Integration in loosely coupled garment supply chains: the case of a Mexican trader as switchboard operator

Introduction

Supply chain integration (SCI) is considered a key element of supply chain management (SCM) (Stevens and Johnson, 2016). Early on, SCM was defined by Lambert and Cooper (2000, p. 66) as the *integration* of key business processes from end user through original suppliers that provide products, services and information that add value for customers and other stakeholders. Since then, others have tried to define SCI more precisely. For example, Zhao *et al.* (2008, p. 374) define it as the degree to which an organisation strategically collaborates with its SC partners and manages intra- and inter-firm processes to achieve effective and efficient flow of products, services, information, money and decisions, with the objective of providing maximum value to its customers. Stevens and Johnson (2016, p. 22) conceptualise SCI as 'the alignment, linkage and coordination of people, processes, information, knowledge and strategies across the supply chain between all points of contact and influence to facilitate the efficient and effective flows of material, money, information and knowledge in response to customer needs'. Thus, SCI has a broader and more long-term perspective that implies more than the coordination of processes to ensure that the chain performs efficiently as a system (Leuschner *et al.*, 2013; Richey *et al.*, 2010; Steven and Johnson, 2016). The ultimate purpose of SCI is to achieve sustainable competitive advantage through the seamless coordination of business processes (connectivity) and the elimination of these processes' redundancies (simplification) (Chen *et al.*, 2009; Jin and Edmunds, 2015).

However, empirical evidence suggests that integration is difficult to attain, even at the level of the dyad (Fawcett & Magnan, 2002; Naslund & Williamson, 2010). Furthermore, a leading proponent of supply chain integration, Christopher (2016) warns that overly lean and tightly linked supply chains will make the chain vulnerable in the face of unforeseen disturbances. He advocates the use of strategic buffers at specific locations in the supply chain and other measures that should make supply chains resilient. This raises an important question about whether it is useful, realistic or even wise to unequivocally suggest seamless integration as an ideal practice in supply chains.

In this paper, based on conceptual and empirical research, we argue that effective supply chain design should not necessarily be approached from the point of view of maximising seamless integration and tight couplings throughout the chain, as implied and suggested in the mainstream SCI literature. While the potential value of integrating certain parts of a supply chain or network is certainly not discounted, this paper makes the case for recognising the value and even the necessity of creating looseness and flexibility in supply chains and networks. Such looseness is instrumental in allowing supply chain actors to maintain autonomy and continuity and to economise regarding their mediating roles in complex and dynamic supply networks. Grounded in fundamental insights from system theory and industrial network research, an empirical case study of a textile and garment supply network in Mexico illustrates how such looseness may be created in the interplay between a trader and small local suppliers, larger suppliers, and large international customers.

The main contribution of this paper is to start a reconceptualisation of supply chain management thinking in general and SCI more particularly, which is aimed at turning the quest for all-encompassing, seamless integration into a managerial issue of creating or allowing the creation of both looseness and tightness in complex supply chains and networks. The central issue is how we can conceptualise and understand looseness (and the creation of it) as a necessary and powerful ingredient in effective supply chain design, along with the typically emphasised need for tightness. As recently emphasized by Scheibe and Blackhurst (2018), when studying supply chain disruption propagation, tight couplings in supply chains, typically endorsed by approaches such as JIT, may severely amplify the proliferation of local disruptions into the larger, global network. They conclude that SCM research is in need of a systemic perspective in order to better understand the propagation of disruptions, as well as other forms of disturbances and instabilities. We argue that the research in this paper is a timely contribution to fulfilling that need. Furthermore, the combination of system theory and the industrial network approach as applied in our research constitutes a novel approach in the SCI field which traditionally has been dominated by work based on contingency theory, transaction cost economics and resource based view, as shown by Kamal and Irani in a recent study (2014).
A second contribution of this paper lies in the empirical research, which sheds light on the role of traders in the Mexican textile and garment (T&G) industry, which create value via connecting local suppliers with global customers. Much of the existing T&G research has typically focused on Asia (see, e.g., Nadvi and Thoburn, 2004; Jin, 2004) and emphasised the relationship between trader and customer, which makes the study reported in this paper a

valuable addition, both in terms of its geographical coverage and its broader scope, by including the suppliers' perspective.

The organization of the paper is as follows. The first section presents the theoretical background for the study and ends with an analytical framework. The next section outlines the methodology used for collecting information about a Mexican trader, followed by a description of the activities it coordinates in its supply network. After that, the case is analyzed and further discussed in relation to the analytical framework presented earlier. In the final section of the paper we draw general conclusions, discuss the paper's limitations and present the main research, management, and socio-economic implications.

Theoretical Background

In this section, we develop and present the analytical framework for the study, as shown in Figure 1 at the end of the section. The framework builds on and connects three strands of literature. First, we consider system theory (Ashby, 1960), particularly Glassman's (1973) overarching work on the concept of loose couplings in living systems. This provides us with basic insights for reflecting on and analysing looseness in supply chains and networks. Secondly, representing the contemporary literature on SCI, we consider Simatupang's (2002) taxonomy of modes of coordination and inter-firm integration in supply chains. This taxonomy is a natural starting point for mapping the type and degree of integration observed in the supply chain (and its network) in the empirical case. Thirdly, we include the perspective of the industrial network approach (INA) in the framework, particularly Holmen and Pedersen's (2003) concept of mediating functions. Each network (or supply chain) actor may fulfill any of three fundamental mediating roles in relation to two other network actors, with varying implications for the looseness created between actors in a so-called triad. The inclusion of this perspective provides us with an effective way of operationalising the mediating roles played by the trader in the case. In the sections below, we further elaborate on each of these three strands of literature. At the end of the section, we integrate the three strands and propose a final theoretical framework, and we explain how the framework will be used in the analysis.

Supply chain integration: A system theory perspective

We aim to develop a fundamental understanding of the issue of integration in a supply chain by considering system theory, particularly Ashby's (1960) work on ultra-stable systems. An

ultra-stable system has the ability to find a new stable state after it has been forced out of a previous stable state. In other words, it is adaptive. Considering a supply chain as characterised by partial, temporary or even sporadic integration and otherwise rather loose couplings between actors – or no couplings at all – is certainly easier to reconcile with the theory on ultra-stable systems than a tightly linked chain throughout. Ashby points out that for any system to be stable, each of its elements must be stable. An element is stable if those variables essential for its survival have values within an acceptable range. Each element must adapt to disturbances in its local environment that threaten to push one or more essential variables outside their acceptable ranges. If elements are tightly linked to one another, the local processes of adaptation are likely to interfere with one another, and the time required to find a new stable state for the entire system will become infinitely long. As Ashby (1960) writes (p. 155):

"Thus, for the accumulation of adaptations to be possible, the system must not be fully joined. The idea so often implicit in physiological writings, that all will be well if only sufficient cross-connexions are available, is, in this context, quite wrong. This is the point. If the method of ultrastability is to succeed within a reasonably short time, then partial successes must be retained. For this to be possible it is necessary that certain parts should not communicate to, or have an effect on, certain other parts."

Glassman (1973) maintains that such loose couplings may appear in two distinct forms: one that requires active maintenance and another form, which is essentially passive. The 'active' form is characterised by letting only one or a *few subsystems in each* part absorb and counteract most of the disturbances stemming from other parts of the system. In other words, the majority of subsystems in each part are largely unaffected by the actions (disturbances) of the other parts. Only when necessary will certain disturbances be passed on by the absorbing subsystem to the other subsystems in the part of the system under consideration. Paradoxically, this form of loose coupling between larger parts in a system implies that the subsystems absorbing the external disturbances are tightly coupled to one another. Glassman refers to this as a 'difficult design' for such a coupling. A wide variety of disturbances may have to be dealt with, and the potential consequences of passing on the disturbance – or not or partly passing it on – must be considered consciously. A passive form of loose couplings, on the other hand, is not dependent on such an advanced design. It simply relies on each part of the system largely shielding itself from – or ignoring – the influence of other parts. It may

be enough for each part of the system to have a mechanism that reacts to external disturbances only if these exceed a certain threshold. Using such a step-function approach, minor or even moderate disturbances will not have any effect at all. However, as Glassman points out, important information, which perhaps should have been reacted to, is also ignored. The severity of this ignorance depends on the volatility of the environment. Ashby argues that even if communication between two parts of the system is useful, it does not have to take place via a direct connection between these parts. It can also take place indirectly through the environment.

Glassman (1973) identifies three reasons why a system displays the particular set of couplings that is does. First, he speaks of a 'constraint from below', which refers to the necessity of having a *minimal* set of couplings in place in order for the system to be able to do its job in a given environment. Secondly, the number of couplings present must be constrained from above, referring to the above-described need for each part of the system to maintain autonomy. Thirdly, however, certain observed couplings may be more difficult to attribute to constraints either from above or below and should, rather, be regarded as accidental, unintended variations on existing solutions.

Summarising, system theory suggests that we should expect to observe loose couplings in supply chains by default. Each actor in the supply chain must maintain a certain autonomy. The need for local autonomy will act as a pressure to reduce the number and tightness of couplings in the larger system. In order for the supply chain to perform, however, certain couplings of a certain tightness must be in place. Loose couplings may be *passive*, i.e., allowing different parts a system to access one another only when a threshold value is exceeded, or *active*, by directing all disturbances attempting to access a part of the system to one particular subsystem, which absorbs the disturbances and serves as an insulator. Finally, Glassman (1973) and Ashby (1960) point out that in any consideration of looseness in the coupling between two systems, one should be aware of the timeframe applied. Two systems may appear to have a negligible effect on one another in the short term, but the effect may first become noticeable over a longer time period; alternatively, a noticeable effect in one time period may be negligible in the long term. Ashby (1960) speaks of temporary independence between variables (p. 158) and 'temporary constancies'. He uses the analogy of a telephone switching system, in which the switching implies alternating between a constant value (disconnected) and a fluctuating value (speaking) for each node in the telephone network. The

degree of looseness or tightness is therefore always relative to time and may fluctuate or vary because of temporary constancies.

The supply chain integration perspective: a taxonomy of coordination modes

Simatupang *et al.* (2002) propose four modes of coordination required to achieve supply chain inter-firm (external) integration: logistics synchronisation, information sharing, incentive alignment, and collective learning. Table 1 summarises this classification system.

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Coordination by logistics synchronisation involves matching demand with supply through understanding customer needs by means of operative practices, such as concerting inventory management and transportation between partners, as well as collaborating to redesign chain processes through strategies such as postponement, collaborative forecasting or build-to-order. Information-sharing coordination emphasises the availability of accurate and timely information to all chain actors to increase visibility and enable the substitution of physical processes as a means of improving operational activities. The coordination related to incentive alignment requires defining strategic performance metrics and offering incentives or distributive gain schemes that motivate the alignment of SC members. The last coordination mode, collective learning, involves the promotion of knowledge dissemination across firms using several mechanisms. Collective learning fosters innovation in products and processes, which contributes to increased system efficiency. At first glance, all four modes of coordination seem aimed at tightening the couplings between actors in the supply chain, albeit in different ways. The question is how this relates to our earlier discussion of loosely coupled supply chains.

As acknowledged by Simatupang *et al.* (2002), the starting point appears to be that in general, increased coordination (tightening) is necessary or beneficial (p. 291): '…The main concern of supply chain management is how to coordinate the independent players to work together as a whole to pursue the common goal of chain profitability in changing market conditions.' In other words, in line with our expectations based on system theory and using Ashby's terminology, supply chains are not 'richly joined' systems by default. Rather, the number of couplings is first constrained from below: a minimal set of essential couplings is in place to ensure acceptable delivery to a final customer. The literature on supply chain integration,

however, advocates additional couplings to help improve supply chain performance without constraining the entire system too heavily, i.e., reaching a constraint from above. In their taxonomy, Simatupang *et al.* (2002) present a range of such couplings, which at first glance seem to resemble the active form of coupling rather than the passive one. This seems especially true for couplings of the 'logistics coordination' type. For example, collaborative logistics refers to '...joint decision-making such as assortment planning, joint forecasting, joint inventory management and replenishment… (p. 294)'. Making decisions jointly across the supply chains implies tight couplings between at least some decision-makers regarding certain issues in the various companies. In addition, the other three forms for coordination listed in Simatupang *et al.* (2002) imply a joint agreement on goals and procedures and will require a deliberate design and the implementation of information systems, resource allocation, decision protocols and so on. Regarding 'information sharing', for example, the authors write that 'This level of information sharing acts as the glue that integrates all chain members (p. 296).'

Still, the suggested modes of coordination may also exhibit certain dimensions of looseness. For example, when considering collaborative logistics, the question is to what extent the decision-makers that engage in joint planning and forecasting *across* the chain extend the same kind of tight couplings to other decision-makers *inside* their respective companies, e.g., to those who work within purchasing, production, quality or R&D. Similarly, when considering postponement, it may be argued that such a strategy creates a tighter coupling between the supply chain and the final customer by allowing the final customer decide more precisely which product variants should be assembled from a given set of available modular product components. After all, in a make-to-stock supply chain, such direct information about real customer demand is absorbed by finished product inventory. However, in a postponement strategy, the design and/or features of the actual modular product components offered to the final customer may be rather stable and insensitive to sudden changes, thereby creating looseness between producer and customer.

Overall, the supply chain management literature advocates the tightening of couplings in the supply chain and suggests that there are various ways (modes) of achieving that. Casually analysing some of these modes from Glassman's perspective on loose couplings, however, leaves the question open regarding the extent to which creating tighter couplings between specific actors across the supply chain and/or sharing information between these has an

immediate effect on decision-making processes in other parts of each chain member's firm. In other words, the suggested coordination modes may contain elements of both tightness and looseness.

Supply chain integration from a network perspective

One important issue is how such elements are created in supply networks by actors who take a leading role in coordinating the actions in the supply network. To address this issue, we turn to a third theoretical perspective. The industrial network approach, or INA (Håkansson and Snehota, 1989; Håkansson, 1987), is added to our study of looseness in supply chains and networks. Fundamental to INA is its recognition of the embeddedness of firms in larger systems. It emphasises the existence and importance of couplings between a firm and its suppliers and customers and other actors. Unlike the mainstream SCM literature, however, the idea of integral control across a chain of firms is rejected by the INA. Although the INA acknowledges that firms can and should attempt to influence their surrounding networks, a firm's set of possible actions is at least partly constrained by the network, and its 'visibility' in the network is limited as well. Holmen and Pedersen (2003) introduce the concept of a network horizon, which is '…the part of the network that a firm is aware of and thereby can take into account' (p. 409). More specifically, they propose three basic ways in which a firm's direct counterparts can assist a firm by mediating between the firm and its wider network, i.e., between the firms and actors that are beyond its own vision and direct reach. First, a firm's counterpart can have a *joining* function, which means that the counterpart enables direct coordination between a focal firm and a third party, for example, a customer. A firm's counterpart may also fulfil a *relating* function, which means that the counterpart acts as a coordinator of activities between the focal firm and a third party. In contrast to the joining function, there is no direct coupling between the focal firm and the third party, but they are aware of one another. Thirdly, a counterpart may have an *insulating* function, in which it also coordinates between a focal firm and a third party, though without these being aware of one another. As Holmen and Pedersen (2003) explain, intermediaries may '…translate, transform, amplify, sort, filter, distort, pause, block, or concentrate the information it transmits (p. 416)'. Referring to the systems perspective, intermediaries may provide more or less loose couplings between a focal firm and other actors in the supply chain. Similarly, Ashby's assertion that parts in a system can communicate through the environment and thus do not necessarily need to be connected directly fits well with the *relating* and especially the *insulating* functions. Summing up, Holmen and Pedersen's (2003) conceptualise a firm as having limited visibility

in a theoretically endless network. Beyond a firm's horizon, however, the network can partly be influenced through the various mediating roles that the firm's direct counterparts may play. Thereby, a focal firm is loosely coupled to the wider network.

An analytical framework incorporating the three perspectives

Based on the previous subsections, we developed an analytical framework that combines and relates the three strands of literature. More specifically, from the three strands of literature, we derive five specific facets of supply chain integration. The framework is shown in Figure 1.

-Insert Figure 1 here-

System theory provides three facets, as shown in the lower box of the framework: (1) the extent to which a supply network is characterised by the fundamental, different types of couplings, i.e. loose or tight couplings; (2) the ways in which loose couplings are created, i.e. actively or passively, and (3) the presence of possible temporary constancies in the degree of looseness, i.e., the degree of looseness changing temporarily relative to an otherwise permanent level. The contemporary literature on SCI, represented by Simatupang et al. (2002), covers the facet coined 'integration modes', which can be found in the upper left box in the framework. Finally, the literature on industrial networks, as represented by Holmen and Pedersen (2003), provides the facet known as 'mediating roles', which is shown in the upper right box in the framework. Based on these five facets, we have formulated five corresponding key questions that will guide the analysis and discussion of supply chain integration in the empirical case:

1. To what extent can we observe the four modes of supply chain integration being used by Aztex in its supply network?
2. To what extent can we observe the three mediating roles being played by Aztex in its supply network?
3. To what extent can we observe loose and tight couplings in the supply network of Aztex?
4. To what extent can we observe the two ways of creating loose couplings in the supply network of Aztex?

5. To what extent can we observe different time-orientations in the loose couplings in the supply network of Aztex?

In the analysis, we shall first address each of these five questions separately and subsequently discuss the particular combination of facets found in the Aztex case in a more holistic manner.

Research Methodology

This paper applies a qualitative research approach to a single comprehensive case study in order to obtain a deeper understanding of how a trader contributes to the integration of the textile and garment (T&G) supply chain in the Mexican context. Yin (2003) defines case study research as an empirical inquiry that investigates a contemporary phenomenon within its real-life context and in which multiple sources of evidence are used. Theoretical constructs, propositions and midrange theory can be derived from case-based empirical evidence when 'how' or 'why' questions are posed about a complex issue over which the researcher has no control (Eisenhardt and Graebner, 2007).

The central problem statement of the study at hand is this: how can we conceptualize and understand 'looseness' as a necessary and powerful ingredient of effective supply chain management? To answer this question, we looked for a single, critical and revelatory case of a reconfigurable supply chain. Based on the case analysis and the theoretical lens of systems theory, complemented by industrial network theory, we seek to extend existing theory on integration in triadic settings.

We selected a case after reviewing the literature on the evolution of the apparel industry in Mexico. The particular case of Aztex Trading S.A. de C.V. (http://www.aztex.net) cited by Bair and Gereffi (2002) has been acknowledged as an example of triad integration. We visited the National Chamber of the Clothing Industry in the Lagunera region, where the chamber's director confirmed that Aztex qualifies as a trader intermediary in Mexico. We also contacted the top executives of Aztex Trading by phone to request interviews. Data was then collected through a combination of site visits and a semi-structured interview protocol that enabled us to bring up broad themes related to the objectives of the research, aimed at understanding and clarifying how the trader intermediary manages and integrates suppliers. Some probes (e.g., how they schedule the production activities to meet delivery times) were included to obtain detailed responses. Face-to-face interviews were conducted with two key informants, the founder and the CEO of Aztex Trading; they each lasted 2–4 hours and were recorded with

consent from the interviewees. Additional information about the company was collected through on-site observations and informal conversations with operational staff at the trader's main offices in Mexico City and Torreon (a principal city in the Lagunera region in the northern region of Mexico, where Aztex has an office because outstanding suppliers are located in the area). Secondary sources, such as published documents (newspapers and academic articles), web-pages and documents provided by the trading company (brochures distributed to customers and reports submitted to the CANACAR), were combined with transcripts and notes taken during the visits and were used for triangulating the information regarding the operations and flexibility of the trader's services portfolio.

We also conducted interviews with three suppliers that work regularly with the intermediary. According to Eisenhardt (1989), the sample selected for qualitative research should be purposeful and based on some theoretical underpinnings. Accordingly, the interviewed suppliers were opportunely selected among the ones referred by the trader; we selected those that agreed to participate and which sustain frequent interactions with the trader, in order to expose how Aztex manages its supplier relationships. The dialogue with suppliers complemented the information provided by the trading firm and enabled us to get insight into the incentives and benefits that suppliers perceive they get from their relationships with the intermediary. In order to increase the variety and external validity of the results, and given the impracticality of interviewing all suppliers connected with Aztex, we chose representative suppliers with different profiles in terms of size, specialization and capabilities. We interviewed a total of three suppliers: MB and WW, both large producers located in the Lagunera region with distinct and complementary production abilities, and FF[1], a small textile manufacturer located in central Mexico.

The interviews with Aztex's top managers captured the extent and depth of its activities regarding two supply chain macro-processes: internal supply chain management (ISCM) and supplier relationship management (SRM) (Chopra and Meindl, 2013). The customer relationship management (CRM) macro-process was not explicitly considered because no Aztex customers were interviewed. Given we use systems and network perspectives to analyze the relationships in Aztex's supplier network, the network coordinated by Aztex is the unit of analysis. This means that interpersonal mechanisms, governance structures, and facets of the external environment are treated as embedded facts within the case study. The case includes informants from several actors in the supplier network—the intermediary and three suppliers—and data from different sources (data triangulation), as well as investigator triangulation that

enhances the reliability and validity of the results (Yin, 2003). However, the results cannot be generalised to other contexts; they mainly clarify and extend our knowledge about how the triad model works.

We used the template analysis technique (King et al., 2014) to perform a thematic analysis of the interviews, observation notes and secondary records. The analysis consisted of developing a coding template composed of a priori codes based on the literature review and the sub-processes implied by ISCM and SRM. Although the analysis departs from preconceived codes, new codes were added when new themes emerged (e.g. marketing intelligence activities). The final coding template included three broad themes: 1) demand anticipation as a CRM sub-process, which helps to predict which materials will be required and to reserve production capacity; 2) the ISCM sub-processes for which the trader is responsible given that it has no production facilities; and 3) the SRM sub-processes managed by the trader on behalf of the customer. Within each major theme, we then identified narrower and more specific activities (e.g., communication with suppliers) and the associated benefits they represent to suppliers. The interview protocol used with suppliers was designed after mapping the supply chain workflows and the thematic analysis, in order to verify and complement the information given by the trader and the data from secondary sources.

Case study: a Mexican trader in the textile and garment (T&G) supply chain

In this section, we start by describing the larger industry context for the case study and follow it with a description of our study of the Mexican trader Aztex.

Background of the case study

Low production costs have been the main driver of T&G sourcing from developing countries, particularly in the case of labour-intensive commodity products. This may explain why some lead manufacturers, retailers and brand owners have switched from Latin American suppliers to suppliers in East Asia or Eastern Europe. However, when realizing the total cost of international sourcing, buyers have recognized the need to consider additional criteria besides low labour and production costs, such as logistics operations and energy costs, physical and cultural (business) proximity, quality and reliability, as well as contextual factors such as socioeconomic and political risks, investment incentives, infrastructure and human resources (Adegoke et al., 2009).

Global sourcing is a common practice in the textile and apparel supply chain because of the relatively low technical requirements of its products and the high standardization of their production processes. Nevertheless, global sourcing decisions must evaluate the total costs of offshoring production. According to Holweg et al. (2011), three main sources of costs are relevant: static, dynamic and hidden costs. Static costs include purchase price, transportation, order-processing, custom-clearance, material handling and quality control costs. Dynamic costs occur because of demand fluctuations and are comprised of inventory, lost sales and stock-out costs. Finally, hidden costs are related to contextual conditions such as currency fluctuations, wage and energy increases, costs related to the risk of political and economic stability and the costs of managing an international supply base. Near sourcing typically reduces dynamic costs and the static costs associated with purchasing, transportation and inventory management (Cagliano et al., 2012).

Many of the relevant criteria used in the selection of a sourcing region are satisfied in the case of Mexico. Among them were low labour costs, geographical proximity to the American market, relatively close cultural and institutional proximity between foreign buyers and local firms because of a long-standing practice of multinational sourcing in the country and international commerce agreements, particularly the North America Free Trade Agreement (NAFTA). During the period 1990–2002, Mexico was the top-ranked garment exporter to the United States; however, the sector has been losing competitiveness ever since. Mexican imports to the United States decreased by 11% per year between 2001 and 2007, while total exports of textiles and garments in 2012 decreased by 5.2% and 2.6%, respectively, compared to 2011 (National Chamber of the Clothing Industry [CNIV], 2011; National Institute of Geography and Statistics [INEGI], 2014).

NAFTA facilitated the entrance of lead firms, which promoted the modernization of the clothing sector and the advancement of production from basic assembly to 'full-package production'[2] (Bair and Gereffi, 2002). However, only some firms progressed to full-package production; others, especially the medium and small firms that account for 90% of companies in the sector, remained dedicated to specific production activities, mainly assembly, with consequently poor integration of the T&G supply chain in Mexico (Sanchez, 2010). In contrast, other sourcing regions of garments, for example China, are not only able to offer full-package solutions but also offer fast fashion and premium quality (Cardenas-Castro and Dussel-Peters, 2007). Thus, in addition to its near sourcing advantages, Mexico could reinforce its position as

a low-cost sourcing region by reducing buyers' transaction costs by more effectively integrating its prevalent supplier base.

The T&G supply chain involves the activities of product design, the supply of raw materials, internal logistics, the administration of orders, a series of production activities—fibre production, yarning/spinning, dyeing/processing, cutting, stitching/assembling and trimming— and the distribution and retailing of garments. While it would be possible to vertically integrate all these activities within a single firm (e.g., a brand manufacturer), the focal or lead firms of the supply chain—brand owners, retailers and manufacturers with decision power over the complete supply chain—manage the more value-added activities of design, merchandising and distribution (Gereffi, 2001), while firms in developing countries execute the less-valued activities of production (Giri and Rai, 2013). Captive offshoring, i.e., totally controlling the sourcing process overseas, is not the most efficient governance mode for the lead firms of the T&G supply chain, in part because the direct management of relationships with non-strategic suppliers implies high transaction costs due to the number and frequency of contacts, bounded rationality and the opportunism of potential suppliers (Mykhaylenko et al., 2015). Thus, contracting production to an experienced intermediary becomes a more convenient governance strategy in terms of appropriating the benefits of the intermediary's role, especially if the buyer is unfamiliar with the local environment (low cultural-business proximity). This explains why trader intermediaries have prospered in East Asia. Moreover, the capability of the intermediary to manage relationships with local suppliers becomes a critical criterion in sourcing decisions. Under such a governance arrangement, a customer places orders with a third party that subcontracts production to multiple regional producers, coordinates the T&G production activities, facilitates information interchanges, administrates suppliers' relations, aligns the participants' goals and becomes the unique linkage between the customer and the supplier base (Christopher *et al.* 2004; Fung *et al.*, 2007; Masson *et al.*, 2007).

This supply chain integration (SCI) model is referred to as a triad by Stevens and Johnson (2016). It corresponds to a specific form of offshore outsourcing where the relationship with the intermediary facilitates access to the offshoring advantages of a low-cost country (Mykhaylenko et al., 2015). These advantages include reduced production and transaction costs because of the coordination role assumed by the intermediary. Further offshoring advantages entail the combination of resources (expertise of dedicated suppliers) obtained by leveraging the knowledge of the intermediary about the best sourcing regions and most qualified suppliers in each one. According to Chen et al. (2013), supplier integration through the intervention of

an intermediary represents a strategic alternative to backward integration by providing a governance structure that reduces the costs and risks of global sourcing by creating a 'virtual' supply cluster around a specific customer order. This integration scheme has been categorized by Cao et al. (2007) as a 'third-party (3P) hub chain', identified as triangular sourcing by Feenstra and Hanson (2004) and labelled by Bitran et al. (2005) as the mini-maestro model.

Supply chain intermediaries are organizations which use their own assets and resources to support or even take total responsibility for performing some part of the supply chain process. These organizations have few physical assets but possess extensive knowledge and technological capabilities that they use to combine and manage their own resources with those of other service providers in order to improve their customers' supply chains (Hickson et al., n.d.). One particular class of intermediaries are trading companies that provide international buyers with a full sourcing service from low-cost production regions. These trader intermediaries do not have manufacturing facilities of their own, but they have been acknowledged as lead firms in the supply chain because they organize all production activities within a segment of the chain required to produce a line of garments and contribute to international logistics efficiency (Bair and Gereffi, 2001; Chen et al., 2013; Chen and Fung, 2013; Gereffi, 2001; Fabbe-Costes et al., 2009; Fung et al., 2007; Jin, 2004; Nadvi and Thoburn, 2004). One example of an advanced trader is Li & Fung, a Hong Kong–based company that coordinates all the productive and logistics activities of the garment chain by capitalizing on its knowledge about the manufacturing capabilities of Asian suppliers, its relational resources, its market intelligence and its ability to restructure and manage multi-region sourcing networks (Ha-Brookshire and Dyer, 2008).

Description of a Mexican trader: Aztex company

Aztex is a trading company, which has been in operation for over 25 years and has a stable staff of 40 people working at 16 offices located around Mexico. Aztex personnel include specialists who search for or develop textiles and who select and certify new suppliers; engineers in charge of production supervision, quality inspectors, and a logistics staff. The intermediary is defined by the CEO as a 'service and knowledge company' that provides customers with full services, from in-sourcing to the delivery of the final products to the customer's warehouse. The coordination of these activities is depicted in Figure 2, which describes how suppliers with different profiles (small specialized ones versus large ones able to provide full-package production) are connected to Aztex, and in turn, how the trader is

connected to customers. It is important to notice that the T&G supply chain coordinated by this trader is relatively simple because it only involves the direct suppliers of materials (textiles and accessories), garment manufacturers and (national and international) buyers; these buyers are the ones that assume total responsibility of outbound logistics, brand management, merchandising, and product design.

-Insert Figure 2 here-

According to company founder Patricia Medina, Aztex in the past was more of a 'supervisor of production' than a full service provider, since Aztex's services to early international brand owners— Liz Claiborne, Boss, Nautica, Dockers, ESPRIT, Polo Jeans Co. and JNY—were only to 1) monitor production and 2) prepare documentation for custom clearance. However, when these customers decided to source from Asia in the early 2000s, Aztex radically redirected its strategy to instead serve large and prestigious local retailers and brand owners. Current customers include two of the most important Mexican department store chains—Liverpool and Palacio de Hierro—as well as national and international retailers and brand owners like Julio, Ivonne and Maringo and Inditex. These customers are not looking for high volume at low prices, but instead want high quality clothing that is original in its design, well-shaped and adjusted to local tastes, reliability and reduced order cycles. These customers have decided to use Aztex's services to manage a part of a customer-oriented, flexible and prime-quality apparel sourcing strategy to reap the advantages of near offshoring (Masson *et al.*, 2007; Mykhaylenko et al., 2015).

In the interviews, Aztex's top management confirmed that low-cost "maquila" (garment assembly) is no longer sufficient for Mexico to remain a sourcing region. Most of the Mexican assembly factories (maquileros) perform neither fabric cutting nor various finishing operations and do not have access to high quality and fashionable textiles; as a result, not only are the fibre, textile and garment firms disconnected, but the garment production process is also fragmented. Aztex's executives therefore summarized the main role of the company as: '[filling] the "holes" in the supply chain [by providing] … an integrated form of manufacturing which results [in] the coordination [of] all the production activities of several firms.'

The trader operates under a make-to-order policy, and when a customer contracts its services, several joint meetings take place to define the contents of the seasonal catalogue that guides sourcing and production. Aztex's managers participate in decisions about the textiles to be used by recommending ones from among those registered in its directory of Mexican textiles

(Teleteca[3]). If the customer asks for imported fabrics, Aztex assumes the responsibility of sourcing them. During the design phase, the interaction with customers was characterized by the interviewed managers as intense, but they stated that once customers had defined the season's catalogue, they relied completely on the trader to complete production: 'that's why they contract us, it's our job'.

Once the customer authorizes the prototypes, Aztex selects the suppliers that will source or produce the textiles and fabricate the garments; to guarantee top quality, selection is made based on the production capabilities of suppliers in the trader's network. The conditions of the purchase order (delivery time, quality standards and supervision schedule) are settled with the selected suppliers. When new designs are going to be produced, Aztex personnel support suppliers throughout the design transference phase; during production, personal communication with and control over manufacturers are maintained through multiple visits by Aztex supervisors. Given the fragmentation of the T&G supply chains in Mexico, semi-finished garments and individual pieces of an outfit (e.g., pants and jacket) are typically produced by different suppliers and picked up by the trader that fully administrates the product flows. Production is consolidated at the trader's warehouses and the finished products are finally delivered to the customers' warehouses located in Mexico.

The first column in Table 2 details the activities performed by the trader to serve its customers' orders; the second column shows the potential benefits that these activities represent to suppliers.

-Insert Table 2 here-

The advantages and benefits of triad integration were perceived differently depending on the suppliers' characteristics. Large and powerful suppliers may deal directly with international buyers, and therefore their relationship with the trader is not very close. In contrast, regional suppliers with limited capacity and/or production capabilities rarely establish direct contact with international buyers, and therefore they perceive their relationship with the trader as being more valuable. In the case of MB and WW, they are large and competitive manufacturers; MB dedicates itself to garment production while WW specializes in finishing. Both suppliers have developed production capabilities that jointly result in full-package production, and they have the power to negotiate directly with buyers and textile manufacturers. They also both usually provide half-package services to Aztex; thus, from these suppliers' perspective, the relationship

is one of low interdependence: ‘To us [MB & WW], Aztex is another customer, we do not make special investments to serve it.’

On the other hand, for manufacturers dedicated to specific activities (e.g., weaving, clothing assembly or finishing of garments) the degree of interdependence is higher because the trader integrates the productive process of such specialized suppliers with those of others firms, as in the case of FF. According to the General Director of FF, it is very important for a small, specialized supplier to maintain relations with full service providers because they absorb most of its fabrication and connect the firm with international brand owners, such as Victoria’s Secret, Avon and Fuller. FF decided to remain specialized and to invest mainly in the development of their core capabilities—the design and manufacture of textiles—instead of advancing forward integration. FF thus depends on its relationship with full service providers like Aztex; however, given the shortage of national producers of textiles, the trader is also dependent on FF. The prevailing mutual trust reinforces both parties’ commitment to maintain the relationship. As expressed by the director of FF, ‘If we [FF] decide to offer full-package production we will be competing with our current customers, but we manufacture textiles and want to exploit our capabilities to serve customers that absorb our production while they fabricate the complete garments.’

From Aztex’s perspective, all relationships with suppliers are ‘symbiotic’—durable, fair, trustworthy and mutually beneficial. However, our study’s findings fit well with extant research that shows how the relative power of the participants in a network limits the self-interest of suppliers, determines their commitment with a trust-based relationship, their interest in collaboration and information sharing, the alignment of their goals with those of the buyer (in our case the intermediary) and their willingness to embark on behavioural-based governance methods (BBGM) (Käkhönen, 2014; Prosman et al., 2016). The asymmetric interdependence between the trader and suppliers with different capabilities and resources defines the relationships with suppliers and the benefits perceived by suppliers (Käkhönen, 2014). In the case of suppliers with relative power, their production capabilities are complemented by those of the trader; thus, each actor makes the most from the relationship and clearly defines their individual roles in the sourcing network. For example, FF remains specialized in the production of one class of textiles, while the intermediary connects it with other specialized suppliers and finds and negotiates with buyers. This explains why the intermediary’s utilization of BBGMs (market information sharing, monitoring and support during the design to manufacturing process) is well accepted and valued by FF. In contrast, suppliers able to offer full-package

production (alliance MB & WW) optimize their own capabilities and are more interested in collaborating directly with the lead firms of the T&G chain. Thus, our findings corroborate previous research that found that a power balance facilitates and reinforces collaboration, resulting in distinctive forms of partnerships in a network. However, according to Prosman et al. (2016), the use of resource intensive BBGMs might be somewhat effective even with powerful suppliers. Therefore, the trader's strategy of investing in all of its relationships with suppliers and its decision to endure personal interactions even in situations of power imbalance contribute to the integration of the T&G chain.

Case analysis and discussion

In this section, we first analyse Aztex's supplier network in relation to the analytical framework developed in the theory section of the paper and the five questions addressing the five different facets of the analytical framework: integration modes, mediating roles, coupling types, coupling creation and coupling time-orientation. At the end of the section, we summarise and discuss the obtained insights regarding the particular combination of facets of integration observed in Aztex's supplier network.

Facet 1: Integration modes – logistics synchronisation, information sharing, incentive alignment and collective learning

First, we focus on *integration modes* and pose the following question: 'to what extent can we observe the four modes of supply chain integration being used by Aztex in its supply network?'

The first coordination mode, *logistics synchronisation*, is performed at the executive level and completed with the assistance of a third party that provides basic transportation services to move in-process and finished products. Judgmental forecasting is mainly used to define the inventory of textiles and reserve production capacity to avoid delays:

'We [Aztex] reserve capacity with suppliers to guarantee we will have production on time […] and have a transportation schedule with slacks for possible delays but very clear delivery deadlines.'

Although lead sourcing agents, such as Li & Fung (http://www.lifung.com/), recognise logistics as a critical element of their business models, Aztex still considers logistics a support

activity because as shown in Figure 2, the trader does not support distribution, and all suppliers are located in Mexico. Hence, the main contribution of the trader to logistics synchronisation is the movement of in-process products across various firms nationwide, as shown by the following citation:

'An apparel cluster? Our suppliers are located in different states of the country. We do not work within a cluster. If the best jeans producer is located in Puebla and the jacket producer is in another state, we split the order […] and make sure that each individual piece has the same finish so they match to make the suit'.

There is no evidence of collaborative production planning. Aztex assigns production loads, while production schedules are fully defined by each supplier according to delivery times settled in advance by the two parties; no collective efforts to improve the efficiency of internal supply chain processes were recognised. The trader synchronises delivery times across suppliers to deliver complete orders on time. Hence, the trader does not recognise the reduction of inventory and transportation costs as one of its main logistics and synchronisation objectives.

With respect to the second coordination mode, *information sharing*, the reduction of cycle times (order to delivery) is recognised as one of its main results (Richey *et al*., 2010). However, in Aztex's case, cycle reduction results from a combination of near sourcing and collaboration with individual suppliers, not from increased supply chain visibility, as expressed below:

'One of our major accomplishments is the reduction of the lead time. By working closely with our suppliers, we have shrunk the time from design to manufacturing […] we can deliver orders in 8 weeks. Meanwhile, garments produced in East Asia take 3 months. We need to get additional reductions because lead times from Central America are only 6 weeks.'

The trader controls information flows and mainly provides suppliers mainly with intermittent and selective information about market trends and the mobility of their products, not with information about orders received, retailer profiles or demand. This comes to the fore in the following:

‘Once products are on the shelf, we [Aztex] play “mystery shopper” to observe how products move. We use that information to make recommendations to our [national] customers but also share it with our suppliers.’

Aztex has not set up specific information and communication technologies (ICT) in order to handle orders or facilitate communication with suppliers. Aztex believes that face-to-face interaction is a better and more cost-effective channel for information sharing, one that facilitates negotiations, ensures operational efficiency, mitigates contingencies and governs exchanges with suppliers. This finding is in line with Mirkovski *et al.* (2016), who conclude that institutional context, specifically social bonds, facilitate buyer (trader)-supplier exchanges and compensate for the low use of ICT among SMEs:

‘The idea of our regional offices is to be in touch with suppliers, supervise production, and help with quality problems, the definition of specifications […] and getting the optimum “fit” of garments.’

Regarding the third coordination mode, *incentive alignment*, the analysis shows that few conflicts of interests arise between Aztex and its suppliers because they do not compete with one another. The main incentives on the part of suppliers for participating in the supply chain joined by Aztex are 1) to remain specialised while Aztex links their production activities with those of other manufacturers, 2) to avoid the need to acquire and engage in relationships with brand owners and retailers because Aztex takes care of these relationships, and 3) to ensure some protection against volatility of demand due to the capacity reservation and direct payments received from Aztex. The centralised planning imposed by Aztex does not seem to require incentive schemes based on global performance, because each integrant of the supply network satisfies its individual objectives: independence, specialisation, and increased sales in case of the suppliers; high-quality products at fair prices for the trader and full outsourcing without high risks or transaction costs for the buyer.

Finally, the fourth coordination mode, *collective learning*, is mainly accomplished by personal communication and collaboration during the design transfer and production phases. However, knowledge is transmitted only from the trader to the suppliers. There was no evidence of the trader promoting knowledge interchanges between manufacturers or between suppliers and

customers. Additionally, we found no evidence of formal mechanisms for supplier development (evaluation, feedback or training courses).

Thus far, the case analysis shows no evidence of the trader actively pursuing or using all modes of integration to increase operational efficiency and flexibility. Of the four modes, *logistics synchronisation* is most prevalent, followed by *information sharing*. Still, for each of the four modes, several key features from Simatupang *et al.* (2002) are 'missing' in the case. Thus, although certain forms of synchronisation and information sharing take place between Aztex and its counterparts, we conclude that as a whole, Aztex's supplier network is *not* tightly integrated in the spirit of SCI.

Facet 2: Mediating roles – joining, relating or insulating

Second, we focus on *mediating roles* and pose the following question: 'to what extent can we observe the three *mediating roles* being played by Aztex in its supply network?" in order to achieve integration in the network, both among suppliers and between buyers and suppliers.

In the network map in Figure 2, we see that Aztex's customers are not aware of the 'existence' of the domestic suppliers and, furthermore, that the suppliers are not directly connected to one another. However, products, information and knowledge flow through the network due to the mediating functions performed by Aztex within its supplier network.

Regarding the first mediating role, there are few examples of Aztex *joining* the other members of the supply network. We have identified only one example, which relates to the textiles that are required to manufacture the garments ordered by Aztex's customers. These textiles must satisfy the customers' requirements for novelty of design and quality. Therefore, Aztex performs a *joining* function when it links customers and textile producers via the promotion and selection of domestic materials to produce the season catalog. Without Aztex's intervention, customers and textile producers would not be able to connect effectively regarding the choice and adaptation of textiles. While this example portrays Aztex joining the resources of its suppliers and customers physically, there are no examples of Aztex joining these suppliers and customers in terms of human resources.

With respect to the second mediating role, we find several examples of Aztex *relating* the other supply chain members. Aztex combines the services of various suppliers to complete an order.

Thereby, a supplier of jackets and a supplier of pants work independently, but in parallel, to produce a suit ordered by the customer. This example shows that Aztex performs a *relating* function with respect to these two suppliers by filtering, converging and adapting the information required for the two suppliers to match the garments' colors and designs and coordinate production and delivery times. It is uneconomical for both suppliers to share information directly and develop a direct relationship to harmonise their production activities because Aztex can handle this more efficiently. In general, Aztex delivers value to small specialised suppliers by performing this relating function.

Concerning the third mediating role, we find many examples of Aztex *insulating* the other supply chain members from one another. Aztex handles all information about suppliers and their capabilities, the quality of their products, their delivery times, and the inventory on hand at the suppliers. The customer is not aware of the existence and composition of Aztex's supplier base and does not need to process any of the information required to manage the relationships with the local suppliers. Aztex selects suppliers, decides which product(s) each supplier is going to produce and even allocates production loads. Similarly, the suppliers do not need to know any details about the brand owner and retailer customer contracts and delivery terms, because Aztex takes care of all dealings with the customers. In this way, Aztex creates value for the suppliers, as well as for the brand owner and retailer customers, by insulating them from one another.

Although one example of *joining* was observed, *relating* and *insulating* are clearly the more dominant functions. Thereby and in line with the analysis of integration modes, the majority of actors do not communicate directly with each other, and often, they are not even aware of one another.

Facet 3: Coupling types – tight or loose

Third, we investigate the types of couplings and pose the following question: 'to what extent can we observe loose and tight couplings in Aztex's supply network?'

In line with the insights from the two previous subsections, an analysis of the integration in Aztex's supply chain from a systems theory perspective shows no signs of seamless and 'full' integration. Thus, the supply network is a *loose*ly, or, in Ashby's terms, partly joined system, in which each integrant only has partial or even no knowledge about the activities of the other

integrant(s). While there are couplings that contain elements of tightness, these mainly refer to Aztex's relationships with suppliers and customers, not to couplings between the suppliers and customers in Aztex's supplier network.

Facet 4: Coupling creation – active or passive

Having established that the couplings are mainly loose, we investigate the creation of the loose couplings and pose the following question: 'to what extent can we observe the two different ways in which loose couplings can be created in the supply network of Aztex?'

Based on Glassman's distinction between passive and active couplings, the analysis shows that Aztex plays a crucial role by creating both active and passive couplings between the other subsystems, i.e., the small and large suppliers and the international customers. Most of the couplings, however, are *active* because Aztex specifically monitors the state, needs and possibilities of the suppliers and the buyers when this is deemed necessary or useful. In addition, Aztex informs, influences and guides each supplier through frequent, predominantly personal, interactions with each supplier. For example, Aztex '…provides suppliers mainly with intermittent and selective information about market trends and the mobility of their products, but not with information about orders received, the retailers' profile and demands (p.18)'. In addition, for particular orders, Aztex organises logistics and provides the involved suppliers, as well as the customer, with carefully selected information needed to achieve the required quality and flow. The *selective, intermittent* and *customised* nature of Aztex's coupling efforts signify their *active* nature because Aztex must make *choices* about what information and which physical resources to transmit (or not) to which suppliers and customers at which point in time.

A few of the couplings provided by Aztex are of a more *passive* nature. As explained by Glassman (1973), passive couplings operate as a 'step function' rather than in a continuous manner. Aztex creates such passive couplings when it reserves 'in advance' production capacity at the various suppliers and builds slack into transportation schedules. In this way, the suppliers and buyers can largely ignore one another's plans and actions as long as they operate within the bounds ('step size') set by Aztex. Such passive, loose couplings do not intrude upon the individual production plans of the suppliers but facilitate achieving the implicit common goal of ensuring a stable production schedule.

Facet 5: Coupling time-orientation – temporary or permanent

We investigate the time-orientation of loose couplings and pose the following question: 'to what extent can we observe different time-orientations in the loose couplings in Aztex's supply network?'

When analysing the role of time and context in Aztex's supply network, it seems useful to differentiate between a shorter-term order' or project context and the more permanent context beyond and between projects or orders. The most intensive interaction between Aztex and the customers takes place in the early design and specification phase. After this early phase, the level of communications with the customer drops as Aztex takes over and handles all activities with the suppliers it has chosen for the particular order. During the execution of an order, Aztex maintains close contact with each selected supplier regarding both operational production details and logistics, and also transmits some information to the suppliers. Hence, when Aztex activates a subset of its suppliers for a single order or project, the couplings among the suppliers tighten, but after the order is delivered, the couplings loosen. In a similar manner, the couplings between the supplier, Aztex and the customers tighten within the time-frame of a single order or project.

For each order, only some of the suppliers in Aztex's supplier network are involved. Furthermore, Aztex's relationships with all suppliers and most customers extend beyond a single order, implying that the supply network constitutes a more permanent system in which Aztex continuously updates and maintains its knowledge of each of the suppliers, as well as the customers in the network, and gains experience regarding how these can be combined for single orders and projects. Hence, the couplings vary with time-orientation. For single orders or projects, there are elements of temporary tight couplings among suppliers, as well as between the suppliers, Aztex and the customers. Beyond single orders and projects, there are elements of tight couplings only between Aztex and the individual suppliers, not among the suppliers.

Having analysed the five facets of integration in the Aztex supply network individually, we now connect the analyses in order to explain how Aztex creates value in its loosely coupled supply network. Regarding facet five, time-orientation and context, we differentiate between the temporary supply network, which Aztex activates for single orders and projects for a customer, and the more permanent supplier network Aztex operates beyond single orders and

projects. In relation to these, we summarise the analyses of the four other facets of supply chain integration in Table 3.

-Insert Table 3 here-

Summarising discussion of insights obtained from the analysis across the five facets

Overall, Aztex's supply network is characterised by much looseness and insulation, and relatively little integration. The observed looseness notwithstanding, the supplier network is well-functioning and has remained so over an extended period of time. This is so because Aztex transmits selective, restructured information into the network, which is sufficient for the suppliers to perform their respective activities in the T&G chain while, at the same time, consciously refraining from transmitting unnecessary information. In fact, the existing couplings (both active and passive) are primarily driven by a 'constraint from below' (Glassman, 1973) and arguably constitute a minimal required set in order to produce, transport and deliver the final product. Aztex's role in actively managing loose couplings between suppliers and buyers can be compared to Ashby's telephone switchboard operator receiving, ignoring or passing on specific, possibly anonymous messages from one person to another or deciding who should talk to whom, about what, when and for how long. The degree of looseness may temporarily be reduced during the start of a project and then return to the previous level as the project continues. Aztex is able to make such decisions because it actively and systematically has gained insights into the capabilities of each supplier, has learned the minimum required information the suppliers need to perform their activities and has developed the capabilities to choose and combine the suppliers' activities for a particular project. This, in turn, allows each participant to pursue its own objectives and strategies, not worry about handling logistical problems and not have to dedicate additional resources to establishing and maintaining direct relations with other network counterparts. Hence, suppliers accept their ignorance of the wider supply network because they expect and trust Aztex to connect them to the network in a manner that is mutually beneficial.

Conclusions, limitations and implications

We now return to the contributions of this paper, beginning with the ambition to start a reconceptualisation of SCM in general and SCI in particular. Next, we will address the specific value of the empirical study. Finally, we propose implications for researchers and managers.

Contribution to SCM reconceptualisation

If we were to strictly adhere to the contemporary SCM literature and its plea for seamless integration, we would be urged to recommend that the trader expand its involvement in the supply chain and strive for a higher level of collaboration and integration across the chain. At first glance, the studied chain appears to be at a basic level of development, a potential victim to sub-optimisation and likely to miss out chances to reduce costs and create additional value. Analysing the case through the lens of system theory and the industrial network approach, however, reveals another picture. The latter perspective shows Aztex playing a strategic and valuable position within Mexican T&G networks mainly by performing the mediating functions of 'relating' specialised domestic suppliers and 'isolating' them from customers that would otherwise need to invest in the management of dyadic relations. This research contributes to theory building by suggesting that the coordination of supply chain activities by means of loose couplings may be beneficial to all parties in a T&G chain. To put the point even more strongly, it suggests that attempting to create permanent, tight and all-encompassing supply integration or coordination is unlikely to succeed or be effective in all contexts. The need for looseness and flexibility in complex systems such as supply chains rules out comprehensive and continuous integration. The case shows how a trader, as a central actor in a chain or network, can create temporary, tighter couplings (integration) when and where it has to while allowing each actor to maintain a stable position in the face of local disturbances. This is close to a view of supply networks as self-organising systems (Choi *et al.*, 2001) and distinctly different from much of the contemporary literature on supply chain integration, which emphasises seamless integration and assumes supply chains to be manageable systems. It also bears some resemblance with Dubois and Gadde's (2002) study of the construction industry, which exhibits loose couplings at the permanent network level but tighter couplings related to specific building projects. However, our case differs from Dubois and Gadde's (2002) findings in the sense that Aztex's dyadic relationship to the suppliers in the permanent T&G network are tighter than the relationships the main contractor firms have to their suppliers and sub-contractors in the permanent construction network. Such differences may be due to country, industry, network, company, and project level differences, as well as genuinely different views on what are valuable couplings, mediating roles, and integration forms. Supply chains will and, according to system theoretic models of living systems, *must* exhibit both looseness and tightness. This study shows the importance of the mediating functions in terms of creating a basis for looseness (through relating and especially insulating) or tightness (through joining). However, again, as shown in our study and consistent with Dubois and

Gadde's (2002) study, looseness and tightness are not constants: depending on the time perspective applied, the observed impacts that supply chain actors have on one another may vary. The immediate impacts of a customer placing a large order at a supplier may be easy to observe in terms of operational, physical aspects, such as inventory level and cash flow, but they may also impact one another in ways that are only observable after a much longer time period, e.g., capability development or strategic direction. The further conceptualisation of SCM would, in our view, benefit from (a) more explicitly focusing on looseness and tightness *in tandem* when discussing effective supply chain design, (b) addressing how to analyse existing coordination modes for SCI, such as those developed by Simatupang et al. (2002), in terms of their ability to create looseness and tightness and (c) recognising that a discussion of the aspect of integration – as in supply chain integration – must always be seen in a certain time perspective.

Contribution to global T&G supply chain research

First, in the literature, triangle manufacturing facilitated by trader intermediaries is regarded as a specific advantage for the developing countries of East Asia, one that has not yet been experienced by other low-cost countries (Jin, 2004). However, this coordination scheme does exist in Mexico and facilitates access to nearby offshoring advantages. However, the Mexican trader only manages the processes in the middle portion of the chain. Front-end activities, such as final distribution, and back-end activities, such as international logistics and banking, are still controlled by brand owners and retailers. New organisational capabilities must be developed by the intermediary to further increase the interest of international purchasers in selecting or switching back to Mexican suppliers, with the expectation of increased responsiveness to demand volatility, decreased logistics and transaction costs and shorter lead times (Cagliano et al., 2012). Inducing buyers to select Mexico as a sourcing region is relevant to the socioeconomic and industrial development of the country, as well as a priority for the government, which aims to revitalise certain industries, promote exportation and guarantee the sustainability of manufacturing sectors that have typically contributed to the national economy and the employment.

The case reveals a pattern of small and specialised suppliers being more attracted to close relationships with a trader intermediary, while large suppliers, which are capable of developing direct relationships with international buyers, only maintain transactional relationships to a trader. Thus, this research contributes to the understanding of the roles trader intermediaries

play in the integration of the supply chain and concludes that supplier integration strategies may vary along the three content-external domains of SCI defined by Vallet-Bellmunt and Rivera-Torres (2013), specifically in terms of the alignment of objectives, joint planning and decision-making (patterns), relationship management (attitudes) and logistics, communication and knowledge-sharing practices. This confirms there is not a unique global mode of supplier integration and suggests that various approaches are viable as long as the objectives of operational efficiency, good customer service and flexibility are met.

Suggestions for further research and implications for practitioners

Our findings suggest that the co-existence of loose and tight couplings in supply chains may not be sector-specific. Future research is necessary to explore, in greater detail, how tight integration takes place in a variety of supply chains and networks, as well as how the required flexibility and looseness are obtained.

As suggested above, the entire SCI toolbox regarding coordination and integration in supply chains, for example, VMI and CPFR, could be analysed from the perspective of what Glassman calls passive and active couplings. This would place these tools in a new light, and an increased understanding of their potential as passive or active loose couplings could further advance SCM practice. Recent developments in the areas of the Internet of Things (IoT), the digitisation of supply chains and, as mentioned in the introduction of the paper, supply chain disruptions (Scheibe and Blackhurst, 2018) further emphasise the importance of increasing our understanding of the need for looseness and tightness in global and complex supply networks.

Finally, future studies should also attempt to capture and analyse loose couplings in supply networks over a longer time period to gain a deeper understanding of how seemingly decoupled actors may actually be coupled at least in certain respects.

For managers, it may be reassuring to learn that there are sound explanations for why it seems difficult to establish true integration across several tiers of suppliers and customers. Tight couplings will only be necessary and even possible in certain situations and time periods, but attempts at the all-encompassing, continuous integration of all counterparts are bound to fail. Instead, firms and managers should begin to recognise where and when looseness is required most (and tightness as well) and how effective and efficient couplings can be put in place to achieve this. A practical starting point may be to analyse how current suppliers and customers

act as mediators for the focal firm, as well as the kind and degree of looseness that this creates under various circumstances.

Limitations of the study

Regarding the limitations of this research, only one particular case was examined and participant suppliers, even when they were judiciously chosen, were suggested by the trader. This is one of the drawbacks of the study because asking the trader directly may introduce a social desirability bias even after promising confidentiality. Additional research from other suppliers and Latin American traders may contribute significantly to the development of hybrid-integrative structures in the clothing industry that benefit small producers which are the most vulnerable to the international buyers' sourcing decisions. Even though research recognizes that traders create value to lead firms in the apparel and garment industries, and this statement was confirmed by the case of a Mexican trader, it will be highly relevant to conduct more or multiple case studies to capture the variety in how companies can operate in loosely coupled systems interspersed with elements of tightness.

References

Adegoke, O. A., Maltz, A. and Christiansen, P. E. (2009), "Criteria for sourcing from developing countires", *Strategic Outsourcing: An International Journal*, Vol. 2 No. 2, pp. 145-164.

Ashby, W.R. (1960), *Design for a brain*, 2nd edition, Chapman & Hall, London, UK.

Bair, J. and Gereffi, G. (2002), "NAFTA and the Apparel Commodity Chain", in Gereffi, G., Spener, D. and Bair, J. (Eds.), *Free Trade and Uneven Development*, Temple University Press, Philadelphia, PA, pp. 23-50.

Bitran, G. R., Gurumurthi, S. and Sam, S. L. (2007), "Third-party Coordination in Supply Chain Governance", *MIT Sloan Management Review*, Vol. 48 No. 3, pp. 30-37.

Cardenas-Castro, H. L. and Dussel-Peters, E. (2007), "México y China en la cadena hilo-textil-confección en el mercado de Estados Unidos", *Comercio Exterior*, Vol. 57 No. 7, pp. 530-545.

Cao, N., Zhang, Z., To, K. M. and Ng, K. P. (2008), "How Are Supply Chains Coordinated?", *Journal of Fashion Marketing and Management*, Vol. 12 No. 3, pp. 384-397.

Cagliano, A. C., De Marco, A., Rafele, C. and Arese, M. (2012), "A decision-making approach for investigating the potential effects of near sourcing on supply chain", *Strategic Outsourcing: An International Journal*, Vol. 5 No. 2, pp. 100-120.

Chen, H., Daugherty, P. J. and Roath, A. S. (2009), "Defining and Operationalizing Supply Chain Process Integration", *Journal of Business Logistics*, Vol. 30 No. 1, pp. 63-78.

Chen, I. S. N. and Fung, P. K. O. (2013), "Relationship configurations in the apparel supply chain", *Journal of Business & Industrial Marketing*, Vol. 28 No. 4, pp. 303-316.

Chen, M. K., Lin, Y. L., Fang, C. P. and Chen, K. H. (2013), "Supply chain strategic structure in the Taiwan textile industry", *International Journal of Electronic Business Management*, Vol. 11 No. 22, pp. 73-87.

Choi, T. Y., Dooley, K. J. and Rungtusanatham, M. (2001), "Supply networks as complex adaptive systems: control versus emergence", *Journal of Operations Management*, Vol. 19, 351-366.

Chopra, S. Y Meindl, P. (2013), *Administración de la cadena de suministro*, Estrategia, planeación y operación, 5ª. Ed. Pearson Education, Mexico City.

Christopher, M. (2016), *Logistics and Supply Chain Management*, 5th. Ed. Financial Times/Pearson Education, London, UK.

Dubois, A. and Gadde, L.E. (2002), "The construction industry as a loosely coupled system: implications for productivity and innovation", *Construction Management and Economics*, Vol. 20 No. 7, pp. 621-631.

Eisenhardt, K. M. (1989), "Building theories from case study research", Academy of Management Review, Vol. 14 No. 4, pp. 532-550.

Eisenhardt, K. M. and Graebner, M. E. (2007), "Theory building from cases: opportunities and challenges", *Academy of Management Journal*, Vol. 50 No. 1, pp. 25–32.

Ellis, P. (2003), "Are International Trade Intermediaries Catalysts in Economic Development?", *Journal of International Marketing*, Vol. 11 No. 1, pp. 73-96.

Fabbe-Costes, N., Jahre, M. and Roussat, C. (2009), "Supply Chain Integration: the Role of Logistics Service Providers", *International Journal of Productivity and Performance Management*, Vol. 58 No. 1, pp. 71-91.

Fawcett, S.E. and Magnan, G.M. (2002) ,"The rhetoric and reality of supply chain integration", *International Journal of Physical Distribution & Logistics Management*, Vol. 32 No. 5, pp. 339-361.

Feenstra, R. C. and Hanson, G. H. (2004), "Intermediaries in Entrepôt Trade: Hong Kong Re-exports of Chinese goods", *Journal of Economics & Management Strategy,* Vol. 13 No. 1, pp. 3-35.

Fung, P. K. O., Chen, I. S. N. and Yip, L. S. C. (2007), "Relationships and Performance of Trade Intermediaries: An Exploratory Study", *European Journal of Marketing,* Vol. 41 No. 1/2, pp. 159-180.

Gadde, L. E. and Snehota, I. (2000), "Making the Most of Supplier Relationships", *Industrial Marketing Management,* Vol. 29, pp. 305-316.

Gereffi, G. (2001), "Shifting Governance Structures in Global Commodity Chains, with Special Reference to the Internet", *American Behavioral Scientist,* Vol. 44 No. 10, pp. 1616-1637.

Giri, S. and Rai, S. S. (2013), "Dynamics of garment supply chain", *International Journal of Managing Value and Supply Chains,* Vol.4 No. 4, 43-56.

Glassman, R.B. (1973), "Persistence and loose coupling in living systems", *Behavioral Science,* Vol. 18 No. 2, pp. 83-98.

Ha-Brookshire, J. E. and Dyer, B. (2008), "Apparel import intermediaries: The impact of a hyperdynamic environment on U.S. apparel firms", *Clothing and Textiles Research Journal,* Vol. 26 No.1, pp. 66-90.

Håkansson, H. (1987), *Industrial technological development. A network approach*, Croom Helm, London.

Håkansson, H., & Snehota, I. (1989), "No business is an island: The network concept of business strategy", *Scandinavian Journal of Management,* Vol. 5 No. 3, pp. 187–200.

Hickson, A., Wirth, B., Morales, G. and Comm B. (n.d.), "Supply chain intermediaries study", available at: http://umanitoba.ca/faculties/management/ti/media/docs/scIntermediariesfinalwithcover(1).pdf (accessed 7 August 2017).

Holweg, M., Reichhart, A. and Hong, E. (2011), "On risk and cost in global sourcing", *International Journal of Production Economics,* Vol. 131 No. 1, pp. 333-341.

Hosie, P., Sundarakani, B., Tan, A. W. K. and Kozlak, A. (2012), "Determinants of fifth party logistics (5PL): service providers for supply chain management", *International Journal of Logistics Systems and Management,* Vol. 13 No. 3, pp. 287-316.

Holmen, E. and Pedersen, A. C. (2003), "Strategizing through analyzing and influencing the network horizon", *Industrial Marketing Management,* Vol. 32, pp. 409– 418.

Instituto Nacional de Estadística y Geografía [INEGI] (2014), *La Industria Textil y del Vestido en México 2014. Series Estadísticas Sectoriales*, available at: http://internet.contenidos.inegi.org.mx/contenidos/productos/prod_serv/contenidos/espanol/bvinegi/productos/nueva_estruc/ITV/702825068448.pdf.

Jin, B. (2004), "Apparel industry in East Asian newly industrialized countries: competitive advantage, challenges and implications", *Journal of Fashion Marketing and Management*, Vol. 8 No. 2, pp. 230-244.

Jin, Y. and Edmunds, P. (2015), "Achieving a competitive supply chain network for a manufacturer. A resource-based approach", *Journal of Manufacturing Technology Management*, Vol. 26 No. 5, pp. 744-762.

Käkhönen, A. (2014), "The influence of power positions on the depth of collaboration", *Supply Chain Management: An International Journal*, Vol. 19 No. 1, pp. 17-30.

Kamal, M. M. and Irani, Z. (2014). Analysing supply chain integration through a systematic literature review: a normative perspective. *Supply Chain Management: An International Journal*, Vol. 19 No. 5/6, pp. 523–557.

King, N. (2004), "Using templates in the thematic analysis of text", in C.Cassell and G.Symon (Eds.) *Essential Guide to Qualitative Methods in Organizational Research*. London: Sage.

Lambert, D. M. and Cooper, M. C. (2000), "Issues in supply chain management", *Industrial Marketing Management*, Vol. 29 No. 1, pp. 65-83.

Leuschner, R., Rogers, D. S. and Charvet, F. F. (2013), "A meta-analysis of supply chain integration and firm performance", *Journal of Supply Chain Management*, Vol. 49 (2), pp. 34-57.

Masson, R., Iosif, L., MacKerron, G. and Fernie, J. (2007), "Managing Complexity in Agile Global Fashion Industry Supply Chains", *The International Journal of Logistics Management*, Vol. 18 No. 2, pp. 238-254.

Mirkovski, K., Lowry, P. B. and Feng, B. (2016), "Factors that influence interorganizational use of information and communications technology in relationship-based supply chains: evidence from the Macedonian and American wine industries", *Supply Chain Management: An International Journal*, Vol. 21 No. 3, pp. 334–351.

Mykhaylenko, A., Motika, A., Waehrens, B. J. and Slepniov, D. (2015), "Accessing offshoring advantages: what and how to offshore", *Strategic Outsourcing: An International Journal*, Vol. 8 No. 2/3, pp. 262-283.

Nadvi, K. and Thoburn, J. T. (2004), "Vietnam and the garments and textile chain", *Journal of International Development*, Vol. 16, pp. 11-123.

Naslund, D. and Williamson, S. (2010), “What is management in supply chain management? A critical review of definitions, frameworks and terminology”, *Journal of Management Policy and Practice*, Vol. 11 No. 4, pp. 11-28.

National Chamber of the Clothing Industry [CANAIVE] (2011), “Situación Actual de la Economía y de la Industria del Vestido”, *CANAIVE*, Año 1 No. 1.

Prosman, E. J., Scholten, K. and Power, D. (2016), “Dealing with defaulting suppliers using behavioral based governance methods: an agency theory perspective”, Supply Chain Management: An International Journal, Vol. 21 No. 4, pp. 499-511.

Richey, R. G. Jr., Roath, A. S., Whipple, J. M. and Fawcett, S. E. (2010), “Exploring a Governance Theory of Supply Chain Management: Barriers and Facilitators to Integration”, *Journal of Business Logistics*, Vol. 31 No. 1, pp. 237-253.

Sanchez, M. S. (2010), *La industria textil en México; diagnóstico, prospectiva y estrategia*. Centro de Estudios de Competitividad del Instituto Tecnológico Autónomo de México, Mexico City.

Scheibe, K.P. and Blackhurst, J. (2018), “Supply chain disruption propagation: a systemic risk and normal accident theory perspective”, *International Journal of Production Research*, Vol. 56 No. 1-2, pp. 43-59.

Secretaría de Economía de México (2002), *Programa para la Competitividad de la Cadena Fibras-textil-vestido*. Secretaría de Economía, Mexico City.

Simatupang, T. M., Wright, A. C. and Sridharan, R. (2002), “The knowledge of coordination for supply chain integration”, *Business Process Management Journal*, Vol. 8 No. 3, pp. 289-308.

Stevens, G. C. and Johnson, M. (2016), "Integrating the Supply Chain … 25 years on", *International Journal of Physical Distribution & Logistics Management*, Vol. 46 No. 1, pp. 19-42.

Su, J. and Gargeya, V. B. (2012), “Strategic sourcing, sourcing capability and firm performance in the US textile and apparel industry”, *Strategic Outsourcing: An International Journal*, Vol. 5 No. 2., pp. 145-165.

Vallet-Bellmunt, T. and Rivera-Torres, P. (2013), “Integration: attitudes, patterns and practices”, *Supply Chain Management: An International Journal*, Vol. 18 No. 3, 308–323.

Yin, R. K. (2003), *Case Study Research. Design and Methods*, 2nd. Ed. Thousand Oaks, Sage Publications Applied Social Research, Methods Series, London, UK.

Zhao, X., Huo, B., Flynn, B.B. and Yeung, J. (2008), "The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain", *Journal of Operations Management*, Vol. 26 No. 3, pp. 368-388.

[1] The companies' names are omitted from this discussion for confidentiality reasons. Names are available upon request.

[2] Full-package production refers to the ability of the manufacturer to supply a complete product or full line of products. To offer this type of production, the manufacturer needs to perform all of the production and logistics activities of the apparel chain, either by itself or through cooperation with other producers.

[3] The special online directory of textiles known as the "Teleteca" was initially developed by Aztex upon request of the Mexican Economy Ministry, which finances the effort. Aztex maintains samples of most of the textiles registered in the Teleteca and updates it by asking for new fabrics from qualified producers. See Hernández, V. (2005). Está México retrasado en el diseño de moda. *El Siglo de Torreón*, March 17. https://www.elsiglodetorreon.com.mx/noticia/138952.esta-mexico-retrasado-en-el-diseno-de-moda.html.