



Relational factors that explain supply chain relationships

Supply chain relationships

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Abstract

Purpose – The purpose of this paper is to gain a better understanding of the types of relationships that exist along the supply chain and the capabilities that are needed to manage them effectively.

Design/methodology/approach – This is exploratory research as there has been little empirical research into this area. Quantitative data were gathered by using a self-administered questionnaire, using the Australian road freight industry as the context. There were 132 usable responses. Inferential and descriptive analysis, including factor analysis, confirmatory factor and regression analysis was used to examine the predictive power of relational factors in inter-firm relationships.

Findings – Three factors were identified as having significant influence on relationships: sharing, power and interdependency. “Sharing” is the willingness of the organisation to share resources with other members of the supply chain. “Power” relates to exercising control based on experience, knowledge and position in the supply chain. “Interdependency” is the relative levels of dependency along the supply chain.

Research limitations/implications – The research only looks at the Australian road freight industry; a wider sample including other industries would help to strengthen the generalisability of the findings.

Practical implications – When these factors are correlated to the types of relationship, arm’s length, cooperation, collaboration and alliances, managerial implications can be identified. The more road freight businesses place importance on power, the less they will cooperate. The greater the importance of sharing and interdependency, the greater is the likelihood of arm’s length relationships.

Originality/value – This paper makes a contribution by describing empirical work conducted in an under-researched but important area – supply chain relationships in the Australian road freight industry.

Keywords Australia, Channel relationships, Freight forwarding, Supply chain management

Paper type Research paper

1. Introduction

In large developed economies, such as Australia, road freight businesses play a significant role as products need to be moved across long distances because of the size of the country (7,686,850 sq km) and the dispersion of its raw materials, production and consumption centres. To maintain an effective cost structure organisations are increasingly required to work closely with their suppliers, customers and other participants in the supply chain in order to strategically compete and integrate the logistical practices (Morash and Clinton, 1997; Lambert and Cooper, 2000). In Australia, the freight industry has remained fragmented but its individual sectors are becoming increasingly concentrated, although in recent years some multimodal operators such as Patrick and Toll logistics have emerged. The road sector which dominates the



transport industry (80 per cent of value) had a four-firm concentration ratio of eight per cent. Small trucking firms with one or two trucks represent almost 65 per cent of the industry participants and account for nearly 12 per cent of the industry's operating income while the sales of the top four firms account for only 15 per cent of the market share (Bureau of Transport and Regional Economics, 2003). This indicates that the trucking industry is not homogenous; it approximates perfect competition because it has minimal entry barriers. A large number of small trucking firms i.e. owner drivers, are mainly price takers and usually subcontractors of large multimodal freight service providers. Many small and medium sized companies in the Australian freight industry have had to act as providers of combined transportation for their clients. They have been increasingly entering partnerships in order to survive the consolidation trend that has occurred in developed economies such as the USA; where small size freight players have managed to scale up through niche market leadership, investment in technology and execution of a differentiated supply chain strategy (Gordon, 2004). Evidences from other research studies (Ferrer, 2010) indicate that competition that is sharing warehouse space and depot staff in capital cities is a practice in the Australian trucking industry that enables regional trucking firms to minimise the cost of carrying inventory but also to provide a more flexible service to customers as they can pick their loads up at a more convenient time. Also, alliances are a type of inter-firm relationships that large size trucking firms would form with customers to provide dedicated 3PL service.

Managing the supply chain involves the management of numerous inter-firm relationships which have become increasingly important in developing a competitive position. Supply chains exist on the basis that the participants actively engage in managing them rather than allowing external forces to direct their actions (Mentzer *et al.*, 2001). In dynamic and complex industries such as the road freight transport, members need realise that inter-firm relationships are strategically important (Anand and Khanna, 2000), that benefits can be obtained from long-term relationships, but not all relationships can be long-term oriented (Ballou *et al.*, 2000; Golicic *et al.*, 2003). Thus, the decision about what type of inter-firm relationship is appropriate for a specific circumstance is complex. There is a spectrum of possible supply chain relationships, from arm's length to complex, long-term alliances and each of them demands a particular degree of managerial attention (Lambert *et al.*, 1996; Bensaou, 1999; Golicic *et al.*, 2003). Supply chain relationships framework involves not only physical-technical but also socio-psychological, network management and strategic factors (Oliver and Ebers, 1998; Nooteboom, 1999; Barrat, 2004). Whilst the strategic factor include sharing processes, the socio-psychological and network management elements encompass the power and leadership structures, trust building processes, risk and reward structures, mutuality and organisational culture. Risk, reward and power affect an organisation's commitment to cooperate with other supply chain members, whereas corporate culture determines the compatibility between members of the different types of relationships such as partnerships. The different relationship taxonomies supply chain researchers (Bensaou, 1999; Lambert and Cooper, 2000; Golicic *et al.*, 2003; Varamaki and Vesalainen, 2003; Xu and Beamon, 2006) have put forward are characterised by factors which develop along a continuum. Thus, as relationship management is a situational approach, firms need to consider and clearly understand how their situation varies as one of the determinants for the selection of an inter-firm relationships' portfolio.

Given there are several types of relationships managers need to better understand the nature of supply chain relationships and how these can influence the functioning of

their businesses. Thus, the key objective of this study is to explore the influence of different relationship factors have on inter-organisational relationships in the Australian road freight transport industry. The research question addressed in this paper is: Do power, interdependency, sharing and trust predict the type of relationship road freight transport firms engage in?

2. Literature review

Inter-firm relationships have traditionally been studied through the use of the “governance” lens. The relationship marketing literature was one of the first to propose a range of relationships from transactional, short duration and sharp ending by performance, to relational exchange, longer duration and reflection on ongoing process (Dwyer *et al.*, 1987; Noordewier *et al.*, 1990). In an attempt at enhancing the spectrum, some other authors have placed, in an intermediate location, cooperative orientated relationships (Golicic *et al.*, 2003; Rinehart *et al.*, 2004). With more adversarial oriented relationships, the likelihood of future exchange between two parties occurring is low. Conversely, a higher probability of future interactions exists if the relationships are more collaboratively oriented (Kaufman *et al.*, 2000). Although the market response to growing competition has for some years been an increasing trend towards integration, it has been asserted that not all supply chain relationships that companies enter need to be either collaborative or cooperative (Duclos *et al.*, 2003). Similarly other authors suggest that supply chain relationships do not need to be “one size fits all” as the market and product circumstances are dynamically changing (Dyer *et al.*, 1998; Bensaou, 1999; Lambert and Cooper, 2000).

Four prominent types of inter-firm relationship can be identified in industries like the road freight transport sector. The first inter-firm relationship type concerns contractual work arrangements defined as arm’s-length relationships. This type of relationship can best be described as inter-organisational linkages characterised by dealings that are at arm’s-length which involve spot transactions, often based on auctions or auction-like arrangements (Hoyt *et al.*, 2000). In arm’s-length relationships, detailed written contracts prevent the parties from operating and making decisions independently (Dore, 1992; Sako, 1992), however, in many cases, particularly in the road transport industry in Australia, contracts are verbal. When contracts are written before the initiation of the relationships, they describe each partner’s obligations in almost every possible scenario. Relationships at arm’s length are characterised by little or no investment in assets with minimal information exchange in which the parties would be typically would be providing standardised items not adding to the differential advantage of the end product (Lambert and Cooper, 2000).

A second type of inter-firm linkage relates to cooperative agreements. Cooperation involves the coordination of similar or complementary activities carried out by organisations in business relationships, aiming at attaining enhanced joint results or individual results with expected reciprocity, as time progresses. The rationale behind cooperative efforts is based on arrangements to share resources, either tangible or intangible, as well as the pursuit of other business goals, through the redesign of processes and products (Cousin, 2002). External and horizontal relationships between partners characterise cooperative agreements. Cooperative efforts differ from arms-length relationships in that they rely on higher levels of trust (Mentzer *et al.*, 2001), moderated levels of power and are more long-term oriented. Cooperation appears to be one of the inter-firm arrangements affirmed to be directly influenced by relationship trust between the parties and it is an important motivator for partners to reduce the

complexity of their environment and gain more control over their external environmental forces (Zhang *et al.*, 2003). Partners in cooperative arrangements seek to lower transaction costs by sharing access to goods, manpower, services and information (Polenske, 2004), and research conducted in the manufacturing industry indicates operational information may be shared among many cooperative firms, because cooperation agreements are non-exclusive.

The third component of the inter-firm relationships typology is collaboration, which appears to be closer to the alliance end of a continuum proposed by several authors (Golicic *et al.*, 2003; Rinehart *et al.*, 2004). This type of relationship is viewed as a more durable relationship in which parties bring organisations into a new structure with full commitment to working more closely, with a shared mission, vision and higher levels of trust. Such relationships require comprehensive planning, seamless linkages (Krause and Ellram, 1997), unified seeking of synergies and goals and well-structured communication channels operating at all levels. Information exchange plays an important role in improving supply chain collaboration (Lambert and Cooper, 2000). Risk sharing is greater in inter-firm collaborative relationships because each participant commits its resources and power can be unequal. Gain and risk sharing capabilities come from a willingness to share rewards and penalties across the firms involved (Spekman and Carraway, 2006). While resource sharing cooperative firms have equal access to these resources, in collaborative agreements the firms tend to gain unique and often unequal access to some of these resources (Polenske, 2004). This can explain the motivation of firms to collaborate to not only improve performance by reducing costs but also by expanding and controlling the market. Alliances are the fourth relationship type that the literature discusses. Alliances can be described as a structured mode of inter-organisational arrangement that involve exchange relationships between parties without necessarily having to create a new entity (Dickson and Weaver, 1997).

Alliances are intended to be long-term, develop new resources or skills, and seek to enhance the competitive position of each partner. It has been asserted that the success or failure of a supply chain alliance is driven by commitment and trust between the parties (Whipple and Frankel, 2000). Trust must exist in an alliance since there is interdependency between the parties to mutually achieve goals which are a pre-requisite for their initial creation, as a partner may be a competitor or be involved in other alliances with a firm's competitors. Likewise, trust needs to exist for allies not only to share critical strategic information but also for each ally to consider that its long-term need will be better fulfilled (Moore, 1998). The commitment of the parties involved in an alliance ideally involves the sharing of risk and reward in a joint effort to create synergy to gain access to resources, access to new markets, access to technology, access to capital and access to international and closed markets (Rothkegel *et al.*, 2006). Many large retailers and manufacturers in Australia are increasingly establishing alliances with 3PL firms that are capable of providing fully integrated multiple services. In today's freight industry, creating this different way of doing business may be, in some cases, a matter of survival. In other cases, different approaches to participating in relationships are adopted to build sustainable competitive advantage, maximise asset utilisation and increase profitability. Participants such as road freight service providers need to realise the importance of understanding relational factors, such as power, sharing, trust and interdependency that influence the establishment of inter-firm relationships that enable them to leverage the complementary strengths of other firms within their supply chain, and function efficiently.

2.1 *The notion of power*

Power, from one perspective, can be described as the influence of one party over the other (Ireland and Webb, 2006). French and Raven (1959) suggested that there are aspects of control and coercion of the parties' power which enable the participants to maintain order and authority but its abuse is a problem and needs to be limited. They also identified five sources of power which they refer to as: reward power, coercive power, expert power, referent power and legitimate power. Although Raven (1993) included a sixth source of power, this has been assumed as a characteristic of expert power (Dapiran and Hogarth-Scott, 2003). Expert power refers to the ability of a party in a relationship to hold and control distinctive knowledge, information and skills that are valuable to the other party and can promote innovation (Cox, 2001); whereas referent power concerns a party's desire to be associated with another out of admiration for them (Zhao *et al.*, 2008). Whilst reward power refers to the ability of one party in the relationship to mediate tangible or intangible rewards to the other party, coercive power concerns the ability to mediate punishment and take disciplinary measures over partners (Rokkan and Haugland, 2002). For instance, in the freight transport industry a party can exercise expert power over the other by holding market, process or regulatory knowledge, and consequently, the other party may give up control, believing such knowledge could lead to better performance and profitable contracts. Likewise, participants in the freight industry could exercise reward power over the shippers by offering lower prices, shorter delivery times or improved material handling technology. Conversely, shippers might offer more long-term contracts or extended loading and unloading times exercising reward power over the freight service provider. Finally, legitimate power concerns the recognition of the right to hold authority over the others which originates from perceived standing or status and is present if one of the parties believe the other retains the natural privilege to such power (Maloni and Benton, 2000).

The notion of power imbalance is often considered one of the greatest discouragements and negative influences to maintaining long-term oriented relationships (Naudé and Buttle, 2000) and has been identified as a deterrent to trust. Although the work of Hingley (2005) discusses that earlier research (Svensson, 2001) has presented a different point of view, not all relationships are based on mutual trust. For instance, the Japanese automotive industry relationships are highly regarded as being long-term oriented and highly collaborative relationships. But research indicates that it does not mean that Japanese car manufacturers' relationships with suppliers are primarily relying upon trust (Cox, 1997). Cox (1997) suggests that there are indications that Japanese car makers often create hierarchies of structural dominance with their suppliers, in which although the latter regards the relationships as a win-win, the car makers keep effective control over the supplier relationship wherever possible and there is little need for trust. Furthermore, Dapiran and Hogarth-Scott (2003) found that the presence of power does not always inhibit close relationships. They found that the existence of reward and coercive power in relationships leads to capitulation and desire to exit the relationship whereas referent and expert power leads to cooperation and trust building.

There is some evidence that suggests that relationships that tend to have power imbalanced are often less stable than balanced ones such that parties comfortable with the balance are less likely to seek alternative partnerships (Bretherton and Carswell, 2002). Nevertheless, it is not always feasible to maintain an ideal power balance in inter-firm relationships and, in many cases, weaker parties are happy to stay in the relationships to keep their business profitable or a least cash-flow positive (Gummesson, 1991). For example, for a small, regional trucking firm survival could be challenged by the

closure of markets so that in order to stay in business the freight company is happy to accept the conditions the remaining dominant firms in the region make until it works out how to rebalance power either changing the nature of the relationship or seeking alternatives. This suggests that organisations should not ignore the diversity of relationships (Bensaou, 1999; Hyland *et al.*, 2005) which are not always initially influenced by trust but also depend on other factors such as power, sharing and dependency.

H1. Power is a predictor of the type of relationship in inter-firm relationships.

2.2 The importance of sharing

It is increasingly argued that organisations need to view themselves as members of a supply chain that depend one upon one another to be competitive and survive (Christopher, 2005). Studies suggest that among the different coordination mechanisms in the supply chain, sharing is a dimension increasingly sought to maximise the benefits and minimise the risks that arise from inter-firm relationships (Varamaki and Vesalainen, 2003; Xu and Beamon, 2006). So in a competitive environment, the success of businesses depends on their ability to manage and share resources such as information and assets, costs and risk within their networks of associates (Lambert and Cooper, 2000).

Sharing information concerns the degree to which information is communicated between supply chain partners and the nature and type of information. Information exchange is enhanced by relational factors such as trust and organisational integration to cope with the effect of lack of visibility which negatively impacts on supply chain performance (Reichhart and Holweg, 2007). Some of the benefits organisations can obtain from sharing relevant and accurate information includes increased system responsiveness, reduced lead-time, improved forecasts, reduced bullwhip effect, reduced supply chain costs and improved customer service (Simchi-Levi *et al.*, 2000). Organisations can share information at several levels including strategic, operational and tactical depending on the type of relationships they are participating in (Mentzer *et al.*, 2000; Varamaki and Vesalainen, 2003). Sharing operational information is less problematic than sharing tactical or strategic information (Monczka *et al.*, 1998; Lamming *et al.*, 2000). Strategic type information is expected to be shared in close long-term orientated relationships – collaboration, partnerships (Varamaki and Vesalainen, 2003; Hyland *et al.*, 2005). This type of information assists businesses in making decisions about strategic issues such as supplier selection, product introduction and location of facilities (Chopra and Meindl, 2001). Tactical level information is usually shared in more cooperative work arrangements (Hyland *et al.*, 2005; Xu and Beamon, 2006) and helps firms to jointly foresee demand. Tactical information includes operating costs, inventory costs and aggregate demand. Finally, sharing operational level information encompasses communicating weekly production, delivery schedules and order replenishment (Chopra and Meindl, 2001) among supply chain member participating in cooperative or arm's length types of relationships (Hyland *et al.*, 2005).

Sharing information in relationships involves cost and risk, which in many cases these can outweigh the benefits of sharing information (Swaminathan *et al.*, 1997). So it is argued that organisations need to understand the costs associated with sharing information in different types of working arrangements. For instance, alliances are characterised by faster task coordination and execution and less asymmetrically held information, transaction costs are negligible which leads the effective deployment of the resources brought to the alliance and transaction costs are kept to a minimum.

Conversely, in relationships at arm's length the transaction costs associated with balancing out information asymmetry might not be as low as desired and can lead to low flexibility and coordination between the participants in the relationship. Xu and Beamon (2006) posit that usually, the higher the level of resource sharing the lower the costs associated with physical flow, but the higher the risk costs. Risks are associated with sharing information as partners have the possibility of abusing information and diminishing the benefits of sharing (Maloni and Benton, 1997; Das and Teng, 2001). If the risk of opportunism in a particular relationship is sufficiently high, considerable resources must be spent on control and monitoring, resources that could have been deployed more productively for other purposes (Wathne and Heide, 2000). Examples of abuse of shared information encompass: voluntary disclosure of confidential information to competitors, loss of competitive knowledge, loss of data privacy and data integrity. This suggests that as more detailed information is shared the lower the transaction costs but the higher the risk.

Organisations enter close relationships such as collaboration and alliances to not only share risks and rewards but also to share coordination costs (Dyer *et al.*, 1998; Gulati and Singh, 1998) and resources. The rationale for establishing relationships involves an understanding of finding ways to make the relationship efficient, the extent to which coordinating the costs offsets the benefits of the relationship. For instance, an organisation with a just-in-time production process can be negatively impacted by a road freight service provider that decides to cut costs by decreasing the frequency of deliveries. The organisation needs to work with the trucking company to avoid an increase in the landed costs by transferring the expertise it has developed in its journey towards just-in-time and find potential improvements – cost coordination – for the freight company. Researchers have explained the extent of coordination costs by using a taxonomy of interdependences which include pooled, sequential and reciprocal interdependencies (Gulati and Singh, 1998). Their work indicates that pooled interdependence, in which partner organisations deploy resources into a pool and each of them uses them from the shared pool, has the least coordination costs due to the low coordination requirements. On the other hand, reciprocal interdependence – partner organisations pool resources in which outputs are highly connected to the inputs of each other – this has the highest coordination costs as continuous mutual adjustments are required to fulfil the needs of the parties.

H2. Sharing is a predictor of the type of relationship in inter-firm relationships.

2.3 The role of interdependency

Power and dependence are related. The seminal work on power by Emerson (1962) posits that the extent of dependence between the participants in a relationship gives an indication of their relative power. The theory argues that the various types of relationships present in the spectrum suggested by Sako (1992) and Spekman *et al.* (1998) are differentiated, from others, by the notion of interdependence including reciprocal interdependency (Koulikoff-Souviron and Harrison, 2007). 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 (Simatupang and Sridharan, 2002). Although the Australian road freight industry is increasingly moving towards rationalisation which allows the larger organisations to maintain a relatively lop-sided power advantage over small owner drivers, not all relationships in the freight transport industry can be simply explained

by a straightforward power motivation. Rather, one can argue that freight companies need to simultaneously pursue adversarial/competitive and cooperative and partnering/network approaches although this implies becoming not only dependant but also interdependent.

Research indicates that interdependency induces cooperative goals between companies and their suppliers and distributors which develop trusting and continuously improved relationships, which in turn produce customer satisfaction (Wong *et al.*, 2005). Mutual dependency prompts companies' sense of urgency to develop cooperative goals with suppliers and distributors and working with much concern for the interests of the others. Interdependency in supply chain concerns the extent to which supply chain relationship participants' processes depend on each other to attain their goals and achieve the overall value creation (Simatupang *et al.*, 2002). Furthermore, a firm's cooperative efforts can be based on whether an organisation perceives the relationship as likely to provide benefits over and above the costs of organisational autonomy: expenditures of resources and/or concessions of organisational power and authority (Pfeffer, 1997). Likewise, asset specificity increases dependency – it helps to increase one party's value to the other, which makes the latter dependant and minimises opportunistic behaviour (Nooiteboom *et al.*, 2000). However, excessive investment on specific assets leads to higher levels of vulnerability of the party that deploys the more specific resources. Partners' vulnerability involves loss of control over critical resources, reduction of freedom of choice and increases the costs of seeking alternative partners.

Criticality of a resource and the concept of switching cost are fundamental to interdependency and are well explained by the resource dependence theory (Pfeffer, 1997) and transaction cost theory (Williamson, 1985). Existence of critical alternative sources or partners has been regarded as a factor that will establish the cost of substitutability (El-Ansary and Stern, 1972). Spekman *et al.* (1998, p. 639) posit that "criticality is based on the notion of high recognized interdependence" as supply chain members will not act in their own best interest to the disadvantage of the supply chain. Moreover, a member can possess a critical resource to the supply chain regardless of what proportion of the total input it represents. For example, when freight service from remote plantations to distribution centres are interrupted this can cause problems to the farm business and to the supermarkets. Further, as firms increase cooperation they become equally dependant upon each other. The switching costs increase and autonomy decreases. In addition, parties that are involved in highly interdependent relationships are expected to face high switching costs which are associated with overcoming the barriers to old working arrangements and the non-recurring expenses of setting up new relationships. Parties involved in more collaborative arrangements progressively adapt resources and processes to fulfil the needs of that relationship, thereby mutually raising the exit barriers and switching costs.

This research addresses the notion of mutual dependence or interdependence for supply chain relationships in which criticality, substitutability and switching cost are key determinants. Interdependent relationships are enhanced by sharing of key resources, engaging in joint cooperative planning and long-term orientation (Bowersox and Closs, 1996; Mentzer *et al.*, 2001; Zeng and Chen, 2003). Managing supply chain relationships in today's competitive markets involves participants seeking close, long-term working relationships with one or two partners (competitors, suppliers and customers) who depend on one another for much of their business; developing interactive relationships with partners who share information freely, working together when trying to solve common problems and when designing new products. Also

jointly planning for the future, and making their success interdependent on other parties (Krause and Ellram, 1997).

H3. Interdependency is a predictor of the type of relationship in inter-firm relationships.

2.4 Trust does matter

Effective supply chains rely on shared information and trust among partners and they are essential requirement for successful supply chain relationships. La Londe (2002) supports this by stating that issues of trust and risk can be considerably more significant in supply chain relationships, because supply chain relationships involve in many cases a higher level of interdependency between competitors. Trust can be best defined as to the extent to which a party fulfils an agreement, meets the expected professional obligations and can be viewed as not behaving opportunistically (Sako, 1992; Gulati and Singh, 1998). Although there has been some empirical research suggesting that there are unexpected high trust levels in early stages of interactions between the parties (McKnight *et al.*, 1998), it is asserted that trust is a behavioural attitude that evolves and is an outcome of gradual consistent effort over time (Bstieler, 2006).

The literature provides insights into three interconnected roles that trust plays in inter-organisational exchanges. First, trust is, in many cases, an effective means of allowing a firm to minimise the risks of opportunistic behaviour as it is expected that parties will forgo short-term individual gains in favour of the long-term interests of the inter-organisational exchange (Das and Teng, 1998). Corsten and Kumar (2005) posit that trust results in greater openness between suppliers and retailers and thus greater knowledge and appreciation of each other's contribution to the relationship. Second, trust can be a source of competitive advantage in inter-organisational relationships formed by parties that behave trustworthily and do not act against values, standards and principles of behaviour. Sako (1998) found that high quality (source of competitive advantage) can be consistently maintained in high-trust production systems. Third, trust influences performance by reducing transaction costs, encouraging investment with future returns and motivating continuous improvement and learning (Sako, 1992; Whipple and Frankel, 2000).

The literature offers several categorisations of trust. For example, Sako (1992) measured three types of trust: contractual trust, competence trust and goodwill trust. More recent studies present types of trust such as credibility or competence and benevolence (Nooteboom *et al.*, 1997) and dispositional, institutional and trusting beliefs (Korczynski, 2000). This research is based on the categorisation made by (Sako, 1992) which has reported trust as a relationship-oriented variable, influencing the formations of inter-firm relationships. For instance, the notion of trust among supply chain partners was found as a vital ingredient for success in more long-term orientated inter-firm relationships such as collaborative arrangement and alliances in which firms make great commitments. They demand joint processes supported by a high degree of goodwill type of trust to smoothly ease conflicts when they arise (Dyer and Chu, 2003). Goodwill trust motivates participants in closer and mature inter-firm relationships to work interdependently, with a shared mission, vision, seamless planning, seeking synergies (Steendahl *et al.*, 2004) and undertaking, if needed, activities that were not agreed (Sako, 1992).

H4. Trust is a predictor of the type of relationship in inter-firm relationships.

3. Research methodology

This research is undertaken with an exploratory purpose as the problem of inter-firm relationships among freight businesses has had little previous empirical investigation. According to Sekaran (2003) exploratory study is undertaken when there is a lack of understanding of the problem which leads to an unstructured problem design. Quantitative data were gathered through a self administered mail questionnaire of road freight businesses operating throughout Australia.

The structure of the self-administered questionnaire was 15-pages, eight sections and pre-specified multiple choices. The six broad topics within the survey related to the manager's perceptions of the influence of trust, power, sharing and dependency on relationships such as arm's length, cooperation, collaboration and alliances. Based on previous studies, Likert-type scales were adapted to measure the extent that road freight transport businesses and their supply chain partners interact with each other. The trust construct was initially measured by nine items that were derived from the extant literature (Dwyer and Welsh, 1985; Koenig, 1989; Green, 2003). For instance, respondents were asked to rate their level of agreement (from strongly agree to strongly disagree on a five point scale) on whether a party in the trucking industry would act fairly and would not take unfair advantage of the other, even given the chance. The assessment of road freight transport supply chain partner's power sources utilised 12 items. Respondents were asked to rate the importance (from very important to not very important on a five point scale) of power in relationships. For example, trucking organisations were asked if the organisation would consider power importance to comply, with a request, as a result of a belief that supply chain partners possessed the ability to penalise them. The extent of sharing between members of the road transport supply chain was measured through a 44-item Likert-type scale instrument, adapted from the extant literature (Koenig, 1989; Das and Teng, 1999; Oliver and Delbridge, 2002), devised to reflect the opinions of participants in the road freight transport industry regarding the importance of sharing resources, information, assets and risk/rewards respondents were asked to rate their perceptions from very important to not important. Finally, the interdependency construct was measured by eight items though. Sample item is "Our supply chain partner would find it difficult to recoup their investments in us if our relationship were to end" respondents were asked to rate their level of agreement from strongly agree to strongly disagree on a five-point scale.

Road freight transport was chosen as the research setting to examine inter-organisational relationships since this is an industry in which inter-firm relationships, in many cases, are exhibiting competitive patterns but many operators are facing problems because profit margins are becoming much tighter over time. A sample of 1,000 trucking firms was identified. The research was designed to target respondents with knowledge of inter-firm relationships. The mail questionnaire, with telephone follow-up, allowed contact with the respondents to facilitate the process of clarification. It is acknowledged that response rate and turn around are issues with these types of data collection methods. Therefore, this study minimised these limitations by also using a drop-off and pick-up technique that enabled the researcher to visit a purposive sample of respondents to gain their commitment to complete the questionnaire. This increased the response rate by 71.4-12.8 per cent and the turnaround was five days faster than the mail questionnaire with telephone follow-up technique.

Regarding respondents profile, the smallest companies (12 per cent) were trucking companies with an annual turnover of less than \$1 million. The largest companies (10 per cent) were freight service providers with an annual turnover of between

\$50.1 million and \$1 billion. This indicates the sample is not restricted by firm size. For the category of service provided, 35.9 per cent of the responding firms carried heavy bulk cargo and chemicals, 19.2 per cent carried containers, 13.3 per cent carried refrigerated cargo, 7.5 per cent shipped vehicles and 29 per cent transported other types of cargo. This is not a representative sample of the industry as some sub-sectors were deliberately excluded. As the research was looking at businesses that were likely to be in supply chain relationships with a variety of trucking businesses, i.e. removalists were not taken into consideration as their work arrangements are based essentially on contract and are unlikely to form more complex relationships. Although there is no census data for the road-freight, transport industry, the distribution of the respondents was representative of the information compiled in "Who goes where edition 2006", which is a comprehensive commercial directory of freight service providers in Australia.

The main purpose of the study was to assess the power of relational factors in predicting the type of inter-firm relationship. The first step in the data analysis was to refine the scales, i.e. assessment of constructs validity and structure, by performing exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Hair *et al.*, 2010). CFA-based methodologies require fewer assumptions than the more traditional methods of assessment and, therefore, are more accommodating to most empirical data (O'Leary-Kelly and Vokurka, 1998). Next, regression analysis was run to find the predicting power that relational factors can have on the engagement in supply chain relationships.

Some limitations have been identified in this study which should caution the reader regarding the generalisability of the findings. The limitations include the small sample size; the research setting which only included Australian firms, the participants were only selected from the road freight sector and did not include customers or suppliers from other sectors; and that only four factors were tested although other factors such as size of business, ownership structure need to be examined in further research. Also further research is needed on relationships with customers and suppliers of road freight firms and it should examine how they view the interrelationships and what factors effect those relationships.

4. Results and analysis

Of the 1,000 managing directors, managers and chief executive officers, 132 responded, yielding a 13.2 per cent response rate. All the responses to the questionnaire came directly from individuals involved in managing inter-firm relationships. Of the entire sample, approximately 25.8 per cent of respondents acted in the capacity of CEOs, 29.2 per cent were managing directors, 18.3 per cent were operations manager, 3.3 per cent were owner drivers and 19.2 per cent performed the role of regional manager.

The first step of the data analysis was the refinement of the scale assessment of the different components of construct validity. Establishing construct validity, involves the empirical assessment of the adequacy of a measure and requires that three essential components be established: unidimensionality, reliability and validity (Hair *et al.*, 2010). Scale refinement was conducted for the trust, power, sharing and interdependency scales used in this study.

4.1 Trust scale validity

The results from Table I show that the loading values of six of the nine items of this scale exceeded the cut-off level of 0.4 so these are the good items that will be further examined with CFA.

Acceptable goodness of fit measures and average variance extracted (AVE) values for a construct model indicate construct unidimensionality and convergent validity, respectively (Hair *et al.*, 1998). Unidimensionality was confirmed with CFA by examining the fit of the one-dimensional models for the trust construct. Some commonly used measures to evaluate model fit include the relative chi-square statistics, root square mean error approximation, comparative fit index; and Tucker-Lewis index (Ho, 2006). A series of goodness-of-fit indices, i.e. CFI > 0.9, TLI > 0.9 and RMSEA < 0.8 provide evidence of convergent validity (Hair *et al.*, 1998). The trust scale regression model fit as indicated by the CFI (0.98), TLI (9.74), RMSEA (0.05) and CMIN/DF (1.47) appears good which confirms unidimensionality. With CFA, the AVE is calculated as the mean variance extracted for the items lading on a construct. So for the trust construct, AVE is computed as the total of squared multiple correlations divided by six items that form this construct. An AVE of 0.5 or higher is a good rule of thumb suggesting adequate convergence (Hair *et al.*, 2010). The AVE was 0.58 for the trust scale.

4.2 Power scale validity

The factor analysis was performed using the maximum likelihood extraction method and oblique rotation to select the items that will participate in the power scale regression model to be tested with CFA. As shown in Table II the factor loadings of the items are 0.50 or higher. This suggested that the 12-item scale measures exhibits unidimensionality. The 12 items loaded on one underlying factor. The scale items were then further evaluated for unidimensionality with CFA. The fit indices for the one factor model as indicated by the CFI (0.81) and the RMSEA (0.12) were not acceptable. The standardised loadings and the R^2 obtained for each item were examined to further test the reliability of the scale via CFA. Items related to the importance of expert power, referent and reward (PIsourcinf, PIknowledge and PIhasasay) had standardised loading of less than 0.50 and R^2 of less than 0.2 (Sharma, 1994). This low level of item reliability indicates they are not good measures of the power construct. Furthermore,

Table I.
Results of factor analysis for the trust scale

	Factor loadings
Tpartapprov	0.84
Tlittlect	0.79
Tcheckpart	0.76
Tconsulpart	0.70
Tsmallmatdi	0.44
Tignorules	0.47

Table II.
Results of factor analysis for the power scale

	Factor loadings		Factor loadings
PIbenefit	0.76	PIpenalize	0.59
PIharmsug	0.66	PIsourcinf	0.59
PIexpertcorr	0.65	PIwitholinf	0.55
PIrightinflu	0.64	PIexaggerat	0.52
PIoblfolsg	0.63	PIhasasay	0.50
PIlotexperi	0.61	PIknowledge	0.50

these items (PIsourcinf, PIknowledge and PIhasasay) possessed item-to-total correlations that are relative lower (0.4) than the remaining scale items. If these items are dropped, the Cronbach's alpha (0.86) for the power scale would not change. After removing these items (PIsourcinf, PIknowledge and PIhasasay), the one factor model fit measures as indicated by the RMSEA (0.06), CFI (0.96) and TLI (0.951), improved significantly. Convergent validity for this construct was tested through CFA. The average variance extracted was 0.495 which is slightly below the cutoff value of 0.5.

4.3 Sharing scale validity

Factor analysis (maximum likelihood extraction and oblique rotation) is used to see whether or not the three domains are valid, and how much the items have loading on each domain. Because the multi-item construct measures each variable, factor analysis with rotated factor matrix checks unidimensionality among the items; and those with factor loading values lower than 0.4 are eliminated (Field, 2000; Hair *et al.*, 2010). Table III shows three domains of sharing are valid and their loading factor on their loading factor on their items are greater than 0.40.

Confirmatory factor analysis of the refined construct consisting of three factors. Factor one was named sharing risk as it relates closely to the road freight firms' willingness to share risk with members of their supply chains. Factor two was named sharing resources as it relates closely to the road freight firms' willingness to share resources with members of their supply chains. Factor three was named sharing assets as it relates closely to the road freight firms' willingness to share assets with members of their supply chains. These three factors resulted in significant standardised loading, as well as acceptable fit indices and variance extracted (Table IV). Thus, convergent validity exists for the sharing scale. In order to establish discriminant validity among the three factors, the dimensions are needed to be shown a non-related in reality (Hair *et al.*, 2010).

A CFA-based approach to discriminant validity is to run the model unconstrained (the correlation between two constructs is free) and also constraining the correlation between constructs to 1.0. If the two models do not differ significantly on a chi-square difference test, the researcher fails to conclude that the constructs differ (Bagozzi *et al.*, 1991). In this procedure, if there are more than two constructs, one must employ a

Factor 1	Factor loadings	Factor 2	Factor loadings	Factor 3	Factor loadings
SRKlcovrisk	0.69	SRlprovreso	0.75	SAldepcap	0.85
SRKlweaken	0.68	SRldedicass	0.74	SAlwarecap	0.84
Sllinfnewdev	0.62	SRlcapabil	0.66	SAlfleetcap	0.70
Sllperiorep	0.60	SRlnotprovreso	0.65	SAlcargcap	0.69
SRKlbenprob	0.58	SRlsamereso	0.65	SAlinfocap	0.45
Slloperatinfo	0.57	SRlcomitreso	0.61	Slltactinfo	0.45
SRKlnoenharep	0.57	Sllstrateinfo	0.46		
SClredcostbe	0.56	SRltechcap	0.44		
SClrelredcost	0.56	SClctrlsavcost	0.42		
SRKlfindother	0.54				
SCljoint	0.52				
SRKleqshar	0.52				
SRKllosscust	0.51				
SRKlmajdec	0.50				
SRKllowret	0.45				
SRKllotherexp	0.41				

Table III.
Results of factor analysis for the sharing scale

Table IV.
Results of confirmatory
factor analysis for the
sharing scale

Factor 1	Standardised regression weight	Factor 2	Standardised regression weight	Factor 3	Standardised regression weight
SRKIcovrisk	0.86	SRIproverso	0.84	SAIdepcap	0.84
SIIinfinewdev	0.72	SRIedicass	0.88	SAIwarecap	0.79
SRKIbenprob	0.72	SRIcapabil	0.87	SAIfleetcap	0.86
SCIredcostbe	0.73	SRInotprovreso	0.63	SAIcargcap	0.81
SCIrelredcost	0.70	SRIamereso	0.76		
SCIjoint	0.71	SRIcomitreso	0.70		
SRKieqshar	0.60				
SRKI:majdec	0.54				
AVE	0.51	AVE	0.58	AVE	0.68
RMSEA	0.73	RMSEA	0.08	RMSEA	0.09
CFI	0.97	CFI	0.96	CFI	0.96
TLI	0.96	TLI	0.94	TLI	0.93
CMIN/DF	1.76	CMIN/DF	1.88	CMIN/DF	2.11

similar analysis on each pair of constructs, constraining the constructs to be perfectly correlated and then freeing the constraints. Table V shows the fit measures for each pair of factors tested separately, first with correlation unconstrained and then with the correlation constrained to 1.0. It was demonstrated for each pair that the constrained model is significantly inferior in fit.

4.4 Interdependency scale validity

The results from factor analysis indicated that four of the eight items had acceptable high loadings on one common factor. CFA of the interdependency scale provided high, standardised loading and high R^2 for only three of the eight items (INrecopuin, INDifreplapart and INteamemb). Consequently, five items were removed from the scale. Upon, deletion of these items, the improved construct demonstrated convergent validity with an AVE of 0.65 but the fit indices could not be examined to demonstrate unidimensionality. Since, there were three scale items for this construct, the model is just-identified, and the fit indices are not valid.

Multiple regression analysis was used to analyse if there is a predictive relationship between the independent variable and the dependent variables (Ho, 2006). The sign of the coefficient assesses the direction of the relationship. $H1-H4$ were tested using stepwise models which were generated at the $p < 0.05$ level. The results for each hypothesis are exhibited below:

$H1$. Power is a predictor of the type of relationship in inter-firm relationships.

Table V.
Results of discriminant
validity test for the
sharing scale

			Normed Chi-sq	Df	p	CFI	TLI	RMSEA
Unconstrained	Factor 2	Factor 3	2.85	31	0.00	0.94	0.91	0.09
Constrained	Factor 2	Factor 3	5.04	32	0.00	0.85	0.79	0.18
Unconstrained	Factor 3	Factor 1	1.79	50	0.00	0.95	0.94	0.08
Constrained	Factor 3	Factor 1	3.84	51	0.00	0.83	0.78	0.15
Unconstrained	Factor 2	Factor 1	1.95	85	0.00	0.92	0.91	0.08
Constrained	Factor 2	Factor 1	3.08	86	0.00	0.83	0.80	0.13

The first hypothesis examines the direct influence that power exerts on inter-organisational relationships in the Australian road freight transport industry. Linear regression results indicate strong support based on the value of β (Table VI).

Looking at Table VI, it can be seen that “power” is only a significant predictor of cooperative relationships formation ($p < 0.05$). A value of $\beta = -0.22$, $F(1, 117) = 5.471$, $p < 0.05$ for the predictor “power” means that there is a direct relationship between power and cooperative relationships such that the greater the importance placed on power the lesser the chances to engage in cooperative relationships.

H2. Sharing is a predictor of the type of relationship in inter-firm relationships.

The third hypothesis examines the influence of “sharing” on inter-organisational relationships (Table VI). Models indicate slight support for *H2*, demonstrating that the importance road freight businesses place on sharing influence engaging in relationships at arms’ length ($\beta = 0.23$, $F(1, 118) = 6.961$, $p < 0.05$).

H3. Interdependency is a predictor of the type of relationship in inter-firm relationships.

The third hypothesis examines the influence of “interdependency” on inter-organisational relationships (Table VI). Values of $\beta = 0.26$, $F(2, 118) = 8.51$, $p < 0.05$ and $\beta = 0.21$, $F(1, 117) = 5.47$, $p < 0.05$ for the predictor Interdependence and a value of for the predictor “interdependency” suggests that there is a direct relationship between interdependency and the formation of both arm’s length relationships and cooperative relationships such as the more the parties work interdependently with each other and meet the business expectations the greater the chances of participating in these type of work arrangements.

H4. Trust is a predictor of the type of relationship in inter-firm relationships.

The fourth hypothesis examines the influence of “sharing” on inter-organisational relationships (Table VI). Models indicate rejection for *H4*, demonstrating that the

Dependent variable	Independent variable	R^2 change model 1	R^2 change model 2	Standardised coefficient (β)	Sig.
Arms’ length	Power		Excluded variables		
Cooperative r	Power	0.45	0.43	-0.22	0.01
Collaborative r	Power		Excluded variables		
Alliance	Power		Excluded variables		
Arms’ length	Sharing	0.23	0.05	0.23	0.04
Cooperative r	Sharing	0.45	0.43	-0.1	0.95
Collaborative r	Sharing		Excluded variables		
Alliance	Sharing		Excluded variables		
Arm’s length	Interdependency	0.67		0.26	0.04
Cooperative r	Interdependency	0.45	0.43	0.21	0.02
Collaborative r	Interdependency		Excluded variables		
Alliance	Interdependency		Excluded variables		
Arm’s length	Trust		Excluded variables		
Cooperative r	Trust		Excluded variables		
Collaborative r	Trust		Excluded variables		
Alliance	Trust		Excluded variables		

Table VI. Regression estimate of power, sharing, interdependency, and trust on inter-firm relationships

importance road freight businesses place on trust does not influence engaging in inter-organisational relationships.

5. Discussions and conclusions

Understanding relational factors such as power, interdependency, sharing and trust and their influence on inter-firm working arrangements has had considerable academic interest and is of importance to managers involved in inter-organisational relationships. In spite of the general consensus about the importance of empirically researching these factors, existing results in the literature have not shown how these factors can predict the engagement of firms in different types of relationships.

While there have been many findings in a number of studies regarding trust being a precursor of inter-firm relationships (Sako, 1992; Karahannas and Jones, 1999; Ballou *et al.*, 2000; Whipple and Frankel, 2000; Jagdev and Thoben, 2001; Green, 2003), trucking firms in Australia nevertheless perceive that this is not a key factor that determines their engagement in inter-firm working arrangements. Given the predominance of a price driven commodity sector, fierce competition and tighter profit margins, the lack of trust is not be surprising.

This study aimed to identify the relational factors that explained engagement, by looking at the nature of road freight transport industry inter-firm working arrangements. It was expected that the underlying characteristics in inter-firm relationships would be identified through inferential analysis of responses from questionnaire items regarding a number of supply chain relationships statements. The study was able to identify three prominent relational factors that typify inter-firm relationships in the Australian road freight transport industry. They are sharing, power and interdependency.

One of the expected findings in our study is the significant inverse relationship between the exercise of power and the formation of more close relationships ($\beta = -0.22, p < 0.01$). The extant literature has demonstrated that power imbalance has a negative influence on the formation of relationships (Dapiran and Hogarth-Scott, 2003; Polenske, 2004). This sample, however, indicated that this is only a factor for cooperative relationships and there was no indication of either a positive or negative impact of power on the formation of other types of relationships. As respondents indicated, the use of power has negative influence on cooperative freight transport organisations which still tend to view use of penalties, bargaining power and expertise as sources of power that might prevent them from cooperating with other firms in the trucking industry.

In general terms, relationships in the trucking industry are strongly influenced by the interdependence and the nature of power. In particular, managers of trucking organisations perceived that to engage in cooperative arrangements it is important to approach the relationships as beneficial until it impacts on organisation's autonomy (Spekman *et al.*, 1998; Ballou *et al.*, 2000). This type of approach leads to interdependency. Interestingly, respondents in the road freight transport in Australia, regard interdependency as a relational factor that explains the engagement in relationships at arm's length. Perhaps, this is explained by the interest that trucking firms such as small to mid size operators have in surviving in the industry. Survival in a country of the size of Australia and can be secured by providing service to organisations that can secure significant contracts due to their bargaining power but that do not find it operationally feasible to dedicate a fleet to cover remote areas.

When looking at the explanatory power of the factor “sharing” an interesting finding emerges. The literature suggests that greater sharing of risks, costs and information is a characteristic of more complex and long-term orientated relationships (Monczka *et al.*, 1998; Lamming *et al.*, 2000). Nevertheless, the values of regression between sharing and the four types of working arrangements in this study slightly support the theory. The findings show that in the industry, placing importance on sharing is critical to engaging in relationships in which actions are primarily regulated by contracts (Sako, 1992). The nature of the industry prompts the participants to sign agreements that enable them to share assets such as depot and warehouse spaces and information systems to have a greater geographical coverage. This supports the findings about interdependency and ensures provision of the service in remote areas for the large to mid size operators and in capital cities for the small operators.

The results also suggest that freight operators see power as discouraging their involvement in cooperative relationships. This supports what has been theorised about the influence of unbalanced power on working arrangements that are not contract oriented (Kumar *et al.*, 1998). This indicates that trucking firms holding powers are not enforcing their power through punitive means as this harms their relationships. For instance it might be the case that participants in this industry do not approve reward/penalty-driven performance. However, if they exist, they are not used to ensure improvements in their working relationships.

This study provides some insights into the factors that explain the engagement of firms in different work arrangements within the Australian road freight transport industry. It demonstrated that in less mature inter-firm relationships, the dominant type of relational factors are sharing and interdependency. It is also demonstrated that the importance that freight managers place on power does not encourage their engagement in cooperative relationships. Trucking firm managers need to acknowledge that sharing and interdependency influence their relationships and they need to better understand how these relational factors influence the operational effectiveness of their individual businesses. The evidence of the influence of the negative relationships between power and cooperative relationships establishes the need of further research to explore what type power has influences relationships.

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