key Collaboration Process and Associated Themes in the SLR.

Search string	Process & associated themes		Total number of articles	Reference articles*
1—Features *(78 articles analysed)*	COLLABORATION		74 *(95%)*	All articles *excluding* 84, 108, 144, 164
	Associated themes	Coordination	46	All articles *excluding* 15, 21, 24, 26, 43, 45, 53, 54, 56, 58, 63, 64, 65, 84, 102, 104, 108, 114, 118, 132, 133, 141, 144, 158, 164, 169, 173, 191, 192, 194, 196, 199
		Cooperation	56	All articles *excluding* 15, 21, 24, 43, 53, 64, 65, 84, 108, 114, 125, 131, 132, 139, 142, 158, 164, 172, 191, 192, 197
		Partnership	61	All articles *excluding* 12, 27, 45, 84, 108, 131, 140, 141, 147, 156, 158, 164, 192, 196, 198
2—themes *(174 articles reviewed)*	COLLABORATION		17 *(10%)*	*Including* articles 17, 19, 41, 43, 51, 62, 67, 69, 94, 96, 110, 136, 157, 168, 177, 179, 184

*See Appendix 2.

Table 5.6. Identification of Key Performance Monitoring & Evaluation Process and Associated Themes in the SLR.

Search string	Process & associated themes		Total number of articles	Reference articles*
1—Features *(78 articles analysed)*	PERFORMANCE MONITORING & EVALUATION		77 *(99%)*	All articles *excluding* 84
	Associated themes	Monitoring	44	All articles *excluding* 1, 12, 23, 26, 41, 43, 45, 54, 56, 58, 63–65, 80, 84, 92, 93, 101, 104, 108, 118, 125, 128, 131, 132, 139-141, 158, 170, 173, 192, 195, 198
		Evaluation	64	All articles *excluding* 12, 41, 43, 45, 63, 84, 117, 125, 141, 168, 170, 173, 193
		Audit	47	All articles *excluding* 2, 12, 23, 24, 41, 45, 53, 54, 58, 64, 84, 89, 92, 93, 108, 114, 125, 128, 131, 132, 139, 141, 142, 144, 155, 156, 158, 172, 195, 197, 198
		Assess	63	All articles *excluding* 1, 41, 43, 44, 58, 70, 84, 101, 104, 128, 147, 158, 169, 173, 191
		Certify	59	All articles *excluding* 1, 41, 43, 44, 58, 70, 84, 101, 104, 128, 147, 158, 169, 173, 191
		Control	48	All articles *excluding* 12, 21, 24, 26, 43–45, 53, 54, 58, 64, 80, 84, 89, 92, 101, 118, 125, 140, 144, 153, 158, 169, 170, 173, 176, 191, 192, 197, 199
2—Themes *(174 articles reviewed)*	PERFORMANCE MONITORING & EVALUATION		97 *(56%)*	*Including* articles 1, 3-6, 10, 12, 14, 16, 17, 22, 25-28, 31, 32, 35-38, 42, 44, 46-48, 50, 52, 54, 58, 61, 63, 70, 71, 73, 74, 76, 78, 80, 82, 84-87, 90, 91, 95, 96, 102, 102, 107–109, 112, 113, 115–117, 122, 123, 125, 127–129, 134, 138, 142–146, 148–151, 153, 158, 159, 166, 168, 171, 178–181, 185, 187, 190, 192, 194–198, 200

*See Appendix 2.