

Sustainable Supply Chains

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Key Sustainable Supply Chain Management Processes

A Conceptual Framework Grounded in Network Theory

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Abstract

The purpose of this paper is to outline a conceptual framework of the key processes that integrate sustainability across the supply chain strategically. This has not been done to date due to several factors including the nascent nature of sustainable supply chain management (SCM) research; increased complexities in SCM such as a proliferation of perspectives given various foci of disciplines, theoretical lenses and stakeholder perspectives; and ever more complex strategies given the added sustainable components. With the maturation of this field, the business case as to why sustainability criteria should be integrated in to core business operations has been well established. Piloted sustainable supply chains are coming of age and are exemplified as flagship business practices in company sustainability reports. Practitioners and academics are now turning to the problem of scaling up processes, not only across the whole supply chain, but across the network too. There is no research that systematically maps processes that integrate sustainability dimensions across the supply chain. This presented an opportunity to develop a conceptual framework, outlining the content from themes and issues in SCM and sustainability processes. Through the literature reviewed, key issues in sustainable SCM and its key processes were identified. Furthermore, key findings indicate that there are divergent interests in sustainability agendas across all disciplines and stakeholders that affect how these processes are integrated. This suggests how sustainability is perceived and integrated, requires further attention. To help frame the understanding of how these processes are managed, given the factors at play, the framework is built upon the theoretical proposition of Network Theory (NT), and the influence of power and decision-making. The aim is to develop a theoretical understanding of sustainable SCM with the intention of making an original contribution to the supply chain discipline.

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List of abbreviations

CA	Competitive Advantage
CSR	Corporate Social Responsibility
NT	Network Theory
RBV	Resource-Based View
SCM	Supply Chain Management
ST	Stakeholder Theory
TCE	Transaction Cost Economics
TBL	Triple Bottom Line

1. Introduction

Sustainable supply chain management (SCM) is the integration of economic, environmental and social dimensions, sustainably and ethically, across the supply chain. This is carried out through the integration of key features, i.e. concepts, process and practices, extended across industries and business activities while collaborating with partners. As the concept of sustainable SCM has been gaining attention across academia and industry, the focus of understanding 'why' it is necessary is now shifting towards 'how' the two fields of 'sustainability' and SCM merge (Gunasekaran *et al.*, 2015; Luzzini *et al.*, 2015; Winter & Knemeyer, 2013).

It is incumbent on companies to take greater account for their impacts not only on its stakeholders but society as a whole. This has led to complexities in managing diverse perceptions and preferences in the business case for sustainability. Business as usual, in terms of the old model of economic growth and consumption, is not sustainable as the global risks landscape is changing core business operations (WEF, 2016; Dhanarajan and Fowler, 2008). As companies increasingly understand the issues of integrating sustainability dimensions, they are reconsidering processes and practices that account for and reconcile these (Kleindorfer *et al.*, 2005; Seuring & Müller, 2008; Teuteberg & Wittstruck, 2010; Morali & Searcy, 2013).

Through this developmental stage, a range of SCM issues have been explored. Focus has been on various combinations of sustainability dimensions (economic, environmental and social) and features (concepts, processes and practices). However, due to the nascent nature of the sustainable SCM field, no work systematically reviews key sustainability processes as has been done in terms of concepts (Sarkis, 2003; Burgess *et al.*, 2006; Carter and Rogers, 2008; Shook *et al.*, 2009; Sarkis *et al.*, 2011; Boons *et al.*, 2012) and practices (Morali & Searcy, 2013) in order to manage these strategically.

A point of congruence is being reached where a fully integrated strategic understanding of sustainable SCM is necessary (Seuring & Müller, 2008; Hassini *et al.*, 2012). Companies, such as Mondeléz Int. and Unilever, are looking to understand how to manage partners' sustainability agendas to align with their own, and convert

these concepts into practice through key processes (Mondeléz, 2014; Unilever, 2014). However, while the field of sustainable SCM gains breadth and depth, to the best of the authors' knowledge there is no research that systematically maps sustainability processes across the supply chain and how these are managed given divergent conceptualisation of sustainability among partners.

2. Literature review

2.1. Managing sustainability processes across the supply chain strategically

In order to understand how sustainable supply chains are managed, it is important to establish what is meant by supply chains processes and the strategic management of them within in the context of power and decision-making in a network structure. Within this context, understanding how to different conceptualisations of sustainability can affect how these processes are managed is then explored.

2.1.1. Defining supply chain processes

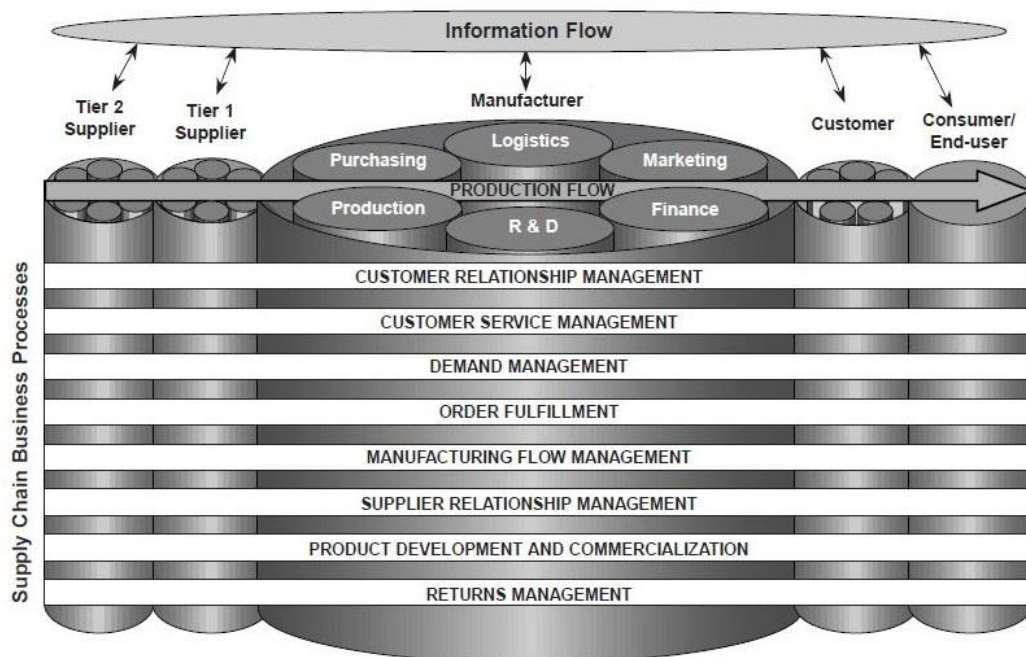
Supply chains consist of a broad range of macro and micro elements (Figure 1). At a macro level these include distinct, external industries, including sourcing/extracting raw materials, production, assembly, packaging, distribution, retail and reverse logistics/waste. Industries that share risks and profits, and participate in the supply chain together, are referred to as partners. These include tier 1 & 2 suppliers, customers and consumers. At a micro level, organisations consider internal business functions such as research and development, finance, purchasing, production, logistics and marketing. The management of the relationships between partners, and the processes and practices through which value, efficiency and effectiveness are delivered, is referred to as supply chain management (Lambert & Cooper, 2000).

Business processes are “a set of logical tasks performed to achieve a definite business outcome” (Winter & Knemeyer, 2013:21). We take seminal work by Croxton, Garcia-Dastugue and Lambert (2001) who provided comprehensive definitions of key business processes and a framework describing how these interact with each other

both at macro and micro levels (Figure 1). Sustainability processes are the business processes by which social, environmental and economic dimensions are integrated sustainably and ethically.

Figure 1

Integrating and managing business processes across the supply chain



Source: Croxton, García-Dastugue and Lambert, 2001:14

Adapted from Douglas M. Lambert, Martha C. Cooper, and Janus D. Pagh, "Supply Chain Management: Implementation Issues and Research Opportunities," *The International Journal of Logistics Management*, Vol. 9, No. 2 (1998), p. 2.

2.1.2. Supply chain strategy

Hines (2013) explains that there is no universal supply chain strategy but rather a range of strategies, structures and relationships coordinated through the integration and synchronisation processes. In concurrence with this multiple strategies perspective, Frohlich and Westbrook (2001) believe it is important to consider the whole supply chain and the range of strategies when characterising the direction and degree of integration. Strategically, companies need to consider the management of relationships between industry partners and the workforce operating in distinct business activities, all with divergent interests and agendas. This creates complex

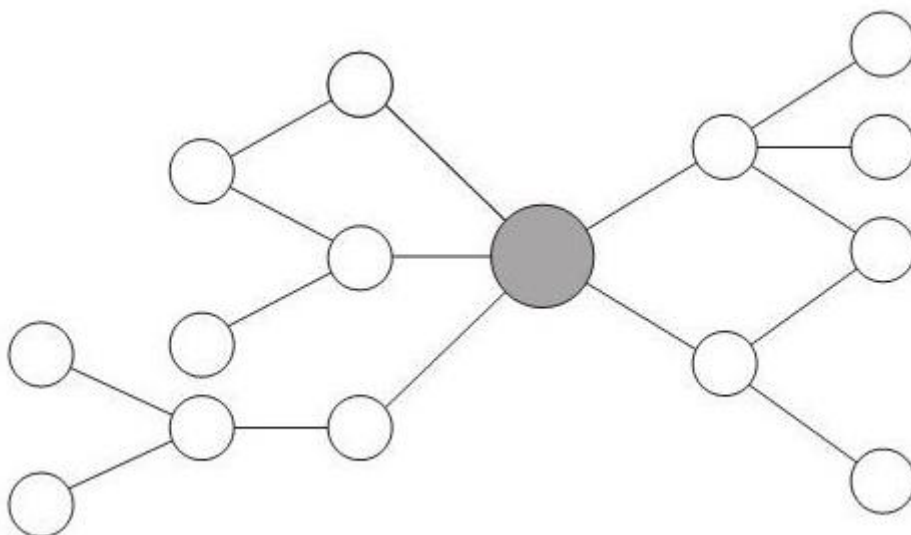
dynamics in power and decision-making in determining the focus of sustainability dimensions, and the level of integration of the processes to do so.

2.1.3. Network determinants in managing sustainability processes

According to network theory (NT), the strategic management of sustainable supply chains are increasingly based on the network view of complex, yet coordinated, integrated processes and collaborative relationships (Lambert & Cooper, 2000; Chen & Paulraj, 2004; Peck, 2005; Vachon & Klassen, 2006; Christopher, 2011) (Figure 2). The use of NT highlights the opportunity to explore the complexity of integrating sustainability processes from a decision-making perspective (Manuj & Mentzer, 2008; Vurro *et al.*, 2009; Miemczyk *et al.*, 2012). If, as Cox argues, everyone is self-seeking in value creation then this creates another dynamic in an already complex sustainable SCM strategy. The question manifests as to how a company takes leadership in managing concepts and processes, and who gets the most benefit, i.e. value and power, from sustainable activities.

Figure 2

A Supply Chain Network model



Source: Christopher, 2011

There is a necessity to manage relationships through a “systemic, holistic understanding of the network of nodes” through *centrality* and *density*, which is paramount to power and decision-making (Vurro *et al.*, 2009). The density of the nodes refers to the interconnectedness of actors along the supply chain and the centrality refers to reflect an organisations relative power or status given its position relative to others. As the degree of centrality determines ability to exert influence, so too does it lead to greater degrees of collaboration and interconnectedness among partners. For example, multinational companies are increasingly held accountable for the sustainable issues across the supply chain (Vachon & Klassen, 2006; Seuring & Müller, 2008; Walker & Jones, 2012). They are centrally located within the supply network as they have the power through resources and legitimacy to exert their influence over partners (Alvarez *et al.*, 2010), broker the design and governance of the supply chain, and coordinate integrated processes and practices (Vurro *et al.*, 2009).

These are important considerations when prioritising sustainability criteria and then managing the processes to achieve these. As Steyn states, “full commitment to process orientation and management is required... [However] it is critically important for organisations substantially to improve leadership acumen if they wish to achieve sustainable strategic supply chain success” (2012:1). As surmised in the Mondeléz Int. 2014 Wellbeing report (2015), the challenge now is for them to put their plans into practice while aligning partners’ sustainability goals with their own.

2.2. Understanding sustainability

At its simplest level, ‘sustainability’ is the ability to sustain an activity, rate or level. ‘Sustainable development’ is the integration of economic, environmental and social dimensions for the well-being of people and planet, and a sustainable future. In unpacking sustainable dimensions, we explore respective criteria including principles, definitions and concepts. Each dimension has a range of principles from which various approaches have been taken depending on the actor’s priorities and area of activity. The most prevalent interpretation is the Brundtland Commission’s (which coined the phrase ‘sustainable development’), “development that meets the needs of the present without compromising the ability of future generations to meet their needs” (WCED,

1987:8). This broadly embraces principles of anti-corruption, environmental impact on economic activity across developing and industrialised economies, environment, ecology, conservation of non-renewable resources, human rights, labour and food scarcity (Carter & Rogers, 2008; UNGC, 2015). Since then, the wide and inconsistent dissemination of the idea of 'sustainable development' has meant the term has proliferated across private, public and social sectors, organisational and management studies, and SCM (Johnston *et al.*, 2007; Glavic & Lukman, 2007; Ahi & Searcy, 2013). Of the three hundred plus terms that subsequently manifested by the turn of the century, it was reported that most were either economically focused or vague and unmeasurable (Johnston *et al.*, 2007).

From a business perspective, one of the most popular definitions is Elkington's (1997) triple bottom line (TBL) model that weighs the cost/benefits to integrating sustainability dimensions into core business operations in the broader context. However, it can be argued that this definition, though prevalent across academia and practice, is too simplistic as it fails to consider the issue of proliferation. For instance, the lack of shared ethos has led to a need for increasing ethical standards which means both *doing the right thing* and *doing things right* (Johnston *et al.*, 2007). From a supply chain perspective, research is limited concerning the management of sustainable principles in terms of the divergent agendas across the network, and how to ethically govern them.

When considering the features of sustainable SCM there is also a proliferation of interpretations. This is due to diverse research communities and disciplines through which multiple theoretical lenses are applied. For example, Ahi and Searcy (2013) offer twenty-two unique definitions of green SCM as opposed to twelve they surmised from sustainable SCM literature. It is important to consider that each industry and business activity has its own priorities and focus in terms of its key practices (Burgess *et al.*, 2006; Vachon & Klassen, 2006; Vurro *et al.*, 2009). These practices include reporting, governance, strategy/policy, performance indicators, standards, monitoring and collaboration (Morali & Searcy, 2013). We can assume that managing sustainability processes upstream, where activities such as extraction and manufacturing that commonly take place in developing economies, will vary compared

to downstream activities such as distribution, retail and consumer demands. Therefore, when merging sustainability dimensions, a company will need to consider the range of concepts, processes and practices at macro and micro levels, as well as their strategic objectives.

2.3. Outline of study

The study seeks to understand the how sustainability dimensions are integrated in SCM by examining the key processes to do so. This is done through a systematic literature review of key concepts in sustainable supply chains; sustainability processes; and theoretical concepts. This paper develops a conceptual framework of sustainability processes in SCM, and a systematic analysis of how they are integrated strategically. The following sections describe the methodological approach followed by key concepts in the extant literature. The final sections discusses the research implications, and offers conclusions and directions for future research.

3. Methodology

This section describes the systematic literature review approach and conceptual framework methodology. The purpose of the literature review was to summarise existing research by identifying patterns, themes and issues. This helped identify the conceptual content that provided a framework for empirical research and contributed to theory development. Yu, Chavez, Feng and Wiengarten explain that, by mapping key processes and their constituent parts, it is possible to “identify the complexity of relationships between processes through their mechanisms” (2014:684). In order to understand the key process key theoretical concepts and issues were considered (Yin, 2014).

3.1. Systematic Literature Review

The systematic literature review design was based on the *3-stage approach* described by Tranfield, Denyer and Smart (2003). They listed these steps as: *planning a review*; *conducting a review*; and *reporting and dissemination* – each with its own set of

corresponding phases. Furthermore, Miemczyk et al.'s (2012) method, which synthesises Tranfield et al.'s approach for the SCM discipline, was adopted for the purposes of this research.

The first stage identifies trends, themes, thought-leaders and keywords based on the signposting of seminal papers that have informed this research. This helped scope the literature and position the study (Tranfield *et al.*, 2003; Bititci *et al.*, 2012; Taticchi *et al.*, 2014). To identify key processes, search strings were trialled in the 'Web of Science' and 'EBSCO: Business Source Premier' datasets (Taticchi *et al.*, 2014). While this approach set out to limit bias and errors, the literature reviewed, while extensive, was not exhaustive due to the limitations of the databases and the researcher. To comprehensively capture literature, two test strings were compared to allow the interrogation of the construction of database by searching themes and features (Table 1). Based on the limit of papers found in Search String 2, Search String 1 was analysed using the key themes and process features to map the field.

Table 1

Key word search strings

<i>Topic</i>	Search String 1 - Features	Search String 2 - Themes
	sustainab* OR "Triple Bottom Line" OR Green OR Ethic*	sustainab* OR "Triple Bottom Line" OR Green OR Ethic*
AND	"Supply chain"	"Supply chain"
AND	Process* OR Mechanism* OR Concept* OR Practice* OR Integrat*	report* OR governance OR strategy OR policy OR "performance indicator*" OR standard* OR monitoring OR collaboration OR integration
Results		
Web of Science	83	31
Business Source Premier	87	30
Total	109	36

Data was synthesised, and connections and patterns in what constitutes key processes in sustainable SCM were identified. The systematic review was complimented by lines of enquiry followed up from authors' citation tracking and the researcher's knowledge of the field. This approach provided the data necessary for the descriptive analysis necessary to build the framework.

3.2. Building the conceptual framework

As Brandenburg, Govindan, Sarkis and Seuring explain, conceptual frameworks are “defined as a set of concepts suitable to represent but not explain real-life objects or processes” (2014:299). To build one, Wacker’s four basic properties was applied as it allowed for an inductive approach to theory building from a top-down perspective (2008:7). This included, *definition; domain; relationships; and predictions*. The conceptual theory distinguished the substance of sustainable SCM (e.g. how to make supply chains more sustainable) from the process of sustainable SCM (e.g. how to integrate sustainability process into SCM) (Yin, 2014).

4. Results

This content synthesis reviewed the literature in terms of key concepts in sustainable supply chains and sustainability processes resulting in a detailed conceptual framework.

4.1. Key concepts in sustainable supply chain management

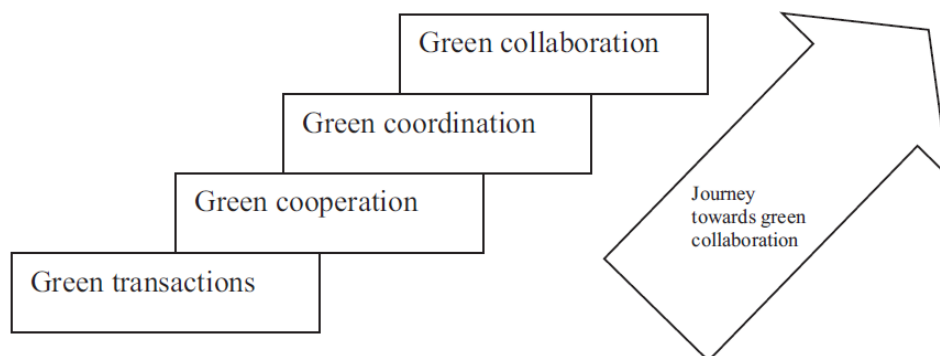
Early sustainable SCM focused on operations and manufacturing processes as seen by the dominance in the literature of environmental criteria over an integrated TBL (Morali & Searcy, 2013; Hassini *et al.*, 2012; Ahi & Searcy, 2013). Supply chains are transforming into complex networks as markets become increasingly globalised (Metta & Badurdeen, 2013). As the challenges of integrating sustainability dimensions and features reveal themselves, attention now shifts towards strategies with a new set of criteria and dynamics: aligning partners’ goals with core business strategy; and putting plans into practice. As such, there are a range of dynamic variable to consider when integrating processes: network determinants; sustainability perceptions and preferences; levels of integration; and phases of collaboration. While the first two have been discussed extensively in the literature review, the latter two have emerged as a result of conceptual analysis of collaboration and integration.

Strategy brings in a temporal dynamic as it looks to the long-term management of business relationships and sustained collaborative advantage. An aspect that

emerged is whether organisations foster coordination or competition (Garcia-Dastugue & Lambert, 2003). It has become critical for companies to strengthen their competitive advantage (Zhu *et al.*, 2012) and collaborative advantage (Alvarez *et al.*, 2010). While competition has been known to create and strengthen competitive markets, this has led to once-off transactional relationships. Whereas, coordination is considered a key success factor in sustainable SCM (Walker & Jones, 2012; Blome *et al.*, 2014). This introduces other elements, i.e. once-off/ongoing and early stage/mature, signifying the strategic nature of relationship. Wiengarten and Longoni argue companies should consider a phased approach to strategic collaboration (Figure 3). They recommend adopting a “coordinative outward-strategy and then build on it to adopt collaborative strategies” (2015:148). This assumes a more nuanced view of collaboration is required considering the temporal dimension of phases of collaboration. The requirements for each relationship will determine whether it is competitive or coordinated and, in turn, will have its own set of processes, practices and mechanisms.

Figure 3

Green collaboration research framework



Source: Gunasekaran, et al., 2015:5
Adapted from Spekman et al., 1988

However, this also leads to increased complexities such as the ethical governance and management of power dynamics in negotiating sustainability. For example, Matos and Hall argue, “A better understanding of complexity and ambiguity may allow practitioners to determine the appropriateness of life-cycle assessment in the

extended supply chain” (2007:1084). There is a variety of sustainable supply chain strategies, which suggest a more nuanced approach is necessary. For instance, Touboullic et al. (2014) consider the importance of power differentials in relationship management strategies. While Vurro et al. (2009) develop governance strategies depending on the structural centrality and density of the supply chain.

There is a dynamic quality to the level of integration that influences sustainable SCM processes. For example, Frohlich and Westbrook (2001) proposed that the *arc of integration*, defined by the *degree* and *depth*, can increase organisational performance and sustainable competitive advantage. Yet, problematically, there is a limited understanding of the holistic integration of sustainability across the supply chain, especially given the complexities and limitations of the term. Kim (2006) explains that the selection of partners and systems based on an organisation’s needs/goals this determines this. Vurro et al. (2009) extends our understanding to the *centrality* relative to the network reflecting power and the *density* of interconnectedness. This places greater onus on those of power and influence, while facilitating sustainability collaborative processes and practices. Therefore, key processes are influenced by the level of integration including the arc and network.

In summation, four dimensions - network determinants, sustainability perceptions and preferences, levels of integration and phases of collaboration, influences the nature of the processes and how they are implemented.

4.2. Detailed conceptual model of key sustainability processes

From the literature reviewed, the following key processes emerged - goal setting, design/re-engineering, governance, collaboration, integration and performance monitoring and evaluation.

4.2.1. Goal setting

A goal is the object or aim of an activity, and on which its effects can be examined on task performance (Locke & Latham, 2002). Therefore, a goal is performed by a process and, as such, affects performance through four mechanisms: (1) as a directive

function, directing efforts towards focused activities, increasing efficiency and effectiveness; (2) different goals have different levels of effort and difficulty (high & low) referred to as the energising function; (3) strategic goals (those that have increased complexity, difficulty and need time to execute) take greater levels of commitment, i.e. persistence and effort; and (4) utilise task-related knowledge and strategies to affect action (2002:707).

Goal setting is a key process as it addresses several requirements for integrating sustainability. It identifies sustainable and ethical aims and criteria. Strategic goal setting establishes the aims, objectives, tasks and performance indicators by defining sustainable dimensions. Therefore, it is critical to integrate the TBL into corporate strategy (Pagell & Wu, 2009), create a common understanding of sustainability (Boons *et al.*, 2012), strategy alignment (van der Vorst *et al.*, 2009), joint goal setting, planning and activity (Yu *et al.*, 2014). This could be done by increasing collaboration by extending the boundary of responsibility (Gimenez *et al.*, 2012) and serves as the dimensions for the performance indicators. Thus, as a key strategic process, goal setting also affects operations and performance aspects of sustainable SCM.

Touboulic *et al.* (2014) explain how power can be effective in achieving sustainability goals as dependence on another's resources for example will see organisations seeking out relationships with one another. In order to manage the imbalance this creates, common goal setting can act as an important phase in the process towards greater integration and collaboration by establishing a more *participative* rather than *dictatorial* mode of relations as described by Vurro *et al.* (2010). This can be done by taking into consideration the sustainability criteria at a macro and micro level. However, the standard TBL definition is too vague to be of practical value as it offers little guidance on the explicit tasks, technologies and resources necessary to meet sustainability goals (Gimenez Sierra & Rodon, 2012).

4.2.2. Design/Re-engineering

Designing a sustainable supply chain considers the 'total life-cycle' (including reverse logistics) through product coordination, process and supply chain design. Designing

processes are a core component of supply chain strategy as they act as a blueprint across the following levels:

Level 1- work and information flows through the value chain, product, services and processes;

Level 2 - managing fixed and mobile assets and contractual through asset and infrastructure dependencies;

Level 3 - trading relationships through organisations and inter-organisational networks; and

Level 4 - the environment which takes into consideration the contextual external conditions which impact upon all systems and which must be considered in strategy (Peck, 2005).

Sustainable SCM and performance are being improved by designing or re-engineering the supply chain to incorporate enhanced collaborative processes (Hernández *et al.*, 2014). It is important for companies to have an in-depth understanding of process and system capabilities when designing or planning otherwise there are efficiency and performance impacts (Metta & Badurdeen, 2013). The design of which offers another critical juncture for the company to clearly and holistically integrate sustainability and ethical goals across the network (Yu *et al.*, 2014).

In terms of structural processes at a strategic level, design focuses on mapping the supply chain network. Research by Frohlich and Westbrook (2001) explain key dimensions of strategic decision-making are the degree and direction of integration. This model allows a company to consider factors that manage risk and lead to sustainable competitive advantage, such as types of partners, technology and information systems, or capabilities and processes (Sarkis, 2003). It also helps identify the areas where strategic decision-making is required, the control hierarchy of decision makers, patterns among relationships, and where heterogeneity exists in sustainability processes and integration mechanisms. Vurro *et al.* (2009) extended this concept from a linear supply chain to a network perspective of sustainability embeddedness - the depth of implementation and scope of integration in sustainable supply chain governance models. For example, in the *Dictatorial Position* "the focal organisation can either resist pressures from others to conform to sustainability expectations or impose self-centred practices, norms, or behaviours that reflect its own interpretation of what sustainability should mean in a centrally controlled value chain" (2009:614).

4.2.3. Governance

Increasingly corporate responsibility has extended the governance of an organisation beyond its direct realm of influence and control, across boundaries into the supply chain network. Lambert, Cooper and Pagh (1998) argue that SCM requires the cross-functional integration at both micro and macro levels across the supply network. This has led to research into design, strategic decision-making and governance network interactions, especially in terms of power and influence, to build collaborative advantage (Chen & Paulraj, 2004; Tachizawa & Wong, 2015).

This creates questions as to the depth and breadth of integration of processes in terms of design and strategy, and where the locus of decision making, power and governance lies. For instance, Vurro et al.'s (2009) network determinants of sustainable supply chain governance models compares the centrality of the focal company (low to high) against the supply chain density (low to high) from which four models of governance emerge: *Transactional* (low/low), *Dictatorial* (high/low), *Acquiescent* (low/high) and *Participate* (high/high). Gunasekaran, Subramanian and Rahman (2015) Green Collaboration Research Framework maps the phases towards greater collaboration (Figure 3). They describe the collaboration process model starting from transactions including benefits, through cooperation including relationship, towards greater coordination including structural integration and into embedded relational collaboration processes and practices. If we merge the two models it is possible to explore the interface between governance and collaborative processes. For example, the transactional governance model would be indicative of transactional-type processes, whereas participative style governance would mean more developed collaborative processes.

4.2.4. Collaboration

This relational process focuses on the tasks to manage relationships between partners for benefits such as efficiency, effectiveness, performance and strategic advantage. "An examination of the integration of sustainability concepts into SCM concerns not only across diverse business processes and activities across functional silos within a

single company, but also cooperation between parties across the network of relationships” (Winter & Knemeyer, 2013:20). From a strategic view, expanding the collaborative process focuses on developing capacity and capabilities through training, information sharing and engagement (operational, management and governance) mechanisms for enhanced decision-making, innovation and performance. This leads to more committed relationship utilising sub-processes such as cross-functional teams and supplier development. The teams share ideas, learning, knowledge, expertise and innovation. Therefore, it becomes necessary to understand the mechanisms, such as capacity development, information sharing, learning and knowledge exchange, at the process interface between design and collaboration for example.

While the strategic process of collaboration infers a broad sense relational management, a detailed understanding of the facets of partnership is also necessary as collaboration with suppliers differs from that with customers. This is because strategic collaborative practices are resource intensive demanding closer relationships and investment (Wiengarten & Longoni, 2015). The added sustainability dimension means designing or re-engineering processes to facilitate additional goals and measures (Vachon & Klassen, 2006; Winter & Knemeyer, 2013; Luo *et al.*, 2015). These include internal sub-processes, such as cross-functional collaboration using mechanisms such as training, incentives and rewards, and external relationship management that behave differently up and down the supply chain (Wu & Pagell, 2011). External collaboration with customers considers cooperating on eco-design, packaging, cleaner production, least energy consumption for logistics/transportation and reducing environmental impact (Vachon & Klassen, 2008; Bhattacharya *et al.*, 2014). The activities upstream with suppliers includes strategic sourcing, supply market analysis, contracting and evaluation (Kannan *et al.*, 2013; Luzzini *et al.*, 2015) indicative of ‘transaction’ in the earlier phases of the collaborative process model. Also, cooperation in redesign, providing design specification and technology innovations and performance (van der Vorst *et al.*, 2009; Yu *et al.*, 2014). Supplier development focuses on methods for collecting supplier information, externally communicating minimum standards to all suppliers, information sharing, strengthening solutions, common goal orientation, motivation and multi-stakeholder initiatives (van Hoof &

Thiell, 2014; Luzzini, *et al.*, 2015). This leads to an interface with goal setting and performance evaluation indicators as inter-organisational collaboration downstream with customers and upstream with suppliers requires monitoring for effective management (Vachon & Klassen, 2008; Flynn *et al.*, 2010).

4.2.5. *Integration*

Leuschner, Rogers and Charvez define supply chain integration as “the scope and strength of linkages in supply chain processes across firms” which by extension includes the relationship management, i.e. collaboration and coordination, necessary to integrate processes (2013:34). As these terms are used interchangeable across the literature, for the purpose of this study collaboration refers to relational processes and integration to structural systemic processes. Therefore, integration is defined as the structural coordination of intra- and inter-organisational processes. Its sub-processes include technological, logistical, channel coordination and standards (Vachon & Klassen, 2006; van der Vorst *et al.*, 2009; Yu *et al.*, 2014).

Vachon and Klassen (2006) explained that effective integration requires the knowledge and skills exchange, and an alignment of capabilities and goals. Another sub-process is managing information, resource and cash flows through systems and mechanisms that are aligned with performance monitoring and evaluation processes (Garcia-Dastugue & Lambert, 2003). Other elements considered are the direct versus indirect role integration in terms of performance and competitive advantage as SCM requires alignment between strategy, operations and performance through systems and practices (Kim, 2009). Vachon and Klassen (2006) put two types of direct integration forward: logistical and technological. Kim (2009) argued for an indirect approach using arms-length integration or market exchange integration. The extent to which either of these types are integrated can be determined by the company’s capacity, competency and capability to collaborate with and monitor its partners. The indirect approach may be more effective as it has allowed for greater flexibility. Whereas, as direct SCM integration increases, in effect, monitoring decreases and collaboration increases. This leads away from conflict to cooperative, strategic networks (Kim & Narasimhan, 2002).

4.2.6. Performance monitoring and evaluation

The final component of this framework is performance. When organisations are considering sustainability impacts, some measures are profitable while others not but the full integration of the TBL improves competitive advantage. A more holistic view of sustainable SCM surmises that organisations that fully integrate the TBL will outperform organisations and strengthen the company's long-term viability (Carter & Rogers, 2008; Seuring & Müller, 2008b; Hassini *et al.*, 2012). Thus collaboration and long-term partnerships, indicative of high levels of power and influence such as the dictatorial and participative governance models, are associated with higher performance.

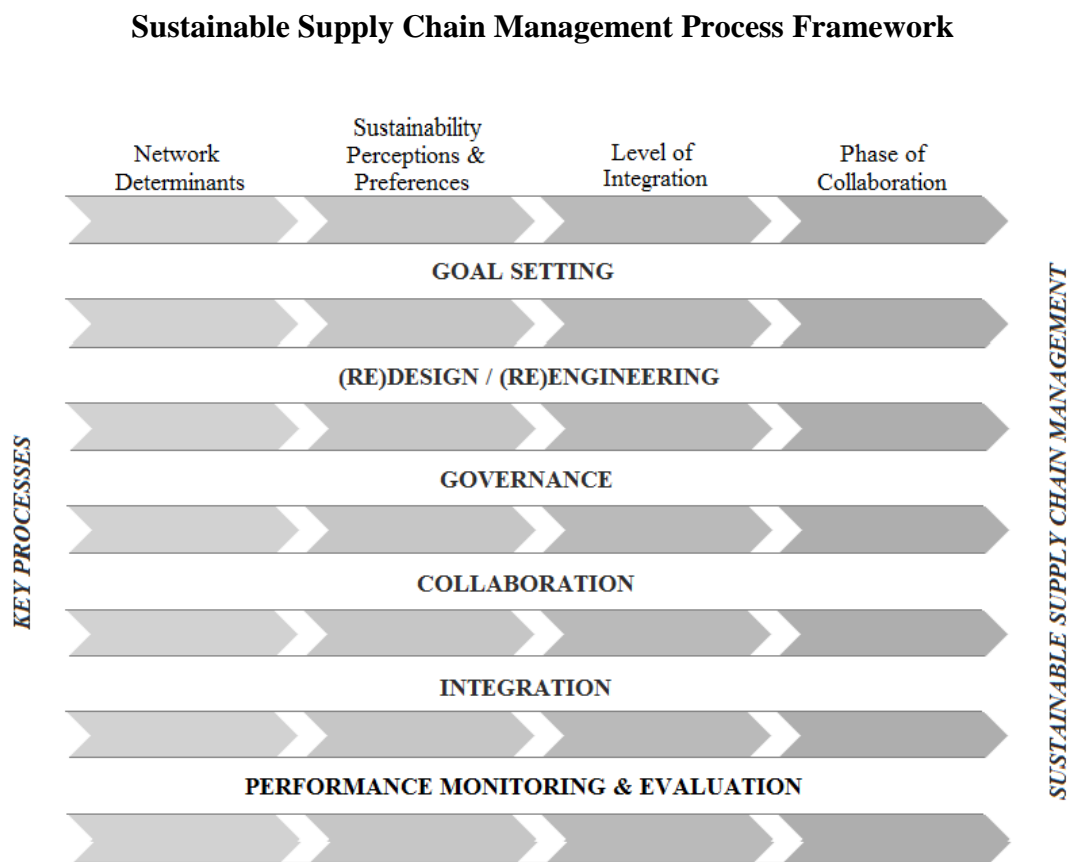
Vachon and Klassen (2006) explained that performance requires the effective integration of knowledge and skills exchange and an alignment (reduction in goal discrepancy) of capabilities and priorities through both the product and process. Furthermore, the direct versus indirect role of SCM integration, in terms of performance and competitive advantage, requires alignment between strategy, operations and performance through systems and practices (Kim, 2006; Kim, 2009). Thus, managing information flows through systems and mechanisms improves performance (Garcia-Dastugue & Lambert, 2003). As does the interchange between collaboration and monitoring processes downstream with customers and upstream with suppliers (Flynn *et al.*, 2010, Vachon & Klassen, 2008).

The process of monitoring and evaluating performance improves efficiency, effectiveness and innovation while meeting strategic goals. The main sub-processes include standards/codes of conduct, certification and the monitoring systems for compliance (Banterle & Stranieri, 2008; Zhu *et al.*, 2008; Pagell & Wu, 2009; Wolf, 2014). For example, inter-organisational total quality environmental management systems, ISO 14000 environmental management and ISO 9000 quality management standards and certifications, and working with NGOs and ethical intermediaries/external advisors such as Oxfam, United Nations Global Compact and academic institutions (Sarkis 2003; Carter & Rogers, 2008; Vachon & Klassen, 2008). Other sub-processes developing performance indicators are operations criteria –

quality, delivery, flexibility and cost to meet sustainability goals (Yang *et al.*, 2010; Govindan *et al.*, 2013; Zhu *et al.*, 2012; Yu *et al.*, 2014). Structurally, environmental management systems that implement environmental management programmes, practices and monitoring systems have proved a popular mechanism (Sroufe, 2003).

4.3. The Framework Model

Figure 4



In considering the key processes for integrating sustainable dimensions into SCM, it is possible to consider the level of embeddedness of each key process (Figure 4), i.e. the sustainability of the supply chain, in terms of the following dimensions:

- (1) Network Determinants - *centrality* of the focal company relative to the network reflecting its power and the *density* of interconnectedness of partners determines the level of embeddedness of key processes in sustainable SCM;

- (2) 'Sustainability' Perceptions and Preferences – this dimension considers the power and influence of the company in considering strategic organisational goals while taking into consideration divergent heterogeneous interpretations and priorities of industries and partners at a *macro level*, and the different internal business functions at a *micro level*. This dimension will affect the level of embeddedness of key processes;
- (3) Level of Integration - the *depth of implementation* and *scope of integration* of key processes used to embed sustainability dimensions across macro and micro elements is an important element to consider when developing a sustainable supply chain; and
- (4) Phase of Collaboration – from early-stage *transaction*, *cooperation*, *coordination*, and through to strategic *collaborative* processes, is another important dimension in considering how the key processes are selected, designed, implemented and evaluated.

The four dimensions allow us to consider the level of power and influence in decision-making in terms of how to select sustainability criteria and the nature of the key processes in sustainable SCM (Figure 5). For instance, from the outset of sustainable SCM goal setting and design, a company's strategy for governance, integration and collaboration, and its measures for success, will be determined by the company's style of relationship management and the way it decides to exert its power and influence for the degree of sustainability in the supply chain.

5. IMPLICATIONS

5.1. Research implications

While acknowledging the calls for extending the theoretical framework of sustainable SCM, this paper set out to develop an understanding of how to manage sustainable supply chains. There has been little research into key processes in sustainable SCM and the interfaces between these at a strategic level. The NT perspective was applied to understand the importance of power and influence in determining how sustainability dimensions are selected and integrated. This allowed for the exploration into the roles

of a complex array of actors at a network level. A more nuanced understanding of levels of integration of processes and phases of collaboration of relationships through this theoretical lens emerged.

The contribution to knowledge is in developing our understanding of sustainable SCM by gaining insights into organisations and managers work in practice (at a strategic, macro and micro level) to achieve competitive and collaborative advantage. The main contribution of future research includes modelling the relationship management problem within the context of a sustainable supply chain by developing and testing a conceptual framework at an empirical level.

5.2. Limitations of existing research

The use of theoretical perspectives may help in explaining which key processes are relevant in pursuing sustainable supply chain goals and the competitive and/or collaborative advantages these present. However, it must be remembered that no theoretical framework is without criticism and limitations and this too must be explored to enhance the rigour of future research and implications for managers and organisations. Therefore, as recommended by Wacker (2008) and Yin (2014), it is essential that conceptualised theory can be logically, empirically or statistically evaluated and tested.

6. CONCLUSIONS

This study set out to examine sustainability concepts, processes and practices to understand how to manage sustainable supply chains strategically. Literature indicates that there is a limited capacity to integrate sustainability dimensions in terms of the level of understanding of the actors (Seuring & Müller, 2008; Wolf, 2011; Taticchi *et al.*, 2014) and contextual setting (Vurro *et al.*, 2009; Miemczyk *et al.*, 2012). Companies need to take into consideration diverse agendas and how these effect the processes and practices of diverse industries and business functions. This study has contributed to literature by mapping sustainability processes- goal setting, design/re-engineering, governance, collaboration, integration and performance monitoring and

evaluation. Furthermore, a conceptual model of how to manage these processes by considering four dimensions- network determinants, sustainability perceptions and preferences, level of integration and phase of collaboration has been discussed. In conclusion, while the conceptualisation of sustainability is heterogeneous across the supply chain, the key processes are not. They remain consistent in throughout, but their level of embeddedness across the supply chain depends on the dynamics of the four dimensions. These dimensions determine the nature of the processes and character of sustainability in the supply chain.

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