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Supply network relationships: a review of empirical evidence

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Abstract

Supply networks are prevalent industry structures which, like the academic literature, are complex, confusing and short on practical guidance. We evaluate the current position of empirical research to expose the main constructs that can be used to study cooperative supply network relationships, to identify emergent themes, gaps and shortcomings, to share insights with managers and, to propose future research approaches. Five significant drivers of supply network relationship behaviors are identified: complexity, power, alignment of objectives, knowledge management and coordination. This paper provides a unique, topical 'map' of the supply networks field and proposes a theoretical model for integrating the many diverse concepts into a general framework. This will enable researchers to focus more effectively on its relational dynamics. We also give managers some key guidance for successful operations within these essential structures.

Keywords: *Supply, Networks, Cooperative Relationships, Complexity, Power, Alignment, Coordination, Knowledge Utilization*

1 Introduction

Research into supply chains has tended to focus on dyadic relationships despite the considerable growth in recent years of multi-party structures including co-operative supply networks, consortia, joint ventures and strategic alliances (Christopher, 2005; Gulati, 1988; Luo & Park, 2004). There is a very large body of knowledge on dyadic supply chain relationships, much of it contained within the supply chain management literature, and it is widely acknowledged that they are difficult enough to understand. But, as soon as additional parties are involved and supply networks are observed, the complexity of dynamics, diversity of theories involved and the physical difficulty of carrying out the research increases exponentially (Andersen & Christensen, 2005; Giannakis & Croom, 2004; Håkansson & Persson, 2004). Moreover, the problems are considerable for operational managers in situations where multiple interdependencies, non-linear feedback and hidden consequences are the norm (Humphries & Gibbs, 2010, p.112).

For purposes of this research the term supply network refers to a set of interconnected supply chains encompassing both up-stream and down-stream co-operative relationships (Harland, Zheng, Johnsen & Lamming, 2004). Supply networks are formed to create, stimulate, capture and satisfy end customer demand through the innovation of products, services and network structures in a global dynamic environment (Harland & Knight, 2005). Relationship management is defined as establishing, developing and maintaining successful relational exchanges as a result of designing and negotiating strategic partnerships (Webster, 1992). Supply networks are characterized by their complexity and differentiation encompassing diverse topologies, lateral links, reverse loops, and multi-way exchanges, and include a broad, strategic view of resource acquisition, development, management, and transformation (Choi & Krause, 2006; Lamming, Johnsen, Zheng & Harland, 2000). This complexity is also defined by the nonlinear dynamic interactions of the individual parts. When several locally optimal policies interact in a complex supply network, the resulting nonlinear dynamics of global behavior can be unpredictable. In effect the network reacts to

and creates its environment so that as the environment changes it may cause the agents within it to change, which, in turn, cause other changes to the environment (Choi, Dooley & Rungtusanatham, 2001; Pathak, Dilts & Biswas, 2007b).

In response to the growth of the supply network phenomenon as a prevalent method of doing business in today's highly dynamic, globalised markets, a large number of studies have been carried out, notably by Harland, Lamming, Zheng and Johnsen (2001), Harland et al. (2004), Choi and Hong (2002), Choi and Wu (2009) and Kemppainen and Vepsalainen (2003) that have developed conceptual frameworks for understanding network behaviors. However, these have generally focused on particular aspects such as topology and information flows. Papers have also been written in diverse fields such as economics (Hwang & Burgers, 1997; Ireland, 2002; Williamson, 2008) and organizational theory (Ireland, 2002; Kale, Dyer & Singh, 2002; Sakibara, 2002; Das & Teng, 2002, 2003; Kemppainen & Vepsalainen, 2003; Harland et al., 2004; Mehta, Plsa, Mazur, Xiucheng & Dubinsky, 2006; Skipper, Craighead, Byrd, & Rainer, 2008). Social networking theory has emerged in recent years as a possible theoretical framework to help understand supply networks (Borgatti & Li, 2009; Li & Choi, 2009). However, we concur with Harland, et al. (2004) and Knight and Harland (2005) over their reticence in translating social psychology theory to the level of operational organizations in networks. We have accordingly concentrated our review on the operational dynamics that occur in supply network relationships.

Due to the many theories at play in the phenomenon, the field is multi-disciplinary, complex and fragmented and in need of a coherent approach to map it. What is lacking is a model that takes an 'enterprise relationship management' perspective in order to explore the set of constructs that are essential to the success of the total, supply network enterprise.

The purpose of this paper is to examine the field and in particular to expose the main themes that can be used to facilitate the study of supply network relationships. It concentrates on the management of supply network relationships rather than their formation or dissolution. Additionally it aims to identify emergent themes, gaps and shortcomings, to share insights with managers and, to propose research approaches that would be suitable to address them. The authors considered adopting a theoretical framework to support the data analysis. However, because of the relatively early stage in the development of supply network research, the approach was discounted to avoid imposing structure on emerging data. It was more appropriate to allow the data 'speak for itself'.

This paper is divided into four parts. The first one is dedicated to discussing the methods used to approach the supply networks literature with particular emphasis on publications over the last 10 years, arguing the identification and selection of papers for the review. The second continues with the empirical evidence that can be used to describe and explain supply networks through its theories and constructs. Part three concentrates on the emergent key themes of power, objectives and their alignment, learning, knowledge capture and dissemination and co-ordination, because they appear to be the predominant areas of management concern and theoretical complexity. In the last section this paper's findings are discussed, conclusions are drawn for academics and practitioners and, the gaps in the field and shortcomings are translated into promising research questions.

2 Methodology

The supply network relationship field is fragmented, nascent and lacks a systematic and comprehensive overview. To methodically approach the wide range of literature, we adopted the process steps developed by Tranfield et al. (2003) which seeks to undertake reviews that are systematic, transparent and replicable. Firstly, expert opinion regarding the state of recent research pertaining to supply networks was sought from a panel of three

experienced academics in this field. With this overview in mind, an initial list of keywords was generated from the authors' experience and discussed with a panel of experts. The result was a total of 31 keywords that formed the basis of the search strings used to query the literature databases: supply chain network relationships, supply chain network relationship management, supply chain triads, supply chain triadic relationships, strategic alliances, supply chain collaboration, inter-organizational relations, complex adaptive systems, supply base, value-added networks, relational capabilities, business relationships, alliance performance, supply chain collaboration, supply chain integration, multi-party relationships, co-operative networks, alliance constellations, inter-firm networks, supply chain network dynamics, joint venture management groups, multi-firm alliances, supply chain partnerships, inter-firm collaboration, alliance power, alliance performance, network theory, supply network topologies, strategic sourcing, supply chain consortia, supply network complexity.

In the next step, we undertook an extensive search of selected peer-reviewed journals (e.g., Journals) we used two databases ABI/Inform Global (Proquest) which covers 2,860 journals in business and management and EBSCO (Business Source Complete) covering over 1,200 scholarly business journals. From the results obtained, we initially selected 84 articles that were directly related to supply networks and undertook an in-depth examination of these articles to identify significant theoretical, methodological, and technical developments. Two researchers read each paper documenting the objectives, definitions, theories and methods. Following this process the number of papers for final analysis was reduced to 52 by excluding those that were weak or only of peripheral interest or where treatment of the subject was stronger or more comprehensive in other papers. The criteria for selecting these papers were relevance (supply networks and their relationships), theoretical depth, methodological robustness (for empirical papers), clarity of argumentation and, significance of the findings. Table 1 shows the quality criteria applied to the papers. Both researchers assessed every paper independently and jointly agreed on a final evaluation. If a paper ranked as poor (1) on any of the criteria it was excluded from further analysis.

Table 1. Literature quality selection criteria

Parameter	1	2	3
Background theory	Research poorly based in literature, weak links to previous research	Average	Comprehensive account of previous research and a strong link to its own contribution.
Method	Poor argumentation for the applied research methods, and/or unsuitable choice of method.	Average	Well-argued choice of suitable method for the particular research problem.
Argumentation	Inaccurate stereotyping and generalizations, and weak logic of argumentation.	Average	Well founded claims through a clear logic of argumentation.
Findings	Unclear or insignificant contribution to theory. Inconsistency with goals of the research.	Average	Novel and significant contribution of importance for both theory and practice.
Relevance	Low relevance	Average	High relevance

Note: These criteria were constructed following the guidelines of the Advanced Institute of Management Research (AIM) for conducting systematic reviews of the literature, which can be found at <http://www.aimexpertresearcher.org/>; last visited 23/04/12. Similar criteria have been used for AIM studies, such as: Leseure, M., Birdi, K., Bauer, J., Denyer, D. & Neely, A. (2004). *Adoption of Promising Practice*, AIM, ISBN No. 0-9546885-2-X, available from: http://www.aimresearch.org/uploads/File/Publications/Academic%20Publications%202/Adoption_of_promising_practices%281%29.pdf, last visited 23/04/12.

In the next part of the paper the empirical evidence from the literature review is evaluated. It begins with an overview and then considers the theories and constructs used by researchers in the supply network relationships field. It concludes by analyzing the linkages within the 20 main constructs and identifying 5 emergent themes that appear to be the most important from theoretical and management perspectives.

3 Supply networks - empirical evidence

3.1 The field - first impressions

The wide variety and richness of the field is immediately noticeable including the diversity of terms used to refer to very similar, if not exactly the same, concepts. Some of the main terms encountered in this research include alliance (Kale et al., 2002), strategic alliance (Parise & Casher, 2003); international strategic alliance (Mehta et al., 2006), multi-firm alliance (Hwang & Burgers, 1997), inter-firm network (Granodi & Soda, 1995), industrial network (Johnsen, Wynstra, Zheng, Harland, & Lamming, 2000), collaborative network (Parise & Casher, 2003), co-operative network (Gnyawali & Madhavan, 2001), constellation (Jones et al., 1998; Gomes-Casseres, 2003) and alliance constellation (Das & Teng, 2002). Although these definitions were broadly consistent with that provided by Harland et al. (2004), in many cases the bounds of the networked relationships were inadequately defined against a common baseline. As a consequence unexplained overlaps and inconsistencies were apparent. It was clear that supply networks could take different structures (topologies) and adopt different types of behavior (typologies) and several authors have developed classification systems to characterize them. For instance, Patak, Day, Nair, Sawaya, and Kristal (2007a) discuss different topologies such as centralized, linear, hierarchical, federated and starburst and, self-evolving (Li, Sun, Gu, & Dong, 2007; Pathak, Dilts & Mahdevan, 2009). Grandori and Soda (1995) classify networks according to symmetry and the degree of centralization. Das and Teng (2002) present a typology based on exchange horizon (short or long) and type of generalized reciprocity (chain or net). Hwang and Burgers (1997) follow a game theory perspective to classify networks according to their payoff structure, where the incentives for co-operation will determine the type of network; and Jones, Hesterly, Fadmoe-Lindquist, and Brogatti (1998) use the scope of activities and the governance mechanism as a basis for classification.

The literature presented a rich terminology with which to describe a complex and diverse field. However, the multitude of terms developed from a wide variety of research objectives has generated a somewhat confusing picture. Many of the models presented covered similar but not quite the same factors. Moreover, a number of dynamics appeared to fit in more than one situation but not in others. Overall, at etymological level, the supply networks field has yet to develop a consistent language to define its terms. As a result, it is difficult to compare like with like and to establish a firm basis from which the researcher can access the field. In the next two sections the theories and constructs used in the study of supply networks will be discussed.

3.2 Supply network theories

A wide range of theories, frameworks and subject areas have been used to explore, describe and explain supply networks. Table 2 includes a brief description of the major theoretical domains and their relevance to the study of supply networks. In particular it exposes a developing methodological trend of two major lines of research; organizational dynamics and process matters.

Table 2. Supply networks literature: theoretical review

Theme	Context and Relevance	References
Transaction Cost Economics (TCE)	Context: An economics theory developed by Coase (1937) and Williamson (1975, 1996, 2008) which has been used to explain supply network decisions. The key elements of transaction costs are frequency, specificity, uncertainty, bounded rationality, and opportunism.	Samaddar, et al., 2006; Choi & Krause, 2006; Jammerneegg & Kischka, 2005; Harland, et. al., 2004; De Toni & Nassimbeni, 1995; Grandori & Soda, 1995; Ireland et al., 2002; Garcia-Canal, et al., 2003
	Relevance: From a TCE perspective, networks represent an intermediary solution between the hierarchies and markets, in which organizations agree to long term co-operation with the prospect of repeated transactions (de Toni & Nassimbeni, 1995)	
Resource Based View (RBV)	Context: RBV argues that possessing resources such as processes, knowledge and capabilities can help organizations differentiate from their competitors (Collins & Hitt, 2006). According to Barney (1991) four characteristics make resources a source of competitive advantage by being: rare, valuable and non-substitutable or non-transferable.	Jones, et al., 1998, Dyer, et al., 2001, Ireland et al., 2002, Sakakibara, 2002, Das & Teng, 2003, Collins & Hitt, 2006
	Relevance: Das and Teng (2003) in particular propose that the specific characteristics of resources and their alignment between network partners can help develop collective strengths and improve network performance.	
Knowledge Based View	Context: The Knowledge Based View (KBV) proposes that “knowledge is the overwhelmingly important productive resource” (Grant, 1997).	Adamides, et al., 2008; Samaddar, et al., 2006; Koh & Tan, 2006; Kale, et al., 2002; Dyer, et al., 2001; Meier, 2011
	Relevance: Creating, acquiring and sharing are central to the operation of supply networks and can help to develop shared understanding, and trust (Adamides, et al., 2008). Furthermore it’s been suggested that through understanding and knowledge organizations can cope better with uncertainty (Koh & Tan, 2006; Meier, 2011). Dyer, et al. (2001) propose a dedicated function to support knowledge and learning across organisations.	
Industrial Marketing and Purchasing (IMP)	Context: The IMP approach, originally developed by Håkånsson, focuses on the study of long-term, mutually beneficial relationships in networks involving the provision of industrial goods (Anderson, et al., 1994; Harland et al., 2004; Grandori & Soda, 1995).	Harland, et al., 2004, Grandori & Soda, 1995, Johnsen et al., 2000
	Relevance: The IMP approach looks at the exchange aspects of inter-firm networks, such as trust and commitment, and the dynamics of networks (Harland, et al., 2004; Grandori & Soda, 1995), rather than on the transaction costs	
Complexity	Context: Complex Adaptive Systems (CAS) are collections of interconnected autonomous entities that self-organize and adapts over time without central control.	Choi, et al., 2001; Pathak, et al., 2007a; Pathak, et al., 2007b; Li, et al., 2007; Choi & Krause, 2006; Skilton & Robinson, 2009
	Relevance: CAS theory has been used to explain the behaviour and evolution of supply networks. According to Choi, et al. (2001), by thinking of a supply network as a CAS, it is possible to interpret the behavior of the network in a more complete manner and develop interventions that	

	are more likely to be effective.	
Others	<p>Agency Theory</p> <p>Game Theory</p> <p>Evolutionary Economics</p> <p>Industrial Networks Theory</p> <p>Organizational Learning</p> <p>Organizational Behavior</p> <p>Relational Networks</p> <p>Role Theory</p> <p>Strategic Management</p>	<p>Cheng & Kam, 2008; Samaddar et al., 2006</p> <p>Grandori & Soda, 1995; Hwang & Burgers, 1997; Pathak et al., 2007b</p> <p>Grandori & Soda, 1995; Kale et al., 2002</p> <p>Andersen & Christensen, 2005; Harland et al., 2001; Lamming et al., 2000; De Toni & Nassimbeni, 1995</p> <p>Grandori & Soda, 1995; Kale et al., 2002; Mehta et al., 2006</p> <p>Grandori & Soda, 1995; Garcia-Canal, Valdes-Llaneza, & Ariño, 2003; Harland et al., 2004; Skipper et al., 2008</p> <p>Grandori & Soda, 1995; Garcia-Canal et al., 2003; Wu & Choi, 2005</p> <p>Jammerneegg & Kischka, 2005; Andersen & Christensen, 2005; Knight & Harland, 2005</p> <p>Grandori & Soda, 1995; Garcia-Canal et al., 2003; Gomes-Caseres, 2003; Harland et al., 2004; Skipper et al., 2008</p>

From the Transaction Cost Economics (TCE) (Williamson, 1975; 1996; 2008) literature the participation of a firm as part of a network is explained through the make-or-buy decision, focusing on selecting the governance structure (market, hierarchy or hybrid) that is deemed more appropriate for economizing on transaction costs (Williamson, 2008). This is particularly useful because it demonstrates that supply network theory can be anchored in a theory that provides an explanation of business dynamics at a fundamental level. On the other hand, the Resource Based View (RBV) (Barney, 1991) explains participation in a network as an attempt to extend and complement a firm's internal resources to develop sustainable competitive advantage. The Knowledge Based View (KBV) (Grant, 1996; 1997) is a development of the Resource Based View which proposes knowledge as the central resource for sustainable competitive advantage. According to Meier (2011) this is particularly relevant to supply networks because knowledge and information sharing

(knowledge management) are seen as essential facilitators for operational integration. As a result, a number of authors (e.g. Adamides, Karacapilidis, Pylarinou & Koumanakos, 2008; Samaddar, Nargundkar & Daley, 2006; Koh & Tan, 2006; Kale, Dyer & Singh, 2002; Dyer, Kale & Singh, 2001) have focused specifically on the role of knowledge to explore and explain the operation of supply networks. The Industrial Marketing and Purchasing (IMP) approach considers the exchange aspects of networks, such as trust and commitment, and the dynamics of network relationships (Harland et al., 2004). Finally, Complex Adaptive Systems (CAS) Theory presents a different perspective which does not seek to explain the motivation for participating in the network but can help interpret the behavior of supply networks (Choi et al., 2001). An interesting aspect of CAS is the ability of a network to evolve/be self-organizing and as a result, behaviors of the participants can be unpredictable (Li, Sun, Gu, & Dong, 2007; Pathak et al., 2009).

Although these theoretical studies probe supply network from a variety of different directions, there are relatively few papers in all and little depth in the key area of relational dynamics. For instance, theoretical insights that integrate 'soft' concepts such as interdependence, reciprocity, value, long-term orientation, co-operative behavior, personal relationships and adaption that are considered to be essential components of relational theories (Humphries & Wilding, 2003; Hwang & Burgers, 1997) are barely encountered. Moreover, the existence of a theory to extend inter-organizational relationship dynamics into the supply network setting is also scant. Other less prominent theories identified in the literature review are included in Table 2 for completeness.

The review in general shows there is no lack of efforts to develop theory in the field with several papers presenting theoretical contributions (Hwang & Burgers, 1997; Jones et al., 1998; Gnyawali & Madhavan, 2001; Gomes-Casseres, 2003; Das & Teng, 2002; 2003; Ireland, Hitt, & Vidyanath, 2002; Samaddar et al., 2006; Choi & Krause, 2006; Pathak et al., 2007a; Skipper et al., 2008; Cheng & Kam, 2008). However, the wide diversity of theories and subject areas applied to the study of supply networks exposes the field's relative nascency, its lack of a theory of its own, its multidisciplinary, its dynamism attracting both theoretical and empirical contributions and above all, its fragmentation.

3.3 Supply network constructs

Within the body of literature reviewed we have identified the most prominent constructs used to describe supply network relationships. This was done by analyzing the key themes in the literature and both the process and the results were validated by a panel of academics. A total of 20 constructs were identified and are presented in Table 3.

Table 3. Constructs used to describe supply network relationships

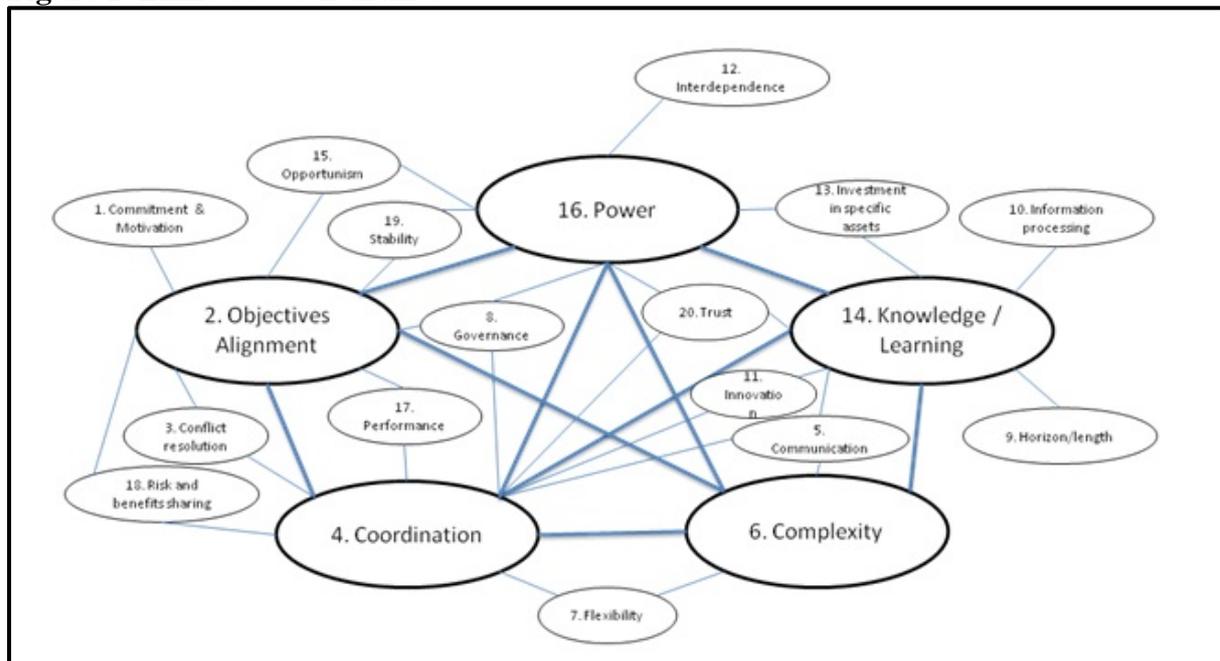
Construct	References
1. Commitment and motivation	Hwang & Burgers, 1997; Harland et al., 2004; Choi & Krause, 2006; Samaddar et al., 2006
2. Objectives alignment	Killing, 1988; De Toni & Nassimbeni, 1995; Gradiori & Soda, 1995; Lambert, 1996b; Hwang & Burgers, 1997; Choi et al., 2001; Gnyawali & Madaven, 2001; Lamming et al., 2001; Das & Teng, 2002; Garcia- Canal et al., 2003; Kempainen & Vepsalainen, 2003; Harland et al., 2004; Anderson & Christensen, 2005; Choi & Krause, 2006; Collins & Hitt, 2006; Mehta et al., 2006; Samaddar et al., 2006; Holmen et al., 2007; Li et al., 2007; Pathak et al., 2007a; Pathak et al., 2007b; Skipper et al., 2008;
3. Conflict resolution	Grandori & Soda, 1995; Johnsen et al., 2000; Skipper et al., 2008; Knight & Harland, 2005

4. Coordination	Grandori & Soda, 1995; Hwang & Burgers, 1997; Choi et al., 2001; Dyer et al., 2001; Ireland et al., 2002; Kale, et al., 2002; Garcia-Canal et al., 2003; Kemppainen & Vepsalainen, 2003; Cheng et al., 2004; Wu & Choi, 2005; Anderson & Christensen, 2005; Jammerneegg & Kischka, 2005; Knight & Harland, 2005; Choi & Krause, 2006; Wilding & Humphries, 2006; Yee & Platts, 2006; Humphries et al., 2007; Ryals & Humphries, 2007; Skipper et al., 2008; Williamson, 1975; 1996; 2008;
5. Communication	Grandori & Soda, 1995; Johnsen et al., 2000; Garcia-Canal et al., 2003; Kemppainen & Vepsalainen, 2003; Harland, et al., 2004; Skipper et al., 2008; Adamides et al., 2008; Skipper et al., 2008, Skilton & Robinson, 2009
6. Complexity	Killing, 1988; Grandori & Soda, 1995; Choi et al., 2001; Das & Teng, 2002; Kemppainen & Vepsalainen, 2003; Choi & Krause, 2006; Wilding & Humphries, 2006; Pathak et al., 2007a; Pathak et al., 2007b; Skilton & Robinson, 2009
7. Flexibility	Grandori & Soda, 1995; Ireland et al., 2002; Collins & Hitt, 2006; Mehta et al., 2006; Yee et al., 2004 ; Yee & Platts, 2006; Gunter et al., 2006
8. Governance	Grandori & Soda, 1995; Hwang & Burgers, 1997; Jones et al., 1998; Dyer et al., 2001; Ireland et al., 2002; Garcia-Canal et al., 2003; Kemppainen & Vepsalainen, 2003; Mehta et al., 2006; De Toni & Nassimbeni, 1995;
9. Horizon / Length	Das & Teng, 2002; Kale, et al., 2002; Sakakibara, 2002; Garcia-Canal et al., 2003; Kemppainen & Vepsalainen, 2003; Mehta et al., 2006
10. Information processing	Grandori & Soda, 1995; Johnsen et al., 2000; Kemppainen & Vepsalainen, 2003; Harland et al., 2004; Harland et al., 2001;
11. Innovation	Jones et al., 1998; Ireland et al., 2002; Gomes-Caseres, 2003; Harland et al., 2004; Wu & Choi, 2005; de Toni & Nassimbeni, 1995; Burgess et al., 2006; Harland et al., 2001; Yee & Platts, 2006; Choi & Krause, 2006
12. Interdependence	Grandori & Soda, 1995; Das & Teng, 2002; Harland, et al., 2004; Skipper, et al., 2008; Knight & Harland, 2005; Skipper, et al., 2008
13. Investment in specific assets	Grandori & Soda, 1995; Hwang & Burgers, 1997; Kale et al., 2002; Harland et al., 2004
14. Learning, Knowledge capture and dissemination	De Toni & Nassimbeni, 1995; Grandori & Soda, 1995; Jones et al., 1998; Johnsen et al., 2000; Lamming et al., 2000; Dyer et al., 2001; Harland & Knight, 2001; Das & Teng, 2002; Ireland et al., 2002; Kale et al., 2002; Koka & Prescott, 2002; Das & Teng, 2003; Garcia-Canal et al., 2003; Gomes-Caseres, 2003; Kemppainen & Vepsalainen, 2003; Harland et al., 2004; Burges et al., 2005; Christopher, 2005; Collins & Hitt, 2006; Koh & Tan, 2006; Mehta et al., 2006; Samaddar et al., 2006 ; Adamides et al., 2008; Ryals & Humphries, 2007; Skipper et al., 2008; Pathak et al., 2009; Skilton & Robinson, 2009; Meier, 2011
15. Opportunism	Grandori & Soda, 1995; Hwang & Burgers, 1997; Gnyawali & Madhavan, 2001; Sakakibara, 2002; Samaddar et al., 2006;
16. Power	Tawney, 1931, p. 229; Webber, 1947; Gnyawali & Madhavan 2001; Gomes-Caseres, 2003; ; Humphries & Wilding, 2003; Cox 2004; Wu & Choi, 2005;2009; Choi & Krause, 2006; Methusamy & White, 2006; Mehta et al., 2006; Wilding & Humphries, 2006; Adamides et al., 2008; Williamson, 2008; Li & Choi, 2009; Skilton & Robinson, 2009
17. Performance	Cheng & Kam, 2008; Danese et al., 2006; Hameri & Paatela, 2005; Jammerneegg & Kischka, 2005 Kale et al., 2002
18. Risk and benefit sharing	Hwang & Burgers, 1997; Gomes-Caseres, 2003; Harland et al., 2004; Skipper, et al., 2008
19. Stability	Kemppainen & Vepsalainen, 2003; De Toni & Nassimbeni, 1995; Pathak et

	al., 2009;
20. Trust	Grandori & Soda, 1995; Hwang & Burgers, 1997; Ireland et al., 2002; Kale et al., 2002; Garcia-Canal et al., 2003; Collins & Hitt, 2006; Adamides et al., 2008; Jammerneegg & Kischka, 2005;

Grandori and Soda's (1995) comprehensive review provided a starting point for the analysis. As can be seen in Table 3 their work was comprehensive however, there are other areas of developments which expand understanding of supply network relationships. Constructs not highlighted by Grandori and Soda (1995) are commitment and motivation (Hwang & Burgers, 1997; Harland et al., 2004); compatibility (Das & Teng, 2002; Koka & Prescott, 2002; Garcia-Canal et al., 2003; Parise & Casher, 2003; Harland et al., 2004); horizon (Das & Teng, 2002; Kale et al., 2002; Sakakibara, 2002; Garcia-Canal et al., 2003; Kemppainen & Vepsalainen, 2003; Mehta et al., 2006); power (Gnyawali & Madhavan, 2001; Gomes-Casseres, 2003; Wu & Choi, 2005; Mehta et al., 2006); performance (Kale et al., 2002); risk and benefit sharing (Hwang & Burgers, 1997; Harland et al., 2004; Skipper et al., 2008) and stability (Kemppainen & Vepsalainen, 2003). This situation is arguably related to developments in theory and practice in the field since their original work. Deeper examination of the papers in each indicates a wide spread of interest and little attempt at integration. However, the publications reviewed enabled links between the different constructs to be identified and analyzed. A graphical representation of this analysis is presented in Figure 1. The analysis reveals that five of the themes stand out because of their extensive treatment in the literature and because of their interconnectivity among the others (number of connections shown in brackets). These are: (2) Objectives alignment, (4) Coordination, (6) Complexity, (14) Knowledge / Learning, and (16) Power. This potentially identifies those are areas of particular management concern and theoretical complexity. In consequence, these emergent key themes are discussed in the next section.

Figure 1. Links between themes



4 Emergent key themes

4.1 Complexity

Perhaps the most obvious and significant characteristic of supply network relationships is the complexity that results from the number of participants (Killing, 1988; Choi & Krause, 2006; Skilton & Robinson, 2009). Supply networks are not simply collections of dyads and this will be manifested in a combination of ways. Primarily are contributions from Complex Adaptive Supply Network Theory which focuses on the unpredictability of behaviors resulting from the interactions of many autonomous, interconnected organizations (Choi et al., 2001; Pathak et al., 2007a; Pathak et al., 2007b; Skilton & Robinson, 2009). Many different configurations are possible including for example: all peers (symmetric), a group within a group (constellations), a group with one dominant leader (asymmetric or centralized) and, a group with a number of sub-groups (Grandori & Soda, 1995; Das & Teng, 2002). Then there are different topologies including no structure, centralized, linear, hierarchical, federated and starburst structures (Pathak et al., 2007a). Williamson (2008) does not qualify TCE's uncertainty/complexity dimension by size of relationship or its degree of variegation but, the principle of difficulty of adaption continues to apply and is magnified by the greater number of participants (Kempainen & Vepsalainen, 2003; Choi & Krause, 2006). Next, is the increased diversity of objectives, interests, capabilities and cultures that the participants in the relationship might have. Objectives in particular should be aligned, however the larger the number of partners, the more difficult it becomes to achieve such alignment (Pathak et al., 2007b; Skilton & Robinson, 2009). Additionally, there are difficulties associated with managing inter-organizational processes across networks through co-ordination and control mechanisms such as communication, decision and negotiation mechanisms, control mechanisms, integration and linking-pin roles and units, common staff, hierarchy and authority relations, planning and control systems, incentive systems, selection systems, information systems, public support and infrastructure (Grandori & Soda, 1995, Choi et al., 2001; Harland et al., 2004). It is thus likely that Williamson's Organization Failure Framework (1975) behaviors such as opportunism, information impactedness and bounded rationality will find more opportunity to be manifested because of the increased difficulty of defection due to the increased difficulty of understanding motives and objectives (Harland et al., 2004; Kale et al., 2002; Choi et al., 2001; Wilding & Humphries, 2006). These "webs" of relationships thus present significant management challenges (Harland, 1996a; Dyer et al., 2001; Kale et al., 2002; Kempainen & Vepsalainen, 2003; Pathak et al., 2007a). In summary, complexity is an area of the literature where there is considerable agreement on its seeming all-pervasive importance and its impact on the relational and therefore the operational dynamics in the supply network context. But, as yet there is little work to bring its many facets together into a coherent focus.

4.2 Power

The exercise of power in inter-organizational relationships can be overt or subtly hidden. It can be exercised by a single company or by two or more working together. Thus, efforts to build trust and stability in order that efforts can be focused on outputs can be hindered (Cox, 2004; Humphries & Wilding, 2003). Webber (1947), p. 152, defined power in inter-organizational relationships as "the probability that one actor within a social relationship will be in a position to carry out his own will despite resistance" (Webber, 1947, p.152) and more recently by Cox (2004) as "a situation – where one party attempts to gain a disproportionate share of the gains from a relationship". We would suggest that this defines the abuse of power which ignores its more positive uses. Taking a more neutral position, power-based control has often been shown to be an ineffective management mechanism

because the other party cannot be made to yield because he has invested relationship-specific assets such as know-how, IT and infrastructure that are critical to the relationship – a symmetric dependency situation (Methusamy & White, 2006; Wilding & Humphries, 2006). Thus, without considerable disruption and cost, interdependence will lock partners into a relationship, encourage forbearance and discourage opportunism (Wu & Choi, 2005; 2009).

In a specific supply network context, Tawney (1931), p. 229, defined power as “the capacity of an individual, or group of individuals, to modify the conduct of other individuals or groups in the manner which he desires, and to prevent his own conduct being modified in the manner in which he does not.” Within supply network relationships the effects of interdependence as a power modifier are likely to be diluted by the diffusion of dependencies within the network (Gnyawali & Madhavan, 2001; Gomes-Caseres, 2003; Choi & Krause, 2006). Williamson (2008) proposes this modifier will be replaced by uncertainty where buyers only really care about competition between suppliers in order to minimize their risks. They often try to accomplish this even at the cost of jeopardizing their long-term relationships with existing suppliers. Alternatively, Adamides et al. (2008) and Skilton and Robinson (2009) have suggested that structured knowledge management can create trust in the network which acts both as a modifier of power relationships and as a co-ordination mechanism. However, even in a supply network situation where a large firm is clearly the dominant partner, the use of overt and covert collusions by alliance members to undermine or subvert attempts to control is a strong possibility i.e. “using-up” rather than using your suppliers (Choi & Krause, 2006; Williamson, 2008). Wu & Choi's (2005) research demonstrated this in an example where a customer attempted to manipulate a group of suppliers to maintain competitive, costs pressures to its advantage. This resulted in a disparate group of suppliers “banding together” and eventually dominating the customer. Li and Choi (2009) portrayed a situation in services outsourcing where the power of the original supplier was eroded by direct contacts between the customer and outsourced supplier. Although various aspects of management that manifest themselves in inter-organizational power-plays are covered in the literature, the extent of power diffusion in supply networks is not addressed. Nor, is the question of whether power is less likely to be an effective control strategy in supply network relationships. Moreover, the key question of how to reduce the tendency to use power for selfish purposes rather than for the benefit of the network has not been answered.

4.3 Objectives and their alignment

A large section of the supply networks literature tends to focus on specific operational issues such as efficiency, customer service, marketing advantages and stability (Lambert, 1996b; Lamming et al., 2001) and the alignment, communication and adaptation of such objectives is considered to be a challenging activity. In supply networks, the objectives of the alliance partners tend to be more complex and diverse and in many cases not clear or concealed (Kemppainen & Vepsalainen, 2003; Collins & Hitt, 2006; Choi & Krause, 2006; Pathak et al., 2007a; Pathak et al., 2007b). Firstly there is the explicit objective of the supply network, the sense of purpose that unifies all of the participants (Lamming et al., 2001; Skipper et al., 2008). Secondly, for each participant in the relationship there will be a set of objectives and interest which can be overt or covert (Killing, 1988). For instance, while the overall objective of a supply network could be to bring financial benefits to the participants, some of the participants might assign more importance to other outputs of the relationship, such as learning, gaining reputation or even obtaining confidential information from the other partners (De Toni & Nassimbeni, 1995; Hwang & Burgers, 1997; Skipper et al., 2008). Christopher (2005) suggests that “partners in a network need to carry out a significant higher

level of joint strategy development" in order that they collectively agree the strategic goals for the network and the means of attaining them.

Several authors (Choi et al., 2001; Choi & Krause, 2006; Li et al., 2007; Holmen, Pedersen & Jansen, 2007, Pathak et al., 2009) argue that new objectives could emerge from the alliance itself, and these could be considerably different to the objectives of the participants. Hence the possibility of finding conflicting objectives increases as does the risk of opportunistic behavior (Gradiori & Soda, 1995; Hwang & Burgers, 1997; Gnyawali & Madaven, 2001; Samaddar et al., 2006). The higher likelihood of conflicting objectives in supply networks creates a need for different governance mechanisms which are necessary to maintain the stability and continuity of the relationship (Collins & Hitt, 2006; Mehta et al., 2006). The need for more informal governance mechanisms to cope with the alignment of member and collective objectives is a managerial requirement but, although there are some interesting case studies in the literature, theoretical studies are crucially absent.

4.4 Knowledge management

Knowledge management is defined as learning, knowledge capture and dissemination. The aim of a networked supply relationship is more often than not the "marrying" of capabilities to develop and deliver a product or service. Learning and skills acquisition are likely to be present but is may not be the main concern of the partners (Collins & Hitt, 2006; Samaddar et al., 2006; Adamides et al., 2008). Alternatively, where a number of organizations have formed an alliance they will concomitantly have created an information and skill-rich environment (Skipper et al., 2008; Meier, 2011). Therefore, the opportunities to learn new managerial and technical techniques will be many and valuable (Koka & Prescott, 2002; Das & Teng, 2003; Gomes-Caseres, 2003; Koh & Tan, 2006). Many organizations enter into supply network relationships specifically to learn from their partners and will set their risk/reward objectives accordingly (Skipper et al. 2008). In turn, learning together leads to relationship intensification which prevents inertia and promotes environmental adaptation and trust (Ireland et al. 2002; Harland et al., 2004). In a supply network, therefore, learning can be a strong influence on relationship stability, productivity and longevity (De Toni & Nassimbeni, 1995; Dyer et al. 2001; Skipper et al., 2008; Pathak et al., 2009). Meier (2011) provides an excellent review of knowledge management in strategic alliances however, the ways that knowledge capture is operationalized and in turn affects the supply network relationship dynamics is an area that is in need of further research.

It has been proposed that a key role of a formal, alliance management function is the management of learning (Dyer et al., 2001; Kale et al., 2002; Meier, 2011) and, that learning can have a beneficial impact of alliance reliability (De Toni & Nassimbeni, 1995; Ireland et al., 2002; Pathak et al., 2009). Moreover, success is dependent on a systematic approach that ensures the right knowledge is institutionalized and exploited (Burges, Burkinshaw & Vijayan, 2005; Meier 2011). These conclusions are interesting but are aimed more generally at strategic alliances. There is a dearth of research that examines formalized approaches to managing learning within the groups of firms operating inside supply networks.

Within supply network relationships propriety knowledge sharing can be intense, particularly when new products are being developed and introduced (Christopher, 2005; Lamming et al., 2000). Knowledge capture and information sharing are important where a number of organizations are working together to deliver both intermediate and finished outputs, (Adamides et al., 2008; Skipper et al., 2008) and, there is necessarily a wider dissemination of intellectual property rights (IPR) (Jones et al., 1998). A consequence of the network setting is it is more difficult to understand the origins and assign ownership of the IPR that is created by the alliance (Grandori & Soda, 1995). The sharing of IPR is only one aspect of the higher risk of "free riding" within supply networks where "learning races" can

often lead to opportunistic behaviors (Ireland et al., 2002; Gomes-Caseses, 2003; Koh & Tan, 2006). Knowledge capture and sharing is another facet of relationship-specific asset management which requires the growth of trust to prevent opportunism (Das & Teng, 2002; Garcia-Canal et al., 2003; Harland et al., 2004; Ryals & Humphries, 2007). The seminal work on relationship-specific assets is provided by Williamson (1975, 1996). Transaction Cost Economics theory offers a means of integrating research on the value that supply network members derive from knowledge capture with the inter-organizational dynamics surrounding this activity. This is a potentially fruitful avenue for further research.

4.5 Co-ordination

It has already been mentioned that governance within a large, multi-party relationships is problematic, especially when several of a firm's departments and divisions are expected to interact with those of the partner organizations. The co-ordination, planning and performance measurement of activities will be particularly difficult to co-ordinate (Cheng, Li, Love & Irani, 2004). Moreover, although the assimilation of new knowledge is likely to be clearly understood by the respective management boards, its implementation will often be more difficult to accomplish because of the lack of clarity of the operations at the interfaces between the partners (Wilding & Humphries, 2006). Although companies use a variety of management methods such as KAM and SRM, it is rare to find systematic relationship management that focuses on the joint enterprise. Ryals and Humphries (2007), Dyer et al. (2001), Garcia-Canal et al. (2003) and Kale et al. (2002) have proposed that in supply networks the scale and complexity of the relationship activity demands more appropriate management arrangements, because there are fewer incentives for building trust. Garcia-Canal et al. (2003) suggest that in joint ventures frequent board meetings can co-ordinate each partner's interests, allow partners to monitor closely the activities of the venture, as well as arbitrating in disputes and solving problems that may arise. They also propose that incentive plans associated with the performance of the alliance can motivate managers to work harder for the success of the venture. Williamson, (1975; 1996; 2008) coined the term credible contracting where the parties take a hard-headed approach by looking ahead, carrying out risk analysis and making appropriate credible commitments to mitigate potential hazards. This highly rational strategy may not work effectively in some supply network settings where rigid commercial frameworks tend to suppress innovation and flexibility (Choi & Krause, 2006). There is a consensus that co-ordination becomes increasingly difficult the more organizations are in the network and the more complex the topology. It appears that less formal governance arrangements that depend upon managing behaviors are more likely to be successful than traditional, more structured approaches (Hwang & Burgers, 1997; Harland et al., 2004; Choi & Krause, 2006). Researchers will thus need to study more closely the interplay of relational dynamics such as trust and commitment within the often fluid interactions between supply network members.

The literature contains relatively little practical guidance on how the management of supply networks will be operationalized. Dyer et al. (2001) and Kale et al. (2002) provide a useful case for a dedicated strategic alliances management function which aims to manage both internal and external perspectives. This department will be staffed by specialists empowered to align alliance policy with the Board's strategies. It will manage knowledge and learning both from an exploitative perspective and as a centre of excellence. Next, it will provide a co-ordination function covering both inter and intra relationship activities and allied to this will act as a "champion" to generate and maintain inter-departmental support for alliances. The function will develop and exercise specific alliance performance measures that are wider-reaching than normal financial and quality measures. It will be a proactive role, taking "troubleshooting" actions when necessary. Finally, the department will have an

external visibility function where it promotes its alliance management expertise and success to investors, future potential partners, the press and other stakeholders. The case for such an arrangement is well-made however, how it would operate in complex supply network settings would need to be explored in further research.

Kale et al. (2002) suggest that organizations that have this dedicated alliance management function will be more successful in managing supply network relationships, more successful in forming and maintaining productive alliances and overall, more profitable than those firms who do not. However, both Choi et al. (2001) and Garcia-Canal et al. (2003) warn that partners in a strategic alliance need to strike a balance between flexibility and rigidity. Undue formality (Choi & Krause, 2006) can limit the possibilities of developing the scope of the alliance or of adapting to changing circumstances and, moreover, excessive control can negatively impact on trust (Jammernegg & Kischka, 2005).

It is clear from the review that strategically important supply networks have severe co-ordination problems due to their scale and complexity and, skilful management that concentrates on the joint enterprise rather than simply "fulfilling the in-house part of the bargain" is a necessity.

5 Discussion, future directions and conclusion

5.1 Gaps, shortcomings and emergent themes

Despite those who argue that supply networks can be studied as a topological arrangement of linked dyads, it is clear from the volume and extent of the literature reviewed, that a significant body of well-crafted theoretical and empirical contributions has accumulated over the last 10 years that sees supply networks as a much more complex set of relationships worthy of individual study. This research has tapped a rich seam of ideas and phenomena however, as with any new field of study, efforts have been fragmented and integration is only emerging slowly, if at all. At the etymological level, the supply networks field has yet to develop a consistent language to define its terms. As a result, it is difficult to decide which key constructs allow the researcher to access its important concepts. A wide range of multi-disciplinary theoretical perspectives are evident from agency theory to strategic management with a strong concentration on operations and less focus on relational dynamics. For instance, theoretical insights that integrate 'soft' concepts such as interdependence, reciprocity, value, long-term orientation, co-operative behavior, personal relationships and adaption that are considered to be essential components of relational theories are barely encountered. What is lacking is a model that takes an 'enterprise relationship management' perspective in order to explore the set of relational constructs that allow us to gain understanding of the dynamics that drive the supply network enterprise. Such a model would introduce a measure of integration and discrimination in a field characterized by a plethora of over-lapping concepts and variable meanings.

From the 20 constructs that were identified in the review, five key themes emerged - see Figure 1. Firstly complexity stands out as a driving factor. It is obvious that the more complex a phenomenon the more difficult it is to understand. However, many researchers have studied its manifestations and impacts in terms of supply network topology, business processes and relationship dynamics but as yet a general theory has not emerged. Next, the opportunities to exert power, constructive and destructive, hidden and overt, and their impact within supply network are many and intriguing. However, the literature misses the opportunity to address how power can be diffused in supply networks and whether or not it can be used as a viable control strategy. Understanding how managers within the network could be incentivized to use power for the collective benefit rather than for selfish purposes would be extremely valuable. Alignment of objectives is even more crucial as a stability and

productivity enhancing requirement than in simpler dyadic business relationships. Without some form of harmony between individual and group goals, the network is likely to fall apart or be unproductive and discordant. Informal governance mechanisms presented in a number of case studies seem to be the most successful method of achieving this balance but, theoretical studies are needed to provide a more solid base for understanding these important dynamics.

A great deal of research around knowledge management - learning, knowledge capture and dissemination - is evident in the wider strategic alliance literature but in the supply network setting there is significantly less. Often knowledge capture and exploitation are key objectives of both individual members and supply networks as a whole because they result in the creation of relationship-specific assets. How knowledge management is carried out and in turn affect supply network relationship dynamics is an area that needs further research. Co-ordination in supply networks can be likened to 'herding cats'. The complexity of the business arrangements including the web of contracts and processes set against a background of who shares IPR and gains from its creation and, how power plays interact with individual and group objectives results in a large set of often unpredictable relationship dynamics. Only very large organizations can afford a dedicated alliance management function so some effective management techniques based on relational dynamics that can be more widely adopted are required. A number of theoretical studies in the field probe supply networks from a variety of different directions but, there are relatively few papers in all and little depth in the key area of relational dynamics (Humphries & Wilding, 2003). Moreover, the existence of a theory to extend inter-organizational relationship dynamics into the supply network setting is lacking.

5.2 Insights for practitioners

Managers are principally concerned with successfully delivering products and services to time cost and quality. Within supply networks this is a function of managing complex sets of relationships. Frequent but informal meetings of network managers appear to be the most effective form of governance. Modes of behavior and management procedures evolve around the need to build trust and commitment. Abuses of power and opportunism are naturally suppressed by the group dynamics. The group provides a means of exposing, understanding and reconciling the participants' differing aims and objectives. It provides a focus for the co-ordination and control of processes, planning and communicating, resource allocation and importantly, resolving problems and conflicts. The group takes strategic decisions about knowledge capture and utilization to enable new competitive advantage to be generated for the network as a whole.

A limited number of case studies exist from the automobile, aerospace, retail, manufacturing and IT sectors concerned with how managers manage supply networks. More are needed, especially if more specific requirements for relationship performance measurement are to be addressed.

5.3 Proposals for further research

The following list encapsulates proposals for the future direction of research in the supply network relationships field:

- Models need to be developed that take an 'enterprise relationship management' perspective in order to explore the set of constructs that are essential to the success of the total, supply network in an integrated way.
- Research is needed to generate clear terms that describe the discrete types of network, the relationships between their parts and the constructs that are used to understand their

dynamics so that a more reliable basis can be established from which researchers can access the field.

- Theoretical studies are needed to probe supply network from the key perspectives of relational and inter-organizational dynamics. These need to integrate 'soft' concepts such as interdependence, reciprocity, value, long-term orientation, co-operative behavior, personal relationships and adaption that are considered to be essential components of relational theories.
- Complexity has an all-pervasive impact on the relational and therefore the operational dynamics in the supply network context. Research is needed to bring its many facets together into a coherent focus.
- Research is required to map the extent of power diffusion and its uses in supply networks and to understand how the inappropriate use of power can be prevented.
- Theoretical studies are needed to explain the use by managers of informal governance mechanisms to cope with the alignment of member and collective objectives.
- The ways that knowledge capture is operationalized and in turn affects the supply network relationship dynamics is an area that needs further research.
- Research is required to examine formalized approaches to managing learning within the groups of firms operating inside supply networks.
- Transaction Cost Economics theory seems to offer a means of integrating research on the value that supply network members derive from knowledge capture with the inter-organizational dynamics surrounding this activity. This is a potentially fruitful avenue for further research.
- If less formal co-ordination arrangements that depend upon managing behaviors are more likely to be successful than traditional, more structured approaches, researchers need to study more closely the interplay of relational dynamics such as trust and commitment within the often fluid interactions between supply network members.

Research is needed to examine the practical approaches to managing complex supply network relationships. As a tentative approach to closing this gap, it is proposed that the five emergent themes identified in this paper might form the basis of a model suitable to probe the relationship dynamics of supply networks.

Table 4. Supply relationships - theoretical models

Transaction Cost Economics (Williamson 1975)	A Dyadic Model (Humphries & Wilding 2003, 2006)	A Networks Model
Bounded Rationality: the limitation on human actors to act rationally which results in incomplete contracts and the likelihood of mal-adaption	Creativity: the degree of innovation and dynamism promoting quality, innovation and a long-term approach by encouraging high performance	Complexity: the differentiation in structure, process and aims of autonomous, interconnected organizations whose interactions can generate unpredictable adaptations and behaviors
Uncertainty/Complexity: organizations have difficulty making sense of current and future events and take a selfish perspective	Stability: the extent of relationship specific investments, synchronization of objectives, joint planning and problem-solving and, confidence-building	Alignment of Objectives: the accommodation of individual organization and group purposes such that the objectives of the network are advanced or at least not hindered
Information Impactedness: deliberate information economy to generate unbalanced advantage	Communication: the quality and transparency of frequent, open dialogue and information-sharing going beyond those specified in the contract and including	Learning and Knowledge Capture: the systematic exploitation of existing and new knowledge for the benefit of the network and its members

	commercially sensitive matters	
Opportunism: self-interested behavior with guile - short term actions to obtain maximum advantage.	Reliability: the effectiveness and efficiency of joint operations concentrating on service and product delivery, lowering joint costs and risks, building up trust	Coordination: the management of intellectual and physical activities and interactions that contribute to meeting the objectives of a connected group of organizations
Small Numbers: Lack of trust in partners. The credible commitment of relationship-specific assets generates mutual dependence which serve as a hostages against opportunism	Value: the degree of share of joint relationship outputs that create a win-win relationship in which each side is delighted to be a part and supports commitment to the future	Power: where organizations alone or together exercise overt or covert influence to achieve value for good or selfish purposes, over the other members of a network

In pursuit of a model likely to integrate supply network theoretical perspectives, Williamson's (1975) Transaction Cost Economics Organization Failure model was taken as a starting point. Throughout this review, it has been observed that Transaction Cost Economics seems to provide the most successful attempt at supply network theoretical integration. Williamson envisaged a negative spiral of behaviors that eventually led to the breakdown of the relationship dynamics. The model's constructs are: bounded rationality, uncertainty/complexity, information impactedness, opportunism and small numbers as shown in column 1 of Table 4. Humphries and Wilding (2003, 2006) derived a set of positive, alternative dimensions from the Organization Failure mode: creativity, stability, communication, reliability and value shown in column 2 of Table 4. These were used as the theoretical framework to research dyadic supply chain relationships. The five emergent themes from this review, complexity, alignment of objectives, learning and knowledge capture, co-ordination and power listed in column 3 of Table 4 appear at face value to correlate with the relational dynamics of Williamson (1975) and Humphries and Wilding (2003, 2006) but, given that we have derived them from the supply network literature, extend the framework beyond the dyadic to the network situation. This model might thus provide a suitable hypothetical framework for testing supply network theories and constructs from a unifying perspective. Even if the model was found to contain shortcomings, it would at least give researchers the rare experience (Andersen & Christensen, 2005) of carrying out macro-level studies involving groups of co-operating organizations and enable them to extend our knowledge of supply network dynamics theory.

5.4 Conclusion

The supply network relationships field is in need of some integrative studies to bring theoretical order to the plethora of diverse, empirical endeavors. The field also exhibits a shortage on longitudinal studies which capture and analyze the relational interactions between the partners in co-operative, multiparty networked configurations. Many of the opportunities for future research have not been attempted because of the difficulty of finding research subjects. It is not easy to understand the impact of trust growth, commitment changes and knowledge exploitation on the operational effectiveness of supply networks through cross-sectional models. The framework suggested in Table 4 has the potential to provide a 'unifying' theory and method of approach. It is also possible that the view of relationship dynamics that it could offer would enable supply network relationship managers to improve business performance and this would encourage their participation in research more comprehensive projects.

The summary of empirical evidence presented in this paper has been comprehensive but as with any review, completeness cannot be claimed. Nevertheless, the aim has been to

capture the key features of the field and this has highlighted some interesting and significant issues and gaps in our knowledge of supply network relationship dynamics. Some emerging themes have been highlighted which offer a clear future direction for research in the field and the possibility of addressing the lack of integrative research tools. The prevalence of supply networks within today's globalised markets suggests that the subject is important and worthy of deeper, more organized study. The growing number of papers and their considerable diversity indicates an interesting field that is blossoming. It is intended that this paper will be of service and a stimulus to researchers in order to advance the field.

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