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LIES, DAMNED LIES AND NEWSPAPER REPORTS: INVESTIGATING COAL SHIPMENTS THROUGH THE PORT OF NEWCASTLE

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ABSTRACT

Australia's reputation for the quality of its coal has led to this commodity becoming a major input to the country's economy. About 88 million tonnes out of Australia's annual port capacity of 270 million tonnes of coal are shipped through the Port of Newcastle, which claims to be the world's largest coal handling port. However, capacity constraints at various parts of the supply chain threaten export shipments of coal.

In the past demand for coal has been regular and constant. However, recent rapid increases in demand, attributed mainly to an increasing Chinese market, have pushed the existing system beyond its capacity. An outcome of the inability of the coal supply chain to meet demand has been the increasing number of vessels waiting to enter the port. In 2002, the number of vessels anchored off the port often exceeded 50 daily.

In an attempt to reduce vessel waiting time, and the burgeoning cost of demurrage, a vessel priority system for loading was introduced. The system appeared to be effective, with the daily number of vessels anchored off the port reducing to single figures. However, in 2007 the number of vessels awaiting entry to the port has again risen to more than 50 on most days, leading to cuts in export quotas [1]. Exacerbating the situation are orders for coal totaling 120 million tonnes for shipment in 2008.

This ongoing research, initially based on newspaper reports and ACCC documents, is a qualitative exploratory case study that investigates the issues affecting the transportation, loading and shipment of coal through the Port of Newcastle, Australia. The research aims to identify why so many ships are waiting to load coal, and how the length of the queue may be reduced. However, reports widely circulated do not accurately reflect the situation at the Port. Following unstructured, formal interviews involving several key people in the coal supply chain a different story has emerged.

Key words: Shipping, newspaper reports, bulk transportation, supply chain, coal, demurrage

INTRODUCTION

The Port of Newcastle, managed by Port Waratah Coal Services, is one of the largest coal ports in the world consisting of the twin loading terminals of Carrington and Kooragang. Thirty six percent of Australia's coal exports are dispatched through the Port of Newcastle [2]. At Newcastle coal blending is carried out in an area that has a capacity of just three million tonnes [3]. The blending area has to deal with the complex combinations of coal grades that are exported from the Hunter Valley of New South Wales. The size of the coal blending facility means that only three to five days of supply are carried at any one time in this area [3].

In 2004 the coal loading capacity of the port was 89 million tonnes. However, the supply chain was having difficulty meeting this level, with supply falling approximately 10 per cent short of the maximum loading level. The major contracts in the 1990's were with Japan. Since this time China has become the leading buyer of coal, significantly increasing the tonnage required for export. Demand for coal shipped through the Port of Newcastle increased to 95 million tonnes in 2005. In 2008 demand is expected to exceed 120 million tonnes.

In addition to increases in tonnage further pressures from coal producers occurred as the price per tonne has double since the initial issues were identified at the coal loader. Coal extraction for export involves a long, slow moving logistics chain that needs careful management in terms of structure and flexibility (i.e. agility) [4]. In the first instance it appears that capacity constraints have restricted deliveries to the port. An outcome of the mismatch between supply and demand may be seen in the number of ships at bay, which is in excess of 70 ships lying at anchor of the Port of Newcastle on any given day [3].

This paper is the first in a series on this issue and attempts to identify and understand the competing factors within the coal supply chain. In doing this it seeks to address the following research questions: "why are so many vessels waiting to load coal at the Port of Newcastle" and "how can the queue be shortened"?

Coal Exports from Australia

Coal is a major export commodity for Australia, and is predominately mined on the east coast of Australia in the states of New South Wales and Queensland. The two ports that service New South Wales are Newcastle and Port Kembla.

The two loaders at Newcastle have been discussed in some detail above. In summary, Kooragang has a 64 MTPA capacity with a loading rate of 10,500 tonnes per hour and a maximum vessel size of 232,000 dwt, with three berths and three loaders. Significant expansion is planned in the areas of capacity in stockyards, rail capacity and ship loading. Carrington has an annual capacity of 25 MTPA. Loading is at a rate of 2,500 tonnes per hour with a maximum vessel size of 180,000 dwt with two berths and two loaders. All future expansion is planned for Kooragang.

Port Kembla, located in Wollongong, has an annual throughput capacity of 16 MTPA with a coal loading capacity of 6,600 tonnes per hour. At Port Kembla there are two berths, one for coal and one for bulk products, with a maximum vessel tonnage of 180,000 dwt. Newcastle is by far the most significant port in New South Wales. Comparative figures for coal shipments from Queensland are summarized in Table 1.

Table 1: Loading Characteristics of Queensland Coal Loading Ports

Port	MTPA	Loading Rate (tonnes per hour)	Max Vessel Size (dwt)	Number of Berths & Loaders
Abbot Point	12	4,600	166,000	1 & 1
Brisbane	5	3,000	138,000	1 & 1
Dalrymple Bay	56	7,200	200,000	3 & 3
Barney Point	5	2,000	90,000	1 & 1
Gladstone				
RG Tanna	40	8000	222,000	3 & 2
Gladstone				
Hay Point	34	5,000 berth1	230,000	2 & 2
Mackay		6,000 berth2		

In Queensland, coal exporting is spread across six locations with Dalrymple Bay, Gladstone and Hay Point being the major contributors. All loading facilities are being expanded to cope with increased demand with a particular focus on the three locations mentioned above. It is clear from these figures that Kooragang is the largest single coal loading point in Australia, and that Newcastle provides the largest tonnage export volumes of all Australian coal loading facilities.

The Development of Coal Shipping From Newcastle

Newcastle is located in the Hunter Valley in New South Wales, Australia, and is a major coal producing and exporting region. Within an Australia context Newcastle is one of the oldest ports and coal production sites in the country. The first European settlers arrived in Port Jackson (Sydney) in 1788. Nine years later the Hunter River was discovered, with coal being found on the banks of the river. Within two years coal from Newcastle was transported within the colony of New South Wales, and by 1881 the first coal mine was opened. During the next 80 years the tonnage of coal shipped from Newcastle rose to 4.5 million tonnes per annum (MTPA). By 1967 the coal loader at Port Waratah was providing 7 MTPA. In 1982, Port Waratah Coal Services (PWCS) was developed to manage increasing coal shipments which by this time had risen to 28 MTPA. Between 1982 and 1984 capacity increased further to 43 MTPA through the expansion of the Kooragang coal loader.

By 2003 the loading capacity across both sites had reached 89 MTPA. In 2005 expansion of the facilities over the next 3 years was set to increase the capacity to 102 MTPA. Despite consistent increases in port capacity, coal shipped in 2006 was 80.2 MTPA and the target for 2007 was 90.5 MTPA [5].

METHODOLOGY AND METHOD

This is a qualitative study that utilizes interview, observational and documentary data. Interview data are obtained by means of unstructured, formal interviews [6, 7] of key stakeholders in the Hunter Valley coal supply chain. Observational data are obtained from visits to key areas of the coal supply chain (e.g. coal loaders, Port of Newcastle, coal mines etc). Documentary data are obtained from reports of government bodies (e.g. ACCC), annual reports, business reports and newspaper reports.

The study is an exploratory case study [8] that seeks to address the research questions “why are so many vessels waiting to load coal at the Port of Newcastle” and “how can the queue be shortened”? The case method is appropriate for this study as it addresses *why* and *how* questions, and relates to a contemporary issue over which the researcher does not have behavioral control [8].

Interview data will be analyzed thematically using the constant comparison method proposed by Strauss and Corbin [9, 10]. Documentary data will be analyzed using qualitative textual analysis which focuses on the semantic aspects of language, utilizing latent coding to assign words based on meaning [11, 12].

KEY COMPONENTS OF THE COAL SUPPLY CHAIN

Key components in the coal supply chain include coal producers, coal transporters, transportation infrastructure, coal loaders and shippers. The relationships between the components are discussed below.

Coal producers - Coal mining is conducted mainly by open-cut mining throughout the Hunter Valley, but also by traditional underground mining. Mine ownership is diverse, with 31 coal mines owned by 17 individual coal producers [13]. Of the 17 individual owners, seven are large producers, two of which (Xstrata and Coal and Allied - its major shareholder is Rio Tinto) produce 70 per cent of the coal mined in the Hunter Valley [3]. Mining produces 80 different export blends of coal [13].

Transport infrastructure – Coal is predominantly transport from mines to the port by rail. Track infrastructure is owned by the New South Wales state government and is leased to the Australian Rail Track Corporation (ARTC) on a 60 year lease. The terms of the lease allow ARTC to sell track access to train operators. ARTC will invest \$152 million on track and signaling upgrades over the next five years. The proposed investment program will increase capacity of rail infrastructure from 85 MTPA to over 100 MTPA. Transit times will also be improved [2].

Rail providers – Coal trains are operated by Pacific National (PN) and Queensland Rail (QR) under the terms of track access purchased from ARTC. At the mine, coal is transported from a railway siding or coal loading facility. PWCS informs rail providers of transport requirements for shipment. Coal is then transported to the port where it is offloaded into stockpiles prior to blending, if required. Once the vessel arrives coal is reclaimed from stockpiles for loading [14].

Coal loaders – The Port of Newcastle has two coal loaders located at Carrington and Kooragang. Major coal producers Xstrata and Rio Tinto own the port and coal loading

facilities at Newcastle [15]. Rio Tinto appoints the port management [3]. As the port owners are also the major producers the Australian competition regulator (ACCC) requires that an open access system be operated [3].

The need for a third coal loader has been debated since the 1990s. Issues of ownership have been raised given the perceived conflicts of interest resulting from coal production and port operation being in the same hands. The record of the current owners of PWCS in developing the port is not impressive [3]. In April 2007 the New South Wales government announced approval for construction of a third coal loader at Newcastle [16]. Newcastle Coal Infrastructure Group (NCIG), a consortium of coal producers that excludes Xstrata and Rio Tinto, has been appointed to build the new \$922 million facility. The members of NCIG are significant coal producers who plan to increase their output by 30 million tonnes during the next five to ten years. When completed in 2009 the new facility will have a maximum capacity of 66 million tonnes per year [16].

Supply chain coordination – The Hunter Valley Coal Chain Council (HVCCC) was established in the 1980s with the purpose of ensuring effective and efficient coal dispatches from mine to vessel.¹ Membership of the HVCCC included coal owners, rail operator (ownership of trains and track were vested in one authority), PWCS, Port Authority, Transport Workers Union (TWU) and New South Wales state government representatives for Mines and Transport. In the 1980s and early 1990s demand for coal could be accommodated by existing infrastructure. Consequently, the main role of the HVCCC was to allocate tonnages by mode of delivery for forthcoming periods. An important consideration for the HVCCC was balancing the needs of road transport haulers for work (persuasively argued by the TWU) against the economic, community and environmental needs of minimizing the transportation of coal by road.

In 2003 the Hunter Valley Coal Chain Logistics Team (HVCCLT) was created to oversee planning of all coal exports from the Hunter Valley. Membership of HVCCLT includes the train operators PN and QR; the track owners ARTC and Railcorp; the cargo assembly and coal loader operator PWCS; and the port manager Newcastle Port Corporation. The HVCCLT has the dual objectives of maximizing coal export volumes and coordinating planning for the provision of future coal chain infrastructure [13]. The aims of the HVCCLT are to provide a single point of supply chain coordination and to provide a holistic approach to managing the coal supply chain [13]. On a short-term planning basis the HVCCLT coordinates vessel berthing, stockpile layouts and train sequencing in the context of 14 days notice of vessel arrivals. On a long-term planning basis the HVCCLT is involved in infrastructure planning and managing the arrival and loading of approximately 1000 vessels each year [13].

CAPACITY CONSTRAINTS

The inability to cope with demand for coal for export is a long standing malaise of the Hunter Valley coal chain. From the late 1980's to 2004 no new tracks had been laid. No new trains or rolling stock had been purchased since the 1990's. Due to lack of investment there was a major short fall in capacity given massive increases in demand for export coal. Prior to 2004 the rail system was delivered by two parties. RailCorp, a State

Government entity, managed the below rail (bridges pavement sleepers etc) and Pacific National (PN), a private company, managed the above rail (rolling stock, trains etc).

In 2004 the Hunter Valley Coal Chain was able to transport 80 MTPA, against a port capacity of 89 MTPA. The result of the capacity constraint caused by the coal chain's transportation systems was more than 50 vessels at one time anchored off the port awaiting berths. The estimated costs of demurrage for 2004 was AUD\$300 million. An initial quota system was introduced in July 2004 which allowed coal producers to sell their quotas to each other. The estimated saving from the quota system were between AUD\$110 – AUD\$195 million per annum [17].

The owners of the port, Xstrata and Rio Tinto, also produce 70 per cent of the coal shipped through the port. Therefore, the market is oligopolistic, with a few major suppliers operating as a cartel. In order to prevent the kind of collusive conduct exercised by cartels that supply high utility goods (i.e. coal has high utility as it is not readily substitutable at a comparative price) [18], Australian law demands that fair and open competition exists in business situations. Therefore, to ensure indemnity from prosecution under Australia's competition legislation, the competition regulator, the Australian Consumer and Competition Commission (ACCC), is required to approve any proposal to restrict the delivery and loading of coal. The central role in the supply chain exercised by Xstrata and Rio Tinto, together with their control over key resources [19, 20], underpins the power of these major coal suppliers.

In February 1998 the ACCC rejected an application for a capacity allocation system for coal loading at the Port of Newcastle [21]. The ACCC noted that although the port had a capacity of 66MTPA and a throughput of 62MTPA, a large queue of ships had developed during the latter part of 1997. The queue had cost mining companies significant amounts in demurrage.

In detailing the application, coal producers sought a capacity allocation system that had the flexibility to opt into or out of the system, or to change it at the discretion of PWCS. The application also proposed allocating of a share of coal loader capacity to each coal mine. Allocating coal loader capacity as proposed was claimed to ensure a balance between total export sales and capacity, thus reducing vessels waiting for berths. The application was supported by many coal producers, but opposed by others on the basis that the capacity allocation system would restrict the ability of mines to compete with one another for sales. Also, incentives for coal mines to improve efficiency would be compromised.

In rejecting the application the ACCC noted that there was uncertainty about the need for a system as recent productivity improvements had resulted in a reduced vessel queue. Also, increased capacity was planned for the port in the near future which would relieve any future vessel queuing situation [21].

In July 2004 the ACCC was again approached to approve a system to reduce the queue of ships at the Port of Newcastle [22]. Up to 56 ships had been queuing off the port due to

vessels arriving at a faster rate than coal could be transported from mines to the port. The revised system was designed to match vessel arrivals with port and transit capacities. In an attempt to ensure that the introduction of the system did not affect coal exports adversely the ACCC authorized producers to sell allocations to other producers in order to improve the operation of the system [22].

In April 2005 the ACCC granted interim approval for a Medium Term Balancing System (MTBS), designed to address the imbalance between coal loading at the Port and the capacity of the Hunter Valley coal chain. The purpose of queue management through the MTBS was to limit demurrage costs from excessively long queues while infrastructure projects designed to increase capacity were completed. The MTBS was designed to provide all coal producers with a proportional share of the coal chain's capacity. Implementation of the MTBS reduced vessel queues to single figures within a few months, while ensuring that the maximum amount of coal moved through the supply chain [23].

In September 2006 the main coal producers, Xstrata and Rio Tinto, decided to end the MTBS and return to a contract allocation system [3]. Ending the MTBS soon caused the number of vessels anchored off the port to increase, to the point that more than 70 ships were waiting to load.

In April 2007 PWCS applied to the ACCC to reinstate the MTBS [24], amid suggestions from Xstrata and Rio Tinto that a capacity balancing system effectively reduced production at mines. Key changes to the previous system were designed to increase flexibility for all coal producers by introducing monthly coal loading allocations for large producers. Under the previous system all producers had received quarterly coal loading allocations. The ACCC gave interim approval of the application, suggesting that it should improve the operation of the coal supply chain by helping to smooth fluctuation and variation. According to the ACCC, greater flexibility in the use of coal loading allocations should reduce the queue of vessels waiting off the port. The modified system should also provide incentives to maximize export opportunities and to take advantage of expansion projects in the Hunter Valley [23].

In May 2007 the ACCC granted final approval to the capacity balancing system, noting that despite expansion at the port to a capacity of 102 MTPA, and ongoing expansion throughout the supply chain, there was still an imbalance between supply and demand for coal [25]. Reinstating the system was expected to reduce demurrage costs significantly. By September 2007 vessels waiting to enter the port had dropped to 44, the lowest since November 2006 [26]. Commenting on the claims of Xstrata and Rio Tinto that a capacity balancing system effectively reduced production at mines, the ACCC stated that there was no link between the two issues. Furthermore, a capacity balancing system did not remove the need for continued investments in infrastructure to improve capacity throughout the coal supply chain [25].

In November 2007 the ACCC received an application for a proposed Vessel Queue Management System (VQMS) to operate in the Hunter Valley in 2008 [14]. The

application reflects a pressing need to reduce vessel waiting times at the port in 2008 [15]. The proposed VQMS is designed to commence operation when demand for coal exceeds the coal chain's capacity for 2008 of 95 MTPA. It is designed to be a short-term, interim measure designed to minimize vessel queues [14]. The proposed VQMS is claimed to be superior to a solely 'port based' approach as it attempts to align coal producers' contracts for rail haulage services with their loading allocations at the port.

The VQMS will operate by allocating coal chain capacity between rail providers based on providers' contracted volumes. Once each rail provider has received its share of coal chain capacity the rail provider will determine each customer's rail allocation based on its individual agreements with its customers [14].

A key feature of the VQMS is the establishment of an Administration Panel consisting of one representative from each of PN, QR and PWCS. The Administration Panel will be responsible for administering the VQMS with the assistance of the HVCCLT [14]. The proposed VQMS will follow five steps. Step one involves determining forecasted demand based on the lesser of each producer's port or rail contracted volumes. Step two involves the HVCCLT calculating the forecast capacity of the coal chain from the point of loading coal at mine loading points, transporting it to PWCS and loading it onto vessels for each calendar month of 2008. The Administration Panel will then calculate available capacity by adding or subtracting the volume of any queue adjustment from the coal supply chain. Step three involves distribution of capacity which ensures that the VQMS comes into operation only when aggregate demand exceeds the coal chain's capacity of 93 MTPA. Step four aligns the rail and loading allocations of individual producers in an equitable and transparent way. Finally, step five provides that adjustments to available capacity take into account the cause of the adjustment, rather than being applied on a pro rata basis as under previous arrangements. This ensures that there is a greater focus on performance issues at the individual producer level [14].

It is claimed that the proposed VQMS will not adversely affect competition while delivering substantial public benefits (i.e. reduce demurrage by regulating the vessel queue). The VQMS is currently under consideration by the ACCC for implementation in January 2008 [14].

LIES, DAMNED LIES AND NEWSPAPER REPORTS

There is little information about the Newcastle coal supply chain apart from newspaper reports and news releases issued by the ACCC. The information presented in this paper was obtained from the abovementioned sources. However, when the authors interviewed senior managers at PWCS and others associated with coal loading, a different story emerged. Errors and omissions in newspaper reports are reported below:

The Port of Newcastle, managed by Port Waratah Coal Services - PWCS manages the coal loaders at Carrington and Kooragang. The Port of Newcastle is managed by the Newcastle Port Authority [27].

The blending area has to deal with the complex combinations of coal grades that are exported from the Hunter Valley of New South Wales. The size of the coal blending facility means that only three to five days of supply are carried at any one time [3] – The lay-down yard is presented as an operational issue when actually it is not [27].

The major contracts in the 1990's were with Japan. Since this time China has become the leading buyer of coal, significantly increasing the tonnage required for export – Only 3% of Hunter Valley Coal is shipped to China [28].

Major coal producers Xstrata and Rio Tinto own the port and coal loading facilities at Newcastle [15] – Xstrata and Rio Tinto do not own the Port or the coal loader. They are major shareholders in the Carrington and Kooragang coal loaders, which are owned by a public, non-listed company [27, 28].

Rio Tinto appoints the port management [3] – Port management has nothing to do with Rio Tinto [27]. Rio Tinto, by virtue of its shareholding in PWCS, appoints three directors to PWCS, including the Chairperson [28].

As the port owners are also the major producers the Australian competition regulator (ACCC) requires that an open access system be operated [3] – This is not strictly true. The reason for the ACCC's interest is the Common User Provision (CUP) which is a term of PWCS' lease from the NSW government[29].

The record of the current owners of PWCS in developing the port is not impressive [3] – Developing the port is outside the remit of PWCS. However, in terms of business performance PWCS provides a 12% return to its shareholders [27].

When completed in 2009 the new facility will have a maximum capacity of 66 million tonnes per year [16] – The real issue that gives NCIG a competitive advantage is the omission of a CUP in the legislation establishing the new coal loader [27, 29]. This critical issue is not explored in newspaper or ACCC reports.

On a short-term planning basis the HVCCLT coordinates vessel berthing, stockpile layouts and train sequencing in the context of 14 days notice of vessel arrivals – Ironically long vessel queues assist operational planning at the coal loaders [27]. This important issue is not explored.

DISCUSSION

The Hunter Valley coal supply chain is a complex system. Until the boom in demand for coal of the last few years, demand for coal had been lower than supply. Also, while demand was lower than the capacity of the components of the chain to deliver and load coal, little investment in infrastructure was made. In 2004 the first signs of problems with coal logistics became evident, with the inability of rail infrastructure to deliver sufficient coal to meet demand. This caused a backlog of vessels which had been ordered to match the capacity of the port. Since 2004 there has been substantial investment in rail

infrastructure. However, additional rail track capacity has highlighted other capacity issues elsewhere in the supply chain (e.g. coal loaders).

What this paper has highlighted is the difficulties in optimizing supply chain performance when demand exceeds the capacity of the supply chain to deliver. Coal producers have the capacity to increase output by at least 15 per cent [3]. However, potential capacity constraints exist in restrictions on the speed on trains - exacerbated by distance traveled, constraints caused by rail track infrastructure, the capacity of coal loaders at the port, vessel arrivals and coordination of all aspects of the coal supply chain. In times of high demand easing capacity constraints at any one point only causes constraints at another.

Further issues at the Port of Newcastle include the CUP which requires PWCS to provide equal access to Kooragang's facility to all coal producers (including new entrants). This major issue has been ignored or avoided by newspaper reports, and to lesser extent ACCC news releases. Ironically, increasing stockpiles at mines, the CUP and demurrage costs are borne primarily by Xstrata and Rio Tinto.

Future plans for the Hunter Valley coal supply chain include substantial strategic investment in rail infrastructure, a third coal loader with a larger lay-down area, a proposed VQMS for 2008, and improved supply chain coordination. Ownership of the third coal loader by producers other than Xstrata and Rio Tinto may provide a competitive advantage for NCIG.

In conclusion, the purpose of this exploratory study has been to identify the key components and interactions throughout the coal supply chain as a platform for further studies in this area. Further research will investigate the physical limitations of infrastructure together with the nature and dynamics of relationships between all key parties throughout the coal chain.

Footnotes

¹ One of the authors was a member of the Hunter Valley Coal Chain Council between 1988 and 1993.

REFERENCES

1. Wong, F., *Australia port cuts Q4 coal export quotas by 9 percent*, in *New Zealand Press Association*. 2007.
2. ARTC, *\$152 million upgrade for Hunter Valley rail freight network*, in *Australian Government news release*. 2006.
3. Stevens, M., *Sell Port Waratah to break bottleneck*, in *The Australian*. 2007: Sydney.

4. Christopher, M., *The agile supply chain: Competing in volatile markets*. Industrial Marketing Management, 2000. **29**: p. 37-44.
5. Judge, N., *Managing the queue*. 2007, PWCS News.
6. Kvale, S., *Interviews: An introduction to qualitative research interviewing*. 1996, Thousand Oaks: Sage.
7. Minichiello, V., et al., *In-depth interviewing: Principles, techniques, analysis*. 1997, South Melbourne: Addison Wesley Longman.
8. Yin, R., *Case study research: Design and methods*. 2003, Thousand Oaks, CA: Sage.
9. Strauss, A. and J. Corbin, *Basics of qualitative research: Grounded theory procedures and techniques*. 1990, Newbury Park: Sage.
10. Strauss, A. and J. Corbin, *Basics of qualitative research: Techniques and procedures for developing grounded theory*. 2nd ed. 1998, Thousand Oaks: Sage.
11. Roberts, C.W., *Text analysis for the social sciences: Methods for drawing statistical inferences from text and transcripts*. 1997, Mahwah, NJ: Lawrence Erlbaum Associates.
12. Bolden, R. and J. Moscarola, *Bridging the quantitative-qualitative divide: The lexical approach to textual data analysis*. Social Science Computer Review, 2000. **18**(4): p. 450-460.
13. HVCCLT, *Hunter Valley coal chain logistics team*. 2003.
14. ACCC, *Vessel queue management system 2008*. 2007, Australian Competition and Consumer Commission, 16 November 2007.
15. Kirkwood, I., *Quota needed to cut queue*, in *Newcastle Herald*. 2007.
16. NCIG, *NCIG welcomes approval of third coal terminal for Port of Newcastle*, in *Newcastle Coal Infrastructure Group news release*. 2007.
17. Evans, P., *Shipping queues at the Port of Newcastle*. Shipping Australia, 2004: p. September, 2004.
18. Cox, A., et al., *Supply chains, markets and power: Mapping buyer and supplier power regimes*. 2002, London: Routledge.
19. Munson, C., M. Rosenblatt, and Z. Rosenblatt, *The use and abuse of power in supply chains*. Business Horizons, 1999. **January-February**: p. 55-65.

20. Crook, T. and J. Combs, *Sources and consequences of bargaining power in supply chains*. *Journal of Operations Management*, 2007. **25**: p. 546-555.
21. ACCC, *Coal loading system interim authorisation blocked*. 1998.
22. ACCC, *ACCC allows system to reduce coal vessel queue at Port of Newcastle to continue*. 2004.
23. ACCC, *ACCC proposes to approve amended system to reduce Newcastle coal ship queue*. 2007.
24. ACCC, *ACCC grants urgent approval to system to reduce coal ship queue*. 2007.
25. ACCC, *ACCC gives final approval to amended system to reduce Newcastle coal ship queue*. 2007.
26. Anon, *Newcastle coal ship queue lowest since November*, in *New Zealand Press Association*. 2007.
27. Oliver, J., *Interview about coal loading at the Port of Newcastle*. 2008: Newcastle.
28. PWCS, *PWCS Visitor Presentation*. 2007, PWCS: Newcastle.
29. Sefton, G., *Interview about coal shipments through the Port of Newcastle*. 2008: Newcastle.