

1-1-2010

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### Recommended Citation

Plambeck, Lena and Gibson, Peter R.: Application of agency theory to collaborative supply chains 2010, 2-12.  
<https://ro.uow.edu.au/engpapers/1276>

# **APPLICATION OF AGENCY THEORY TO COLLABORATIVE SUPPLY CHAINS**

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## **APPLICATION OF AGENCY THEORY TO COLLABORATIVE SUPPLY CHAINS**

### **ABSTRACT**

This paper describes some supply chain theory using a case study based on a large coal export supply network in Australia, namely the Hunter Valley Coal Chain. This involves the supply of coal by road and rail from some 30 mines scattered around the Hunter Valley to the Port of Newcastle for loading onto very large bulk carrying ships. Due to severe constraints on the capacity of the infrastructure involved, highly competitive adversarial and destructive relationships have evolved between the supply chain players. As a result, the supply chain is characterised by high inventory levels, delays and queues which perhaps could be lessened if the players would work together instead of competing for capacity so intensely through destructive political and economic relationships. This paper proposes Agency Theory and other organisational theories as the means of achieving more collaborative relationships between supply chain players and hence much greater supply efficiencies to the collective good of the all of the supply chain players.

## **INTRODUCTION**

The objective of supply chain management is to focus on improving the efficiency of inter-organisational supply relationships as a whole from source to customer with particular emphasis on the interfaces of the different operations in the supply chain. The belief is that by partners in the supply chain all focusing on the same goals (E.g. deliver goods to the customer at the overall lowest cost or fastest rate); they will streamline their processes by eliminating duplication, improving communications and maybe even adjusting their operations to better serve the greater good of the supply chain. This may mean that some partners may incur greater costs or require higher investments, but a collaborative supply chain will ensure all partners share appropriately in the overall gains made. As one can appreciate, a successful supply chain requires a significant amount of trust to exist between partners for them to collaborate in such a transparent manner. It could be a real challenge to introduce these concepts into a business environment where adversarial relationships between supply chain entities have traditionally dominated.

The work described here focuses on the supply chain of coal from the coal mines in the Hunter Valley region in New South Wales, Australia, via trucks or rail to the port in Newcastle (Port Waratah Coal Services, PWCS), where it is exported to customers world wide. This work will focus on the relationships between the supply chain partners and investigate the application of agency-theory and other theories to model the behaviour of the partners in the supply chain.

## **THE HUNTER VALLEY COAL CHAIN**

The partners in the supply chain are the 30 coal mines in the region, the transport services providers that transport the coal from the mines to the port (truck and rail), the government body that owns the rail infrastructure and the port operations that stockpile and then load the coal onto the ships to be delivered to the overseas customers. In a growing export market for Australian coal, there is considerable competition for port and transport infrastructure between the coal suppliers (the mines). As a result, considerable destructive rivalry has traditionally evolved between the various supply chain players as they compete for insufficient capacity in mine to port rail links, port stock piling, loading and shipping berths. The result is that the infrastructure is not equitably managed as the coal suppliers struggle to control sufficient rail, road and port facilities to allow them to deliver their product to their customers. The power, political and economic relationships inevitably dominate decision making and equity within the supply chain and hence the supply chain is beset with queues and extraordinarily high waiting times for many of the players. E.g. it is not unusual to find over 30 very large bulk carrying ships at anchor waiting off shore for a loading berth and many thousands of tonnes of coal stockpiled and waiting to be loaded at both the mines and the port.

In 2003, a cooperative logistics planning team, the Hunter Valley Coal Chain (HVCC), the first of its kind in Australia, was established by members of the various corporate and government organisations involved in the transportation of the coal to the port in an attempt to develop more collaborative relationships. According to their website, the Hunter Valley Coal Chain, HVCC, is the largest coal export operation in the world and consists of:

- 30 coal mines owned by 17 individual coal producers
- 23 points for loading coal onto trains
- Approximately 28 trains making more than two trips per day

- More than 80 different export blends of coal
- Five coal berths and ship loaders and approximately 1.5 million tonnes of useable stockpile space at the port

(Each of these entities constitutes the supply chain players.)

Even though improvements have been achieved since the establishment of the HVCC, continued demand for greater throughput at the port still remains. The coal producers are paying millions of dollars in demurrage costs due to ships having to queue and wait for their turn to be loaded. The complicating factors are the many organisations involved and the complex ownership and business relationships between the entities. To make matters worse, small coal producers are emerging wanting to cash in on the current business environment and these operators also need access to the existing port facilities.

A recent development to this supply chain is a new structure to better manage the capacity constraints. As of 2010, PWCS will enter into long-term contracts with the coal producers and these contracts will in turn support the investment required to meet the projected demand increase. Plans are already in place that could potentially double the capacity of the port. The HVCC will be established as a stand alone company, called the HVCCC (Hunter Valley Coal Chain Coordinator), and will continue to manage the day-to-day scheduling of trains and ships as well as support long-term planning of infrastructure projects to increase capacity. They will be responsible for ensuring all contract obligations by PWCS are met.

The challenge to the managers of this new arrangement, who will become a board consisting of a representatives from all of the supply chain players, is to create a truly effective collaborative arrangements and to overcome the negative effects of the destructive adversarial supply relationships established over previous generations. In an attempt to achieve this, the authors are investigating potential application basically consisting of Agency theory; whereby cooperative relationships are built between the supply chain players by establishing a collaborative principal and agent structure. They aim to achieve this by freeing up regulation of the infrastructure and committing long term capacity contracts to the coal suppliers, who will inturn be able to trade their contracted capacity on an as needs basis. In return for the long term commitments, government and supply chain partners will collaboratively commit over two billion dollars for upgrading of the infrastructure over the 10 year period of the contracts. In so doing, it is envisaged that all of the players will develop a long term interest in the efficient and profitable operation of the infrastructure facilities.

### **AGENCY THEORY AND OTHER APPLICABLE ORGANISATIONAL THEORIES**

The aim of this research is to apply relevant organisational theories to the above case study. In particular, Agency Theory and Social Exchange Theory are relevant to the case but other theoretical approaches will also be investigated.

Agency theory relates to business relationships that consist of a “principal” and an “agent” who are engaged in cooperative behaviour, but have differing goals and differing attitudes toward risk. The mechanism for controlling the relationship is the contract between the principal and the agent

and, depending on the situation; the contract will be behaviour-based or outcome-based. The heart of principal-agent theory is the trade-off between the cost of measuring behaviour and the cost of measuring outcomes and transferring risk to the agent (Eisenhardt 1989).

Social Exchange Theory on the other hand, focuses on the interactive relationships between partners (Qiu 2007) and considers material as well as non-material exchanges. Reciprocity of explicit and implicit rewards in Social Exchange Theory forms the basis for fairness research. The 3 types of fairness provide a good platform for analysing the relationships in the HVCC: Distributive (input v output), Procedural (impartiality, consistency and refutability) and Interactive (informal interactions, decision justifications and truthfulness) (Qiu 2007). Griffith et al (2006) found how perceived procedural and distributive justice improved the performance of a distributor in a supply chain context.

Research into Supply Chain Collaboration may also be applicable to the HVCC. Extensive case study research in other industries into defining collaboration as a function of levels of information sharing, decision synchronisation and incentive alignment between supply chain partners has proven to be related to supply chain performance in terms of fulfilment, inventory and supply chain responsiveness (Simatupang and Sridharan 2005).

Furthermore, Social Network Analysis (Carter, Ellram et al. 2007) might prove a suitable method to determine the dynamics of the inter-actions between the actors in the coal chain.



Table 1 below compares the differences, strengths and weaknesses under a number of parameters of the three theories on which this research is based. The strongest emphasis for this work was placed on Principal Agent Theory with some consideration of Social Exchange Theory to cover perceived deficiencies in Principal Agent Theory.

	<b>Transaction Cost Analysis (TCA)</b>	<b>Principal Agent Theory (PAT)</b>	<b>Social Exchange Theory (SET)</b>
The Basic Assumption	Bounded rationality Opportunism (self-int)	Hidden info & action Self-int	Success/reward/Value/Aggression/Rationality proposition
The Focus of Relationship	Inter-org relationships	PA relationships	Inter-org/intra-org relationships
The Nature of Relationship	Transactional	Transactional	Relational
The Focus of Analysis	Efficiency from the buyer's perspective	Efficiency from the buyer's perspective	Interactive relationships between partners
The Focus of the Theory	Determination of market v hierarchically based exchange relationship	Determination of the most efficient contract	The impact of reward expectations on attitudes or behaviours
The Role of the Relationship Partners	Ignore the individual diff's among partners	Take into account the individual diff's among partners	Focus on the individual diff among partners
The Key Issues	Transaction costs	Agency costs	Rewards of interaction
The Stage of Relationship Examined	Ex post transaction cost minimisation	Ex ante agency cost minimisation	Ex ante motivation for interaction
Relationship Outcomes	Vertical integration or not	Outcome-based / behaviour-based compensation for interest alignment	Positive/negative attitudes/behaviours

Table 1: Comparison of three theories

Basically, the decision on research methodology was based on the following views: TCA addresses channel dependence relationships by emphasising the channel member's cost minimisation efforts. PAT provides guidelines in how to design incentive packages to achieve efficient relationships. SET models relationship fairness in light of the reciprocity rule. In view of established priorities in the case study, PAT and SET were considered priorities and to some

extent, it was thought that TCA was not necessarily and last likely to be aligned with goals of collaboration and cooperation.

## **RESEARCH**

The purpose of this study is to understand and explain the nature of the relationships that exist in the Hunter Valley Coal Chain and how they relate to business outcomes and, in doing so, answer the following question:

“Could Agency behaviour and enhanced social exchange positively affect the performance of the Hunter Valley Coal Chain?”

## **METHODOLOGY**

The method used to analyse the supply chain partner relationships is a survey by conducting in-depth interviews to gather as much information as possible. The methodology defined by Yin (2009) and Cavana (2001) for case study research is utilised. The details of the survey are to be published elsewhere and will be discussed in the conference presentation. Basically, the survey attempts to discover attitudes towards collaboration in the supply chain, in terms of information sharing in relation to their individual on-going infrastructure capacity needs, costs and attitudes to partners. It then goes on to investigate the likelihood of establishing agency behaviour and social exchange theory between the different partners, enquiring about the level of self interest in the individual players and whether they are culturally inclined to put that before the efficient utilisation of the supply chain infrastructure. Particular attention is paid to supply chain players' views on prioritising their overall costs, customer satisfaction and inventory levels. Data gathering is on-going and is to be obtained by interviewing executives and directors at the highest

level who drive the decision making process concerned with becoming involved in the supply chain coordinator venture within the individual supply chain players' firms. (In obtaining this data, support of the Senior Executives in the Coordinator organisation is gratefully acknowledged.)

## INITIAL RESULTS

Study of the supply chain organisation has been extremely difficult due to a high degree of instability in the organisation and it is important to understand that this study is of a dynamic situation as the new initiative is evolving. On occasions, it appears that key organisational factors have not remained constant from one day to the next. For example, one of the key drivers of the new initiative was the support of the government minister responsible for the port infrastructure, the port being a key player and stakeholder. Unfortunately, the initiative lost some momentum when the minister was removed from his position for political reasons not connected to the HVCC. However, the initial results are interesting in that there appears to be a strong culture of mistrust, even between the players' representatives in the HVCC organisation. One reason for this appears to be that the coordinator organisation managing executives are (were) from one of the large mining companies, Rio Tinto, who are a major user and part owner of the supply chain infrastructure. This executive team was appointed for no other reason than they had the necessary management, scheduling and optimisation supply chain skills and Rio Tinto provided much of the initial support for the project. However, such was the level of mistrust among the other partners that it became politically unacceptable for them to remain and a new executive team had to be created. This left the research in something of an impasse but in the meantime, further information gathering and development of the hypotheses was planned with

key new personnel at the new HVCCC. However, in accordance with Qui, 2007, the authors have found that the 3 types of fairness provide a good platform for analysing the relationships in the HVCC: Distributive (input v output), Procedural (impartiality, consistency and refutability) and Interactive (informal interactions, decision justifications and truthfulness) are all key factors in the analysis of HVCC supply chain relationships.

### INITIAL CONCLUSIONS

It appears that there may be considerable barriers to the establishment of meaningful Principal-Agent relationships in the studied supply organisation. Initial indications suggest that most of these barriers result from a culture of mistrust, politics and self interest that have been established over many years where partners are competing for capacity intensely through destructive political and economic relationships. It is clear that unequal power relationships and political priorities in conflict with individual business goals are at play. This work is continuing and will begin to focus on proposals to build a culture of trust and collaboration between major supply chain players with the goal of achieving improved supply chain efficiencies, based on Agency relationships. In accordance with Griffith et al (2006) it is strongly believed that perceived procedural and distributive justice could enhance the performance of this supply chain by encouraging collaboration between the principals and agents involved. This will be the focus of future work.

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