

UNDERSTANDING CONSTRUCTION SUPPLY CHAIN RELATIONSHIPS: AN AETIOLOGICAL APPROACH

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Supply chain management (SCM) has evolved as a form of practice and as a domain of study in recent years. Supply Chain issues are treated as matters of strategic significance. Considering the plethora of information on the topic, there seems to be a paucity in systematic empirical studies which explains just what the management of a supply chain actually involves in practice. There appears to be an element of neglect from a practical and from a theoretical perspective, with a lack of attention afforded to the variety of forms which supply chain relations can take. Dealing with the problems associated with supply chain relationships represents chronic difficulty for construction managers. This is further compounded by the dynamic turbulences inherent within individual organizations. The research is aimed at exploring the root causes of problems that surface at the interfaces in the supply chain and suggest ways in which they can be detected and prevented. The use of a dual paradigm was espoused to advance the knowledge within the area, both to gauge the perceptions of people and to comprehend the cause and effect of their actions. The paper introduces a theoretical framework that explains the interaction of participants within the supply chain and the development of a measurement mechanism is proposed.

Keywords: collaboration, measurement, partnering, relationships, suppliers, supply chain management.

INTRODUCTION

Supply chain management (SCM) represents a paradigm shift that extends the appreciation for the concepts of co-operation and competition. Co-operation is no longer seen as a process between one set of trading partners but exists along the entire supply chain (Spekman *et al.*, 1998). Studies conducted on made-to-order supply chains observed the spread of problems along the supply chain and existed at every interface in the total production process (Storey & Emberson, 2001). Clearly, it must be recognized that in the search for supply chain optimization, the relationships within a supply chain must be addressed and understood in order for it to be applied effectively by practitioners. Traditional contractual arrangements have proven to be problematic and conducive to an adversarial climate (Latham, 1994). By merely employing a new formal framework or operating system does not guarantee success – often the opposite is created (Hamza *et al.*, 1999). In order for SCM to be effectively implemented, an examination of the types of relationships, as well as their cause is necessary.

This paper presents the relationships between organizations within a construction supply chain. A case for the measurement of the relationships is proposed. It introduces the concept of multiple level supply chain relationships: Endo-level; Meso-level; and Extrinsic-level. The concept is further developed to form a hierarchy of

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relationships that allows supply chain participants to identify the type of relationship that is present, in order for the relationship performance to be measured and improved.

AN OVERVIEW OF SUPPLY CHAIN MANAGEMENT

As with any management philosophy and especially ones like SCM that are still evolving, available definitions can be characterized as possessing a wide spectrum of different meanings and equally numerous applications, including those: structured around operational issues (Ellram, 1991); focused primarily on facilitating the outbound flows of inventory and information (Mentzer, 1993; Langley and Holcomb, 1992); as a channel management philosophy (Cooper, 1994; LaLonde, 1996); and as a strategic integration of trading partners (Walton and Miller, 1995). Below is just a small selection of definitions for SCM, found in various fields of literature:

“Supply chain management is a continuously evolving management philosophy that seeks to unify the collective productive competencies and resources of the business functions found both within the enterprise and outside in the firm’s allied business partners located along intersecting supply channels into a highly competitive, customer-enriching supply system focused on developing innovative solutions and synchronizing the flow of the marketplace products, services, and information to create unique, individualized sources of customer value.” Ross (1998)

“Supply chain management is the integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders”
Global Supply Chain Forum.

“The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole” Christopher (1998).

The number of definitions reflects the diversity of business philosophy consisting of a complex combination of concepts and applications that can be employed to respond to a myriad of problems that impact the organization both internally and externally. Although there is widespread consensus that SCM is fundamental to achieving competitive advantage, there is considerable “fuzziness” when it comes to defining exactly what the concept means, how it applies to businesses, what the benefits are, and how it may be implemented. Discussion of SCM is often shrouded in complex jargon, further inhibiting its application. The main reason for the confusion surrounding SCM derives from the fact that the concept did not enter the world as a complete body of knowledge or with proven implementation techniques. In addition to the lack of basic concurrence regarding principles and scope, it has been shrouded by the fact that it is still evolving and is being influenced by a multitude of directions as there is a constant search for new strategic business philosophies enabling them to leverage the value generating processes to be found within their network of supply partners. In this respect, SCM is in an ideal situation of providing supply chain systems with the capability to generate entirely new approaches to product and service innovation as well as being fashioned by the practical realities of identifying and creating competitive advantage. The problem is compounded by the fact that actual implementation of operational and strategic aspects of SCM has been ongoing over several years. As is often the case with new management responses to turbulent market conditions, elements of SCM have been put into practice long before there has

been a detailed clarification of the theory. Koskela (2000) noted a distinct lack of explicit, coherent theories within the operations management discipline. This situation has evolved under the influence of the dominating paradigm within operations/production management, with the focus on abstract application of techniques and rarely involving empirical or theoretical studies. Many practitioners have developed a negative attitude to theory, equating it with lack of practical applicability (Filippini, 1997). In recent times, a number of researchers have begun to voice their concerns on the importance of theories (Westbrook, 1994; Filippini, 1997). Theories can help any applied scientific discipline to derive the benefits that help to explain phenomena and the relationships between relevant variables. Much of today's supply chain paradigms is based on implicit theories and could be termed 'theories-in-use' (Argyris and Schon, 1978). There are fundamental differences between paradigms in science and supply chains. Scientific paradigms are normally proposed via a scientific community, with the latter progressing through inter-organizational competition, along with the dissemination through professional bodies. In the case of the construction industry, the quantity and disparity of professional bodies induces a complex scenario. The implicit nature of much of the supply chain paradigms contributes predominantly through the inducement of myopic actions and perceived benefits in the longer term, rather than its ability to explain and predict. The resultant theories cannot be generalized or tested, with an uncertain feasibility domain making application problematic and making its diffusion to a wider community extremely difficult. In terms of the construction industry, the relevant literature on the topic of supply chain management has only been popular since the mid 1990s. Research in this area has broadly focused on:

- Industrial organization economics to better understand market structure and forces and their effect on firm and supply chain behaviour (London & Kenley, 2001).
- Analytical modelling of supply chains to improve their performance along parameters such as cost, reliability, quality and speed (Vrijhoef and Koskela, 2000).

O'Brien *et al.* (2002) suggested that both methods provide useful but ultimately incomplete solutions on their own. An interdisciplinary approach that draws from both areas is needed. The benefit of a combined perspective is evident and an interdisciplinary research agenda may be enhanced with an understanding of multi-level supply chain relationships.

A FOCUS ON SUPPLY CHAIN RELATIONSHIPS

SCM may be described as an open-ended philosophy for managing companies and supply chains in which they participate. SCM is above all, a business philosophy that enables individual companies as well as participants to achieve higher levels of productivity, profit, and growth (Ross, 1998). Organizations in numerous industries have become involved with the exploration of the opportunities in terms of competitive advantage that can be gained by utilizing the core competencies and innovative capabilities that exists among networks of supply chain partners. Although the importance of the relationships that existed with suppliers and customers have always existed, it has only been recently that creating and nurturing alliances has been recognized as a critical source of strategic advantage and is perhaps today's most important competitive strategy.

The best companies have come to realize that the effective management of the supply chain has major implications for the search for new sources of process improvement. Having sustained internal advances through the use of management paradigms such as Total Quality Management (TQM), Just-In-Time (JIT), and employee empowerment, the design and manufacturing functions have become increasingly agile and lean. Sustaining the momentum of these management paradigms has necessitated the requirement for organizations to venture outward to their channels of supply and distribution in search of untapped opportunities from the total supply chain process improvements. There is increasing realization that an integrated supply chain can provide unique sources of competitive competencies. Previous management models focused on utilizing quality and improvement in tackling the internal business processes. In contrast, SCM diverts attention to the previously untapped opportunities that arise when organizations seek to combine the innovative competencies and unique resources of their external chains of customers and suppliers. Although there are still numerous organizations depending on vertical integration for the provision of competitive advantage, many organizations are divesting themselves of non-performing functions and focusing on its core competencies. Preference is placed on supply partners who specialize in the weaker aspects of the organization. In this environment, the management of the supply chain partners has become the key to market competitiveness.

Masqood and Akintoye (2002) stated that relational exchange or contracting is a key to drive supply chain management successfully and is often mistaken for being SCM itself. Vrijhoef *et al.* (1999) commented that much research has assessed that construction is ineffective and is associated with many problems, with the majority originating at the interfaces of different parties and functions. Relationships within supply chain networks should reflect the complexity of such networks and should be characterized by several dimensions, each of which can be a combination of collaborative and non-collaborative elements (Gadde and Hakansson, 2001). Holmen *et al.* (2002) suggests that there is a current “state of confusion” regarding Construction Industry Inter-Organizational Relationships (CIORs). They indicated that CIORs have been associated as the root of all evil, but are also seen as the lever for change. An understanding of these relationships is a pre-requisite for future project success.

An empirical study conducted by Akintoye *et al.* (2000) in the UK construction industry showed that the principal objective for large contractors in developing SCM is to ‘bring benefits to the customer’, with ‘developing benefits for suppliers’ and ‘overall supply chain cost reduction’ ranked a poor seventh and eighth respectively out of nine variables. However, 90% of respondents regarded SCM as ‘important’ or ‘critical’ to their organizations. A similar study by Saad *et al.* (2002) showed that over 92% of the respondents believed that ‘long term and stable relationships’ are ‘important’ or ‘very important features of SCM. The study also suggested a reluctance to rationalize supplier and customer bases, restructure supply chains and to fully embrace the culture needed for an effective implementation of SCM relationships. Both studies highlight the paradoxical nature of the construction industry: it is willing to embrace new practices like SCM for improving efficiencies but it is content on maintaining an arms length relationship with its suppliers and subcontractors. In order for SCM to succeed, there must be greater integration of the whole supply chain.

In the area of construction disputes, which is inextricably linked to the failure of relationship, Fenn (2002) noted the absence of sufficient empirical data suggested that

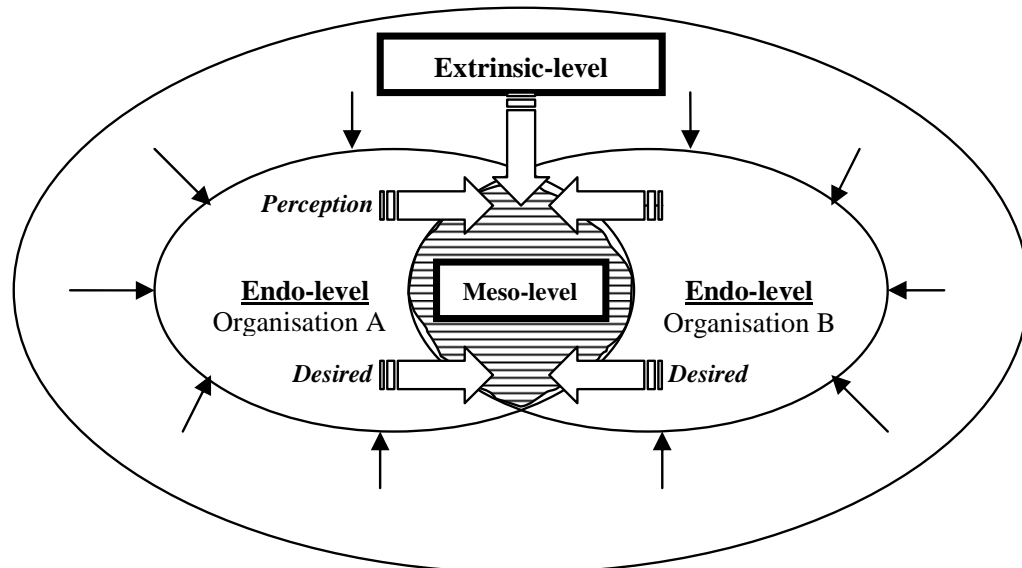


Figure 1: Conceptual Model of SCM Relationships

structured prediction and avoidance will be unlikely as a result. The author suggested an "aetiological approach" to construction disputes, which will help develop a mature and sophisticated research base and may help improve industry performance. Aetiology is the study of the causes. The word is derived from the Greek "aitia" (a cause) + "logos" (a discourse). A similar approach for supply chain relationships will be equally valid. An investigation into the causes of different types of supply chain relationships will be developed conceptually.

A CONCEPTUAL MODEL FOR SCM RELATIONSHIPS

To fully understand the causes of the actual relationship, there must be an appreciation by the actors of the degree to which the perceived and desired relationships obscure reality. A joint effort involving discussions on the perceived and desired relationships, necessitating the integration of the input in terms of experiences and perspectives by both parties. The outcome is to enable inter-organizational supply relationships to be better understood both internally and externally. Figure 1 is a conceptual model that attempts to explain the interaction of participants within the supply chain. One of the fundamental aspects in the development of the model was the recognition that an organization's competitiveness can eventually only continue to be improved if it is recognized that intra-firm development must be combined with inter-firm development (Lamming *et al.*, 1996).

The conceptual model utilizes the concept of multiple level supply chain relationships: *Endo-level*; *Meso-level*; and *Extrinsic-level*. *Endo-level* relationships relate to those found "within" individual organizations of the supply chain where *Endo* is a prefix meaning 'internal', derived from the Greek *endon* which means 'within'. *Meso-level* relationships deal with the "interaction" between organizations in the chain. *Meso* is a prefix, derived from the Greek *mesos*, meaning 'middle'. *Extrinsic-level* relationships relate to the global supply chain system as a whole, addressing cultural stratifications, influencing both the individual organizations (endo-level) and the interaction between organizations (meso-level). *Extrinsic* means in this context, 'external'.

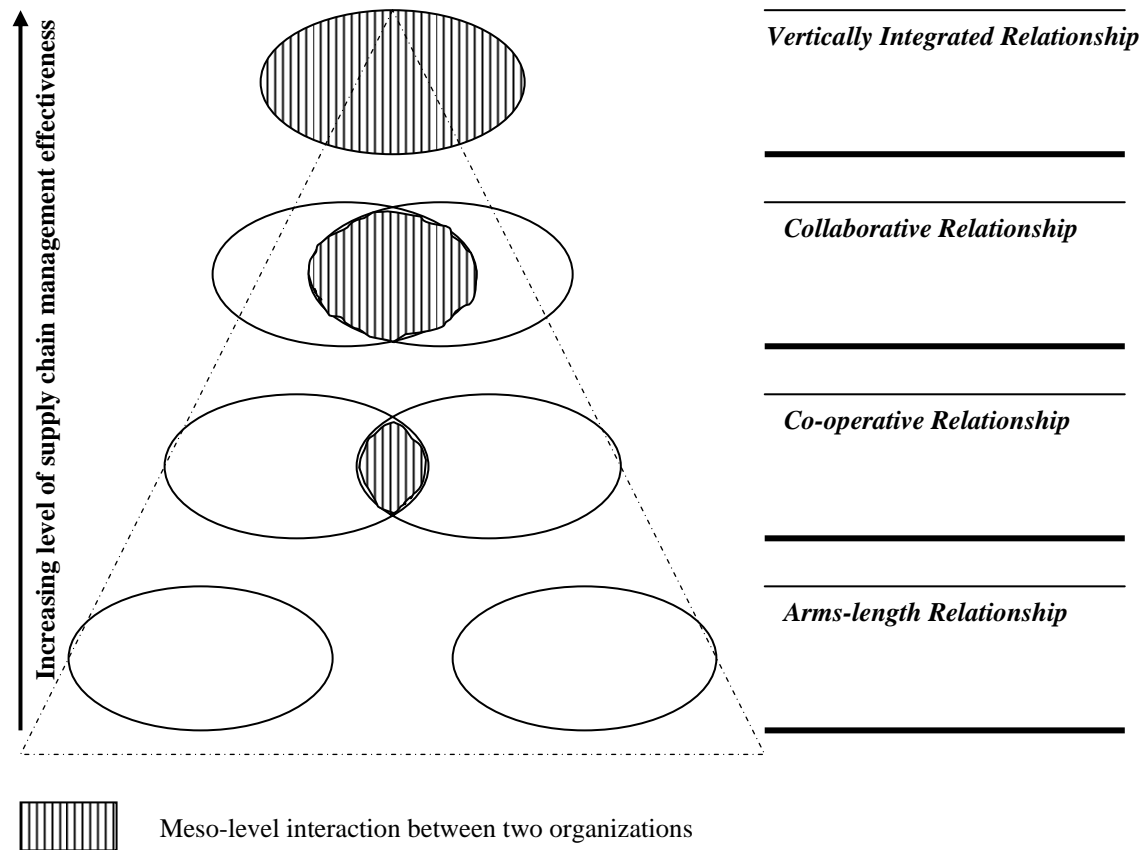


Figure 2: Hierarchy of relationships: levels of relationship types

The model can be further developed from its basic state to incorporate the different types of relationships, forming a *hierarchy of relationships* (Figure 2), creating four levels of relationships: arms-length; co-operative; collaborative; and vertically integrated. The lowest level consists of the traditional ‘arms-length’ contractual type of relationship has been part of the culture of the construction industry. This type of relationship seeks to divide responsibilities, the method of reimbursement and the apportionment of risk (Moyses, 1991). The situation has been exacerbated by drives of ‘value for money’ where through competitive tender, the works are procured to the lowest-price supplier with minimal or no guarantee of future work. This causes what Williamson (1985) terms ‘bounded rationality’ and ‘opportunism’, which are associated with behavioural assumptions with regards to Transaction Cost Economics.

The recognition by central government and the construction industry has resulted in a plethora of new initiatives, such as Partnering in an attempt to improve the adversarial relations. Partnering may involve a one-off project specific alliance, or *project based partnering*, assembled at concept stage or after the award of the construction contract, relating to the next level in Figure 2, the co-operative level. It can also take the form of long-term relationships between contractors and clients, as well as between contractors and subcontractors and suppliers, which endure over a number of projects and is termed *strategic partnering*, relating to the collaborative relationships in Figure 2. In order for the highest supply chain relationship level to be achieved, there must be transparency to the relationship, almost as if the separate organizations have merged to form a single, vertically integrated organization.

IDENTIFICATION AND MEASUREMENT OF RELATIONSHIPS

It is important to identify what type of supply relationship exists from the model in figure 2, in order for the relationship performance to be measured and improved. There is significant importance of rendering invisible attributes visible through measurements. The network of information in terms of relationships and organizational learning can be assumed to be present at all times implicitly. These networks are transparent or are invisible unless they are measured and transformed into some form of indicator (Santos, 1999).

The use of systematic measurement helps to detect problems as they occur, in most cases by giving an early signal that may be indicative of critical situations before they materialize into a real problem. This enables the systematic identification of root causes of relationship problems. It must be stressed that the measurement and monitoring have to be interpreted quickly and converted into meaningful solutions at the earliest possible time in order for the system to be of any significant value. The traditional functionally based structure of construction inevitably causes large cycle times between the source of the problem, detection and correction. The reasons may be due to a lack of communication or the existence of long and complex channels that in most cases produces a level of distortion in message content (Koskela, 1992).

The objectives of measuring and assessing the relationship should be:

- improve the performance of the relationship by treating it as a joint responsibility; and
- enable the participants to develop a clearer understanding of a specific buyer-supplier relationship by getting both sides to: identify who influences and controls the relationship; clarify to themselves what benefits they want and feel they are actually getting from the relationship; identify mismatches between the desired type/state of the relationship and the perceptions of the actual state of the relationship.

This should allow the participants to understand the type of interaction they find most appropriate for a given situation, enabling an understanding of the essential features that are most appropriate. The fundamental outcome is to allow users to identify their most appropriate management and assessment stance towards their supplier/customer and utilize it to evaluate the allocation of resources to a specific relationship.

RESEARCH AIMS AND OBJECTIVES

The subject of the paper is part of an ongoing research towards a PhD programme with the aim of developing a framework for the assessment of inter-organizational relationships as a precursor for the successful implementation of supply chain management within the construction industry, focusing on the outcomes for organizational learning and innovation. The research objectives are:

- To identify the underlying philosophy of Supply Chain Management
- To assess multi-dimensional relationships within construction supply chain networks
- To investigate the implications of different levels of supply chain relationships on organizational learning and innovation within a construction environment

- To identify the key drivers and inhibitors that impact on relationships in different forms of construction supply chain governance structures
- To develop a system to assess relationships within construction supply chains that is conducive to organizational learning and innovation.

The conceptual model presented in the paper forms the basis for the next stage of the doctoral research study and for collecting data from the following research questions:

- Are there construction practices applying relationship performance principles?
- How are these relationships measured and assessed?
- What are the main inhibitors/drivers of such systems?

CONCLUSIONS

The study of inter-organizational relationship has been and still remains an important topic in different fields of research. It pre-occupies many academics and practitioners from diverse areas such as logistics, information technology, organizational theory, strategic management and industrial marketing and purchasing. In construction projects where an organization's competence is only of interest to the client if combined with the competencies of others in the project team, the ability to maintain a co-operative relationship is of strategic importance (Kornelius, 1999). The literature reviewed suggests the importance of inter-organizational relationships in terms of competitive advantage and yet there are no clear views on what forms of co-operation should be developed for this to take place. A model has been proposed, to evaluate elements of their infrastructure for inter-organizational co-operation, both for its potential competitive advantage and for their strategic importance. The model examines supply chain relationships at multiple levels and seeks to understand the causes of the actual relationship. It also acknowledges that an organization's competitiveness can eventually only continue to be improved if it is recognized that both intra-firm and inter-firm developments must be combined. The importance of the measurement of relationship performance was also highlighted and will be further examined as part of the next stage of the doctoral research study.

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