

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

Collaborating with competitors: Value through coopetition in the New Zealand forest industry.

A thesis presented in partial fulfilment of the requirements for the degree of Master of Supply Chain Management.

At Massey University, Manawatu,
New Zealand

Virginia Anne Christians
2015-2016

I. ABSTRACT

The purpose of this research is to investigate the scale of possibility for cooperation to be applied to the logistics activities in the export log supply chain in New Zealand. The research ascertains there are financial benefits of approximately \$200million to the industry from cooperating in port logistics and shipping activities while continuing to compete in other sectors of the chain. The research tests to see if the existing theory on barriers and facilitators applies in this case study. Two research methods were used: 1. Qualitative interviews with exporters to probe for specific factors that support or hinder cooperation adaptation. 2. Quantitative research looking at financial implications, involving data collection from industry, building a simulation model, and simulating four degrees of cooperation adoption.

The research identifies that small levels of cooperation between exporters can produce the most cost reduction benefits, with decreasing returns to scale through further collaboration attempts. As well as providing overall cost reductions the research indicates that there is a significant reduction in cost volatility by collaboration in shipping and logistics. While exporters used various terminology the themes that emerged, through semi-formal interviews, the barriers and enablers that were identified in this context relate closely to those models of other authors. The alignment of the physical world in time and space, the connection between strategic business models and relevant levels of autonomy and risk and the alignment of values, history and ability to communicate with relationship and their cost were all found to be significant factors that could both enable or disable cooperation between competitors in this case. Levels of trust and communication were found to be generally low in the log export industry the input of an independent third party may assist in supporting cooperation. The research concludes that there is potential for at least small and medium sized players in the industry to adopt some level of cooperation to reduce costs in the supply chain. However, the findings indicated that there are significant invisible costs associated with cooperation outside of the operational costs. The full cost of building and maintaining relationships required for it to persist still needs to be investigated further. These factors should be considered when analysing the savings as they may easily erode any gains made through cooperation.

II. ACKNOWLEDGEMENTS

I would like to thank SCION for generously funding my research and allowing me to keep a roof over my head while I completed my study. My thanks to the NZIF foundation for their contribution towards the costs of travelling to interview the exporters.

I would like to acknowledge the contribution of my supervisors Professor Paul Childerhouse, Professor Carel Bezeidenhout and Mr Graham West, thank you for your time and effort your inputs have been invaluable for my learning and growth through this time.

Acknowledgements to the port companies who participated in the questionnaire and were very helpful in explaining the processes that take place on their ports. Thanks to Port of Tauranga, Eastland Port, Napier Port, Port Taranaki, Centre Port, Port Nelson, Lyttelton port of Christchurch, Port Otago and South Port for your contributions.

My appreciation goes out to those individuals who fronted up to give their time and talk to me for the interviews. While privacy prevents me from thanking you individually please know I appreciate you taking time out of your day to contribute, for being both candid and passionate about your business. This research would not be the same without your very significant input. To the exporter who kicked off the idea for this research, thank you for your extra time and patience in explaining the industry in detail to me and garnering my interest in the topic.

Last but not least thank you to my friends and my family, most especially to my husband, for supporting me every day through this journey.

III. TABLE OF CONTENTS

i. Abstract	2
ii. Acknowledgements	3
iv. Table of Figures	6
1 Introduction	7
1.1 Introduction to Co-opetition	7
1.2 Extended Resource Based lens of Coopetition	9
1.3 The New Zealand forestry logistics industry context	10
1.4 Aim and Objectives.....	11
1.4.1 Purpose of the Research and Research questions	11
1.4.2 Objectives of the Research	12
1.5 Structure.....	12
2 Literature review	13
2.1 Horizontal supply chain relationships	13
2.2 The choice to compete, cooperate or compromise.....	16
2.3 Scarce resources combing to create a value advantage	18
2.4 Theoretical Lens	20
2.5 Logistics Coopetition	23
2.6 Attributes that enable and obstruction coopetition.....	27
2.7 Coopetition in the New Zealand and forest industry context.....	28
2.8 Transport and Logistics Coopetition in the New Zealand Context.....	30
3 Methodology	32
3.1 Philosophy	32
3.2 Strategy	37
3.3 Design.....	40
3.4 Research Questions.....	44
3.4.1 General Questions	44
3.4.2 Specific Questions	44
3.5 Ethical considerations	45
4 Background to the New Zealand log export industry context of the research.	46
5 Qualitative method and analysis	52
5.1 Research Method	52
5.1.1 Data Collection	52

5.1.2	Qualitative analysis approach	54
5.1.3	Qualitative ethical considerations	54
6	Qualitative Results	56
6.1	Case study results	56
6.1.1	Company A	56
6.1.2	Company B	58
6.1.3	Company C	60
6.1.4	Company D	62
6.1.5	Company E	64
6.1.6	Company F	66
6.1.7	Company G	68
6.1.8	Company H	70
6.2	Cross Company analysis	72
6.2.1	Alignment in the physical world	72
6.2.2	Relationships	72
6.2.3	Autonomy and Risk	74
6.2.4	A vehicle for communication	74
7	Quantitative method and analysis	76
7.1	Research Method	76
7.1.1	Data Collection	76
7.1.2	Quantitative Analysis Approach	82
7.1.3	Quantitative ethical issues	82
8	Simulation modelling results.	84
9	Conclusion and recommendations for future research.....	89
9.1	Conclusion	89
9.2	Recommendations for future research	91
10	References	93
11	Appendix A	105
12	Appendix B	106
13	Appendix C.....	107
14	Appendix D	109

IV. TABLE OF FIGURES

Figure 1-1: Three organisations share of value with and without cooperation. Space between the pies represents additional value captured as a result of cooperative practices in one section of the value chain (Adapted from Chin, Chan, and Lam, 2008) 7

Figure 1-2: Indication of the network ties between individuals in two organisations that allow for sharing of resources 9

Figure 1-3: Two organisations with no social network ties making use of a third party organisation with ties to both organisations in order to share resources 10

Figure 2-1: The value net (from Nalebuff & Brandenburger, 1997)..... 13

Figure 2-2: Vertical and horizontal interfirm relationships (from Björnfort and Torjussen, 2012)..... 14

Figure 2-3: Variations of horizontal relationships (from Bengtsson & Kock, 1999, p181)..... 15

Figure 2-4: Co-opetitive interfirm relationships types (from Bengtsson & Kock, 2000) 17

Figure 2-5: Testing Coopetition partnering theory in an extended resource based case..... 31

Figure 3-1: Methodology at the centre (Morgan, 2007 p 69) 35

Figure 3-2: Abductive cyclical knowledge generation over time (From Strübing 2007 p567) 36

Figure 4-1: Map of New Zealand ports showing their International location codes (UN/LOCODE) 47

Figure 6-1: Summary of perceptions around Company A 58

Figure 6-2: Summary of perceptions around Company B 60

Figure 6-3: Summary of perceptions around Company C 62

Figure 6-4: Summary of perceptions around Company D 64

Figure 6-5: Summary of perceptions around Company E 66

Figure 6-6: Summary of perceptions around Company F 68

Figure 6-7: Summary of perceptions around Company G 70

Figure 6-8: Summary of perceptions around Company H 71

Figure 8-1: Total supply chain savings under four cooperation scenarios between exporters 84

Figure 8-2: Savings per Jas m3 under four cooperation scenarios between exporters 84

Figure 8-3: Total logistics cost per ship under four cooperation scenarios between exporters..... 85

Figure 8-4: Percentage of ships making 4 port calls..... 86

Figure 8-5: Total logistics cost to exporters by port logistics and shipping costs for four scenarios of cooperation 87

Figure 8-6: Total time spent waiting to berth for all ships over four scenarios of cooperation 88

1 INTRODUCTION

1.1 Introduction to Co-opetition

Co-opetition refers to a situation where competing organisations cooperate in one activity in the supply chain, whilst still competing with each other in some other activities (Bengtsson & Kock, 1999). As depicted in Figure 1-1, organisations work together in order to increase the size of the value pie that is available to them jointly. They compete with each other to divide this value, which may not be distributed equally (Chin, Chan and Lam, 2008). The power position of a party in terms of the resources they control and their particular skills in negotiation will influence the size of the value captures they gain (Morris, Kocak, and Özer, 2007).

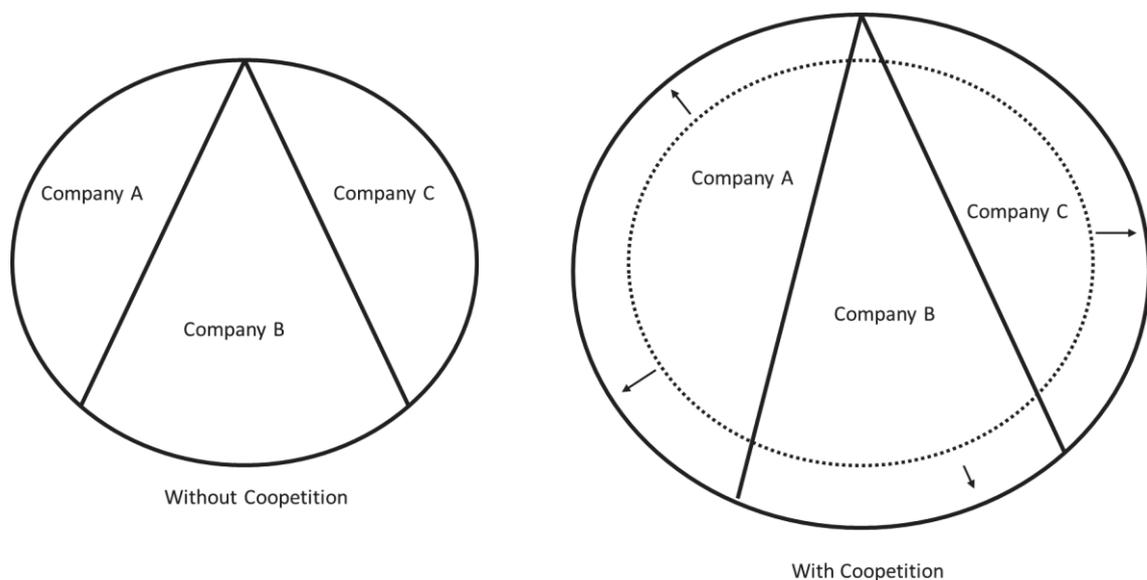


Figure 1-1: Three organisations share of value with and without cooperation. Space between the pies represents additional value captured as a result of cooperative practices in one section of the value chain (Adapted from Chin, Chan, and Lam, 2008)

There are a number of factors that enable and support co-opetition relationships. Co-opetition relies at a basic level on the creation of these mutually beneficial situations in order to incentivise the parties to continue the relationship. This means that any cooperation relationship must leave each party at least as well off as the competition relationship did, after accounting for the costs of the relationship.

Crujssenn, Dullaert and Fleuren (2007) found that alignment of incentives is a strong enabler of the continuance of coopetition relationships once the incentive to enter the relationship have been identified. The existence of strong interfirm relationships has been shown to be necessary to maintain the relationship (Crujssen *et al*, 2007). Põllumäe, Lilleht and Korjus (2011) found that where these interfirm relationships were weak membership of an industry organisation may enhance them. A third party intermediary may overcome existing barriers by providing missing relationship and communication elements between the parties. Põllumäe *et all*, (2016) maintain that alignment of the environment is essential to the maintenance of coopetition. The internal alignment includes similar norms and culture between the organisations. An aligned external environment with mutual geography also supports the coopetition relationship (Dahl, 2014).

These enablers encourage the coopetition relationship by reducing the operational burden of relationship management. Where the cost to create and maintain such a relationship is high then it can erode the gains that can made from cooperating, possibly to the point where the relationship is no longer mutually beneficial. A number of factors that can obstruct the coopetition relationship, have been identified. Crujssen *et al*, (2007) documented partner selection and coordination and negotiation skills as being the most critical. Selecting the correct partner to balance the benefits and costs of the relationships is essential. Where one party to the relationship lacks skill or power in negotiating terms and coordinating the division of the gains this can give the other parties an advantage which may alter the benefits to each party. Põllumäe *et al*, (2016) identified a lack of support mechanisms and time constraints as further obstruction to coopetition relationships.

Coopetition situations where the cooperative activity takes place in a non-core area, such as logistics, provides benefits to both the organisations taking part as well as the wider industry (Crujssen *et al*, 2007). Logistics cooperation has been identified in academic literature as a waste reduction exercise that is of particular benefit to commodity supply chains dealing with high volumes of products and low margins. Where margins are low controlling cost in low value adding areas of the supply chain such as logistics is essential (Bengtsson & Kock, 2000). Where logistics is the cooperating activity in the relationships,

increased flexibility of the supply chain has resulted and risk has been shown to reduce (Björnfot & Torjussen, 2012).

1.2 Extended Resource Based lens of Coopetition

This research examines coopetition through an extended resource based lens. This lens views organisations as operating in complex interactive networks (Lin, 1999). The connections between the people within organisations provide opportunities to connect across competing firms (Gnyawali, He, & Madhavan, 2006). This cross connection supported by these interactive social networks allows organisations to share resources to create sustainable competitive advantage for both firms (Arya & Lin, 2007). Figure 1-2 illustrates the connections between individuals in two organisations that allow the organisations to share resources. Where there are connections with competitor organisations these opportunities present real value as competitors use similar resources and the mutual benefit of reducing redundancy and cost in these is high (Gnyawali & Park, 2009).

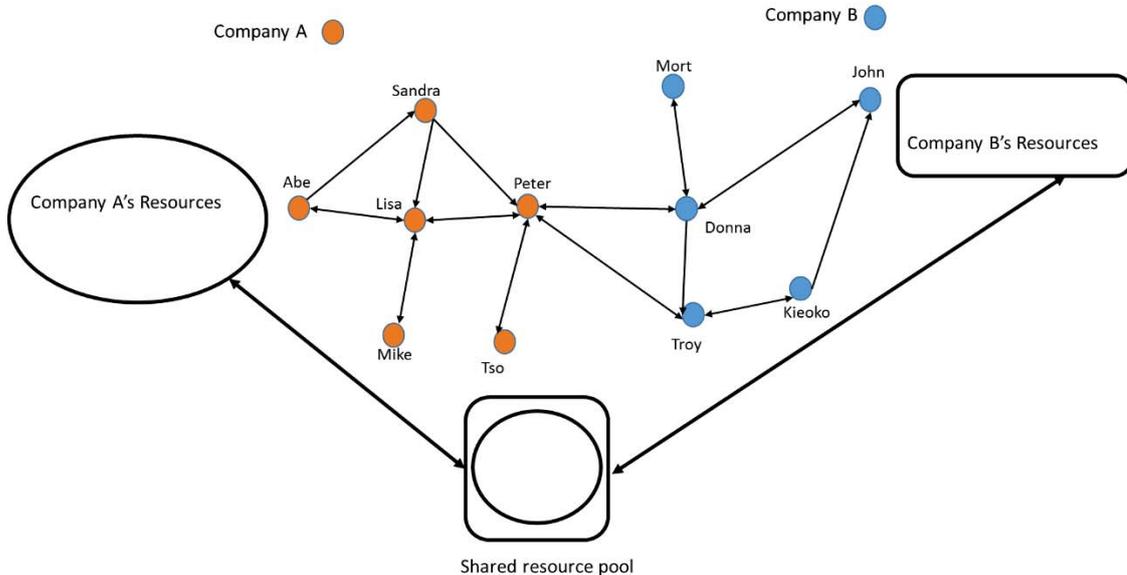


Figure 1-2: Indication of the network ties between individuals in two organisations that allow for sharing of resources

Organisations that lack these social ties with individuals from competing organisations struggle to find appropriate partners to connect with. The cost of maintaining relationships to allow for coordination and negotiating with others can reduce incentives to cooperate. Where partner selection and information sharing is challenging this can create disinterest

in cooperation by the decision makers in these organisations. These obstacles can be surmounted by the use of a third party to the relationship, such as an industry organisation or a joint alliance, to provide an independent bridge between the organisations networks. Third party involvement can also act as a convenient vehicle for information sharing where network ties are low or non-existent between parties (Hingley, Lindgreen, Grant, & Kane, 2011; Pöllumäe, et al, 2016). Figure 1-3 depicts a typical example where a third party has an individual node in connection with two otherwise between two otherwise connectionless organisations. This individual operates as a bridge allowing the two companies to communicate and share resources.

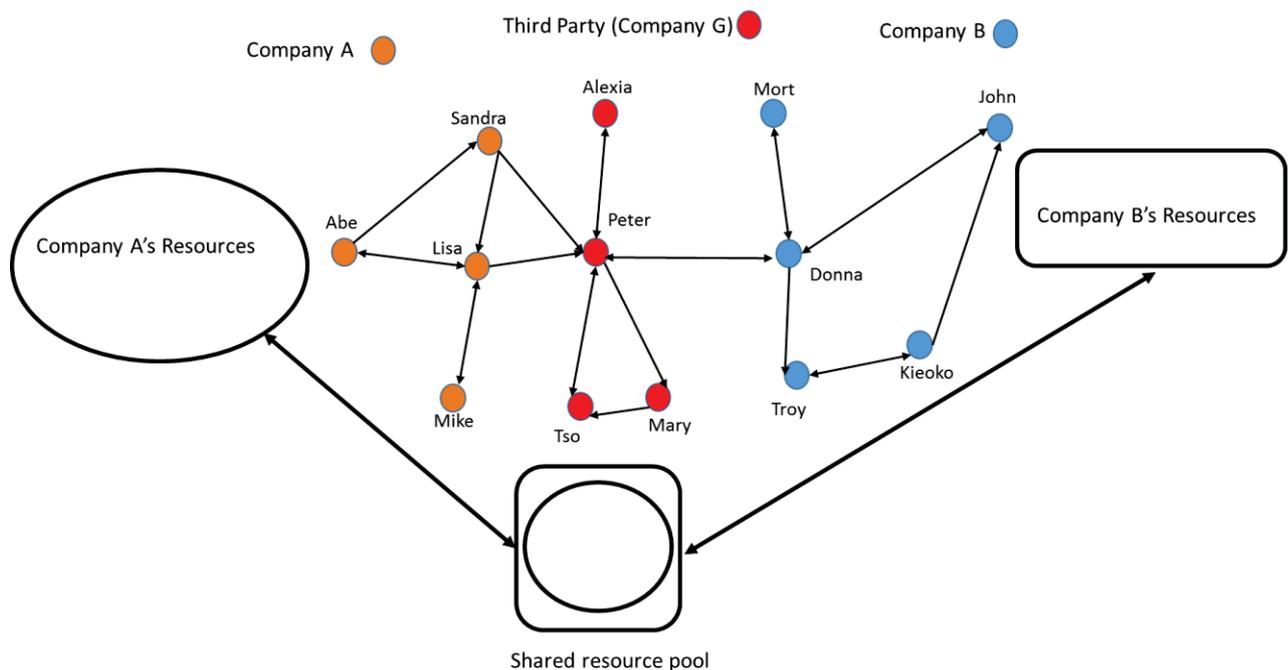


Figure 1-3: Two organisations with no social network ties making use of a third party organisation with ties to both organisations in order to share resources

1.3 The New Zealand forestry logistics industry context

New Zealand is a small country surrounded by the Pacific Ocean. With a small population, New Zealand takes advantage of its extensive land based natural resources to produce primary products as inputs into manufacturing in other markets (Sankaran, 2000).

Coopetition, where marketing has been the primary cooperative activity is frequently found in the New Zealand context. Industries such as dairy, pip fruit and red meat have

fairly homogenous products this has supported the creation of industry level alliances (Zespri, n.d; Meat Industry Association of New Zealand, 2016). These alliances have allowed the industries to access to more markets and take advantage of scale in marketing operations within those markets (Sankaran, 2000,). In addition to the marketing cooperation many of these industry level organisations also cooperate on logistics activities to support their marketing efforts, sometimes through the use of third party logistics providers (Kotahi, 2014).

New Zealand contains about 1.75 million hectares of sustainably grown plantation forestry, consisting of predominantly pinus radiata (New Zealand Forest Owners Association, 2014). These forests are harvested, and approximately 45% of the output is exported as log, mostly to Asian markets such as China, Japan, Korea and India (Ministry for Primary Industries, 2015). Logs are primarily exported from New Zealand on large bulk vessels. These bulk vessels are hired on a charter basis to visit New Zealand and load and then travel to their export destination and unload. There are 12 sea ports that load logs on bulk vessels and with the exception of Port Taranaki, these are spread through the east coast of New Zealand up to approximately 1080 nautical miles apart.

In order to achieve this, logistics is a key supply chain function, linking up the harvesting activities in the regions with the marketing activities in the purchasing countries. New Zealand is located over 5,000 nautical miles from its nearest primary Asian markets, shipping logistics therefore is a significant cost to the supply chain. While there has been some literature to examine the logistics impact on New Zealand's export industries, these have focused more on logistics strategy for value creation (Thirkell & Dau, 1998; Mollenkopf & Dapiran, 2005) than operational activities for value capture.

1.4 Aim and Objectives

1.4.1 Purpose of the Research and Research questions

The purpose of this research is to examine the applicability of co-competition theory to the New Zealand log export industry. The research investigates the possibility of the adaptation of co-competition relationships between exporters in logistics activities. Potential barriers and supporters to co-competition in this context are identified and examined against the content of current literature. Where possible cost savings and financial benefits that accrue to the industry are identified.

1.4.2 Objectives of the Research

There are 3 main objectives of the research

- Identify any barriers that may prevent the adaptation of cooperation if there is a financial incentive.
- Identify any factors that may support cooperation in this context, given that there is a financial incentive to cooperate.
- Identify if there are potential cost savings to be made by the use of degrees of cooperation in the New Zealand log export supply chain.

In order to achieve this, a qualitative study is undertaken in order to identify barriers and facilitators from the perspective of the organisations involved in log exporting and shipping activities. Cost savings that identify potential mutual financial benefits that are required to offset the costs of cooperation are found by the use of industry level simulation modelling.

1.5 Structure

This thesis is made up of five main content sections. This first section, the introduction has provided the background to the study and introduced the research problem.

Section Two, the literature review outlines in detail the published literature relating to cooperation including how it has been applied in logistics and in the forestry industry.

The third section examines the methods used. The methods section outlines the research philosophy, design, analysis techniques and any ethical considerations that arose.

Section four contains a detailed discussion of the results of the research, both the simulation and interviews that were undertaken. The results are linked to the literature where connections can be found.

Finally section five summarises the main conclusions that can be drawn from the results of this research and makes recommendations for areas of future research from gaps that have arisen through the course of this document.

2 LITERATURE REVIEW

2.1 Horizontal supply chain relationships

Organisations do not exist in vacuums, they are surrounded by other businesses with whom they create connections. Rusko (2011) argues that organisations should have a strategy for every relationship in the network. Nalebuff and Brandenburger (1997) describe a value net that surrounds each organisation which is depicted in figure 2-1. Each organisation has developed relationships at both vertical and horizontal levels. The value net includes the traditional linear supply chain model relationships, customers and suppliers and also extends to include the contribution of horizontal organisational relationships, those between an organisations complementors and competitors.

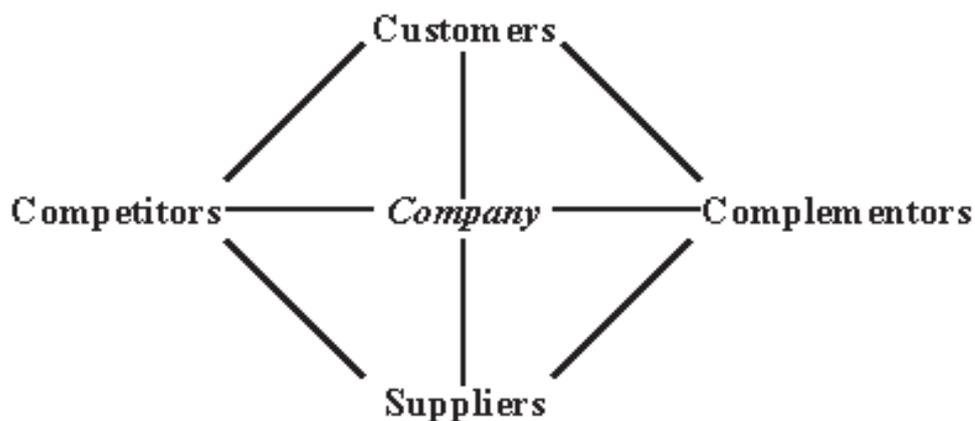


Figure 2-1: The value net (from Nalebuff & Brandenburger, 1997)

Björnfot and Torjussen (2012) describe the relationship between organisations on a two dimensional surface (see Figure 2-2). In this notion traditional supply chain relationships between customers and suppliers are labelled vertical collaborations. Slightly less apparent are the informal and less visible horizontal interfirm relationships of complementors and competitors. When these parties join forces these relationships are described as horizontal collaborations. (Bengtsson & Kock, 2000; Easton & Araujo, 1992).

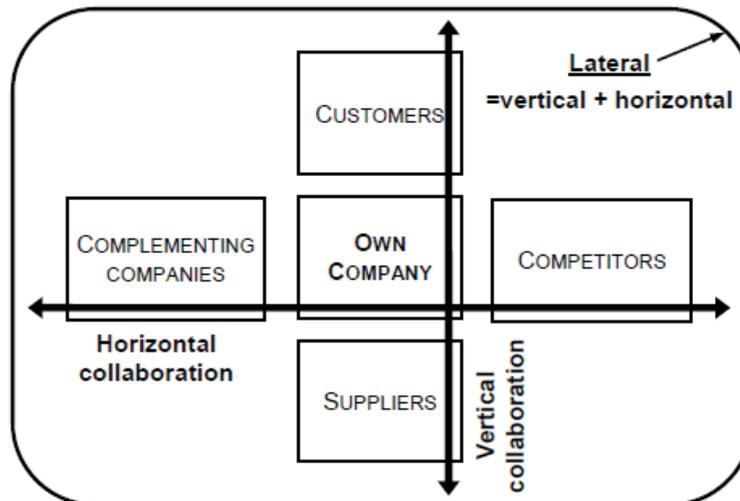


Figure 2-2: Vertical and horizontal interfirm relationships (from Björnfot and Torjussen, 2012)

There are different definitions of what describes an organisation as a competitor or a complementor. Bengtsson and Kock (2000) define a competitor as those who “produce and market the same products” (p415). Cruijssen, Cools and Dullaert (2007) agree with the European Union (2001) who state the actor must be operating at the same level of the market in order to be a competitor. Nalebuff and Brandenburger (1997) define a competitor is someone who induces your customers to “value your product less when they have the other player’s product than when they have your product alone” (p16). Likewise a complementor is an organisation who induces your customers to “value your product more when they have the other player’s product than when they have your product alone” (Nalebuff & Brandenburger 1997, p16).

Cruijssen et al (2007) narrows the focus to more direct competitors. Nalebuff and Brandenburger’s (1997) wider definition enables consideration of the impact of relationships between substitute products. For this research a combination of the two schools of thought will be applied to enable a focused but encompassing view. Competitors will be defined as those who cause customers to “value your product less when they have the other player’s product than when they have your product alone” (Nalebuff & Brandenburger, 1997 p16), and who also operate on the same level of the supply chain (Cruijssen et al, 2007).

Organisations must make choices about the types of horizontal relationships that they choose to have with various competitors, ranging from arm's length competition or co-existence through to close co-operative relationships (see Figure 2-3), Bengtsson & Kock, 1999). These choices are strategic, designed to improve the outcome to the firm by partnering with others who are able to provide the most benefit. At the same time organisations avoid some partners to minimise the costs associated with relationships that do not provide a competitive advantage (Clemens Bakstran 2010). The enterprises in these relationships may be competitors or complementors as described above. Organisations may be more or less dependent on the organisations around them and they manage these networks of relationships to minimise this reliance (Bengtsson & Kock, 1999). This leads organisations to develop relationships with others who complement their own resources or skills, these relationships vary by activity and are based on support (cooperation), rivalry (competition) or some combination of the two.

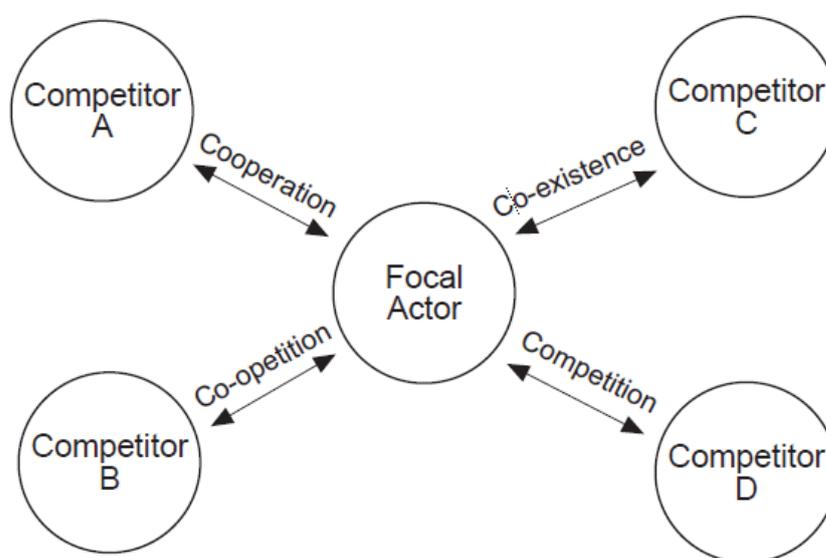


Figure 2-3: Variations of horizontal relationships (from Bengtsson & Kock, 1999, p181)

Nalebuff and Brandenburger (1997) argue that the strategy employed in a relationship with a complementor versus a competitor should be opposite. Table 2-1 details the difference between the various strategic relationships options that an organisation might choose, from one extreme of arm's length competition, through to the other of full co-operation.

Table 2-1: Horizontal relationship properties (adapted from Bengtsson & Kock, 1999)

Characteristic	Competition Relationship	Coexistence Relationship	Co-opetition Relationship	Cooperation Relationship
Independent	✓	✓	Mutually independent	×
Common Direction	✓	×	✓	✓
Formal relationship	×	×	Possible	✓
Direct Interaction	×	×	✓	✓
Power and dependence balanced	×	×	Possible	Likely
Type of exchange	Indirect	Indirect or none	Business, social, informational	Complex business, social, economic
Rules of Play	None	Understood and accepted	Clear	Formal agreement

2.2 The choice to compete, cooperate or compromise.

Competition can be categorised as a situation where one or more players strive for an outcome that only one can achieve (Wilhelm & Kohlbacher, 2011). Competition involves tacit norms and accepted rules of engagement between all participants; there may be many divergent strategies and goals amongst players (Bengtsson & Kock, 1999). Exchanges between players are limited, benefits individual and opportunistic behaviour drives frequent conflict (Raza-Ullah, Bengtsson, & Kock, 2014). Cooperation is defined as two or more players working together to achieve a better value outcome than each could alone (Wilhelm & Kohlbacher, 2011). Cooperation requires mutual goals and alignment of strategy. Shared norms may be explicitly outlined and exchanges between cooperating organisations include social and informational. The social and knowledge bonds, explicit or shared understanding of norms and the mutual goal alignment reduce the likelihood of conflict between the parties (Bengtsson & Kock, 1999).

Co-opetition as a concept marries the two paradoxical ideas (Kotzab & Teller, 2003; Rusko 2011). Co-opetition will be understood as a relationship between players where they work together in one or more activity to achieve a mutually beneficial greater value sum, a win-win situation. While in another activity the same parties strive to divide the value in a manner where only one can achieve a given result, win-lose situation (Bengtsson & Kock, 1999; Cruijssen, Cools, & Dullaert, 2007, Wilhelm & Kohlbacher, 2011). Coopetition contains elements of cooperation and of competition and may be weighted more heavily in favour of one or the other, one of these elements may be tacit (Bengtsson & Kock, 1999). Figure 2-4 depicts the types of competitive relationships; the sum of support or rivalry defines the inter-organisational relationship as being equivalent, competition or cooperation dominated.

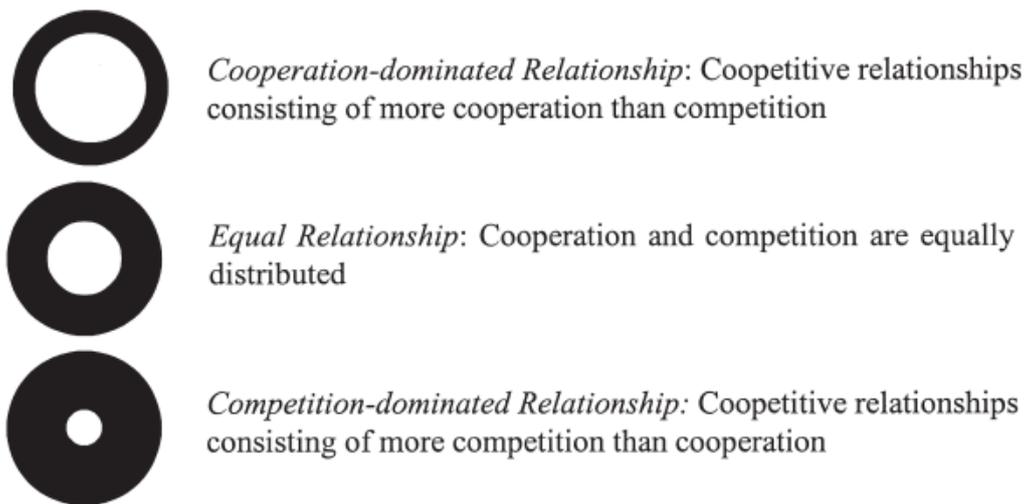


Figure 2-4: Co-opetitive interfirm relationships types (from Bengtsson & Kock, 2000)

In order to co-operate parties must create some mutual goals, agreed norms and accepted rules of play in the activities that they are jointly involved. These may not be present in the activities in which they compete (Bengtsson & Kock, 2000). Chin, Chan, and Lam, (2008) have likened co-opetition to organisations working together to increase the size of the value pie, and then competing to eat the slices..

Competitive positioning of direct competition and co-operation can be seen as opposite ends of a continuum and researchers have traditionally viewed the marriage of the two as somewhat of a paradox (Chen, 2008; Gomes-Casseres, 1996; Lado, Boyd, & Hanlon, 1997; Raza-Ullah, *et al*, 2014). In order to resolve this paradox unarguably these relationships

must involve more than one organisational or supply chain activity. It is argued to be impossible to both compete and co-operate in the same activity at the same time (Bengtsson, & Kock, 1999). When organisations engage in co-opetitive relationships, the scale of co-operation and competition varies. Organisations may co-operate on a series of activities, in which case the relationship is dominated by co-operation or they may co-operate only narrowly on a single activity and have a relationship dominated by competition (Bengtsson, & Kock, 2000)

2.3 Scarce resources combing to create a value advantage

Organisations attempt to make use of scarce resources in order to gain some competitive advantage over other firms and increase the value pool available for their products. Competitive advantage may be tied to cost or to differentiation of product. These resources can be financial, human, physical, technical, reputational or organisational (Bretherton & Chaston, 2005; Cruijssen, Dullaert, & Joro, 2006). There are two ways in which more value can be gained for an organisation. The first is by reduction in cost, the same product can be produced and delivered at a cheaper cost. A company may also pursue product differentiation as a strategy producing a slightly different product that is more valuable to the end consumer (Ling-yee & Ogunmokun, 2001).

Coopetition can provide both cost reduction and product differentiation value to supply chains. Co-operation in research and development activities can provide mutual product differentiation value improvements to competitors. Research and development co-operation, while competing in all other supply chain activities is a common model of co-opetition and has been studied extensively (Ouchi & Bolton, 1988, Bengtsson & Kock, 2000, Bahinipati, Kanda & Deshmukh 2009, Björnfot & Torjussen 2012, and Rusko, 2012). Cooperating in activities to share resources that reduce costs is another common method of using coopetition to create value. This research will focus on the cost reduction method of value creation in coopetition relationships.

Resources are not limitless and each firm has only so much of each to use to complete their activities. For many organisations success is tied to sharing pools of these resources with

other organisations (Morris, *et al*, 2007). Organisations who are able to use their resources more economically, or to leverage the resources they control through their relationships are more likely to stay in business (Bretherton & Chaston, 2005). Coopetition provides competitors the opportunity to reduce costs. Competitors share similar resource constraints and sharing these can create economies of scale (Gnyawali & Park, 2009). Competitors share a high similarity of both resources and resource challenges and they are best posed to benefit from the sharing of these, particularly for small and medium sized businesses (Gnyawali & Park, 2009). The use of co-opetition as a coordination mechanism can provide a sustainable competitive advantage for organisations by removing obstacles, sharing resources, and controlling risk (Chin, *et al*, 2008). Sharing resources removes redundant duplication from the supply chain which reduces both the costs and the impact on scarce resource availability (Letourneau, 2004). Coopetition also enables organisations to benefit from unique resources that due to their similarities have combined benefit to both parties (Gnyawali & Park, 2009).

Organisations can create strategic alliances with suppliers, customers, competitors and those outside their own industry to create mutually dependent bridges. These co-operative relationships can range in both intensity and scope from a fully integrated pool of resources through to a limited, narrow scope of collaboration for a specific purpose (Bretherton & Chaston, 2005). Competitors who have previously operated in either a co-existence or competitive orientation have previous knowledge of each other. These existing relationships mean that competitors share a mutual understanding and common world view which makes creating goal alignment in a cooperative mechanism more possible (Arya & Lin, 2007). There may be power positions within a co-opetitive relationship where one party controls enough of the shared resources to effectively oblige the other to participate, or continue participating to preserve their profitability (von Friedrichs Grängsjö, 2001; von Friedrichs Grängsjö, 2003)

Environmental and economic conditions and the power position that an organisation holds (von Friedrichs Grängsjö, 2003) can create a driving force whereby coopetition is more a necessity than a choice (Raza-Ullah, *et al*, 2014). Co-opetition accelerates the benefits for supply chains in these clusters providing opportunity for growth, innovation,

market penetration and resource efficiency (Michael, 2003). Small and Medium size enterprises [SME's] have particular benefits in co-opetition relationships (Björnfot & Torjussen, 2012) as it provides a platform in which they are able to compete with large international supply chains through the use of efficient resource allocation (Bengtsson & Johansson, 2014), improved inventory management and cost sharing (Shockley & Fetter, 2015).

2.4 Theoretical Lenses

The rationale for co-opetition in the literature has been examined from a multitude of theoretical lenses. These are briefly summarised in Table 2-2.

Table 2-2: Summary of theoretical lenses applied to co-opetition

Lens	Game Theory	Transaction Cost Economics	Resource Based View	Extended Resource Based View
Main tenet	Business make decisions to cooperate or compete based on others behaviour	Standardisation of transaction systems such as ordering and payment.	Competitors share similar resources. Shared resources provides both parties reduced waste or additional resource capacity	Social network ties are needed in order to enable sharing of resources. Power positions in the network are influenced by resources under a parties control
Value Creation Strengths	Cooperate when there is more value to be gained working together. Compete to divide the value	Reduced costs for procurement and for end customers	Reduced cost of duplicated or redundant resources	Social ties create strong networks of shared assets and reduce relationship costs. Shared assets reduce waste
Value Creation weaknesses	Cost of observation of others can be high. High potential for defection	Real benefits require wide adoption, possible even at industry level	Resources may provide competitive advantage reducing incentive to share.	Creating ties can be difficult. Power positions play a significant role. Relationships management can be costly
Key Authors	Axelrod, 1984, Brandenburger and Nalebuff 1996	Coase 1937, Williamson 1975, 1985 Caputo & Mininno, 1996 Cheng, Mu-Chen and Chi-kuo. 2010,	Penrose, 1959, Barney, 1991, Teece, 1997	Lin, 1999 Gnyawali, He, & Madhavan, 2006 Arya & Lin, 2007 Brodrechtova, 2008

Some authors take a transaction cost economics lens through which to view co-opetition. This industry wide view of co-opetition argues that the benefits of co-opetition are in

reducing the cost of transactions for all parties. Thus compliance by all players then benefits customers and therefore increases the value available to the industry (made up of those players). These studies have focused on standardisation, providing standard metrics to be used and assimilating transaction systems across the industry. Examples of these authors include Caputo and Mininno (1996) and Cheng, Mu-Chen and Chi-kuo (2010).

Other authors use a game theory lens to examine cooperation. Game theory takes a firm based, economic perspective to cooperation. Organisations are perceived as perfectly rational and reactive. These authors believe that cooperation comes about through value creating iterations of the prisoner's dilemma game, where firms either cooperate or defect; followed by value dividing dictator games (Lacomba, Lagos & Neugebauer, 2011). Organisations cooperate where there is a positive sum to be gained, there are no barriers to entry and there are clearly outlined incentives not to defect. Cooperation is seen as a vehicle for value growth and to allow players to improve market share. Examples of authors examining cooperation through this lens are Ouchi and Bolton (1988), Lacomba, *et al*, (2011) and Björnfot and Torjussen (2012).

The social network lens argues that organisations exist within embedded social networks with competitors. Organisations create social ties with others in order to manage uncertainty. Cooperation is used to leverage these existing networks to improve their position in the industry, creating a competitive advantage for the focal firm. Organisations control and manage relationships within this network in order to create more value by collaborating in some activities with organisations whose capabilities enhance their own. Organisations rely on existing social ties to make decisions about who to interact with in that network (Gulati & Gargiulo, 1999). Weaker ties drive organisations towards competition and co-existence relationships whereas stronger ties may help to create cooperative relationships between organisations (Gnyawali, He, & Madhavan, 2006; Gulati & Gargiulo, 1999).

Organisations are made up of a number of individuals who may provide a bridge across structural social holes that exist between organisations that have no network ties.

Individuals operating as bridges can provide opportunities to move from co-existence relationships to ones with more cooperative elements (Lin, 1999) using shared knowledge to create mutual opportunities while still pursuing individual goals (Tsai, 2002). Authors from the Social network lens of cooperation include Brodrechtova, Gnyawali and Madhavan (2001), Gnyawali, *et al*, (2006) and Stebbings and Braganza (2009).

The resource based lens of cooperation argues that organisations co-operate with each other in order to access resources that complement their own and are also beyond their means (Gnyawali & Madhavan, 2001). Cooperation with competitors allows leveraging of the combined pool of resources to provide scale. Players strategically align with others who have internal resources that provide them with a competitive advantage (Barney 1991; Lado, *et al*, 1992; Arya & Lin, 2007). Strategic alliances are formed between two or more organisations so that their combined resources and capabilities create rare, valuable, inimitable and sustainable competitive advantages beyond what they were able to achieve alone (Barney, 1991; Clemens & Bakstran 2010). Gnyawali and Park, (2009) argue that it is this leveraging of resources that is the key goal of cooperation, because it is what provides the win-win solution. Authors from the resource based view of cooperation include Gnyawali and Madhavan (2001), Arya and Lin (2007), Gnyawali and Park (2009) and Clemens and Bakstran (2010).

There is also a combinatorial view that looks at cooperation through a combination of elements of the social network and the resource based views to form an extended resource based lens. It is this combinatorial lens that this research uses to examine cooperation opportunities.

The extended resource based view argues that to truly understand the effect of such collaborative relations, it is important to view organizations as embedded in social networks (Granovetter, 1985), called collaborative networks. For the purposes of this study, a collaborative network is defined as “a collection of loosely connected or closely knit organizations that share resources” (Arya & Lin, 2007 p698). The sharing of these resources provides value creation leading to a competitive advantage for members of the network (Brodrechtova, 2008). Individuals that provide bridges across structural holes can

be valuable resources that an organisation controls in the network (Lin, 1999). Without strong social ties resource sharing is difficult to achieve. These social ties provide opportunity for organisations to communicate and build trust. The norms and trust built as part of the network become themselves valuable assets and are essential to the maintenance of the relationship (Lin, 1999)

The extended resource based view provides an outlook that combines the benefits of understanding how firms interact in social networks, from social network theory, with the resource provision drivers of resource based theory to explain organisations co-opetitive behaviour. Arya and Lin (2007) argue that the integration of resource based and social network theories presents an explanation for how organisations use networked environments to drive sustained competitive advantage. They argue the two theoretical perspectives must be viewed together to fully understand the interaction.

In a typical network, two types of resource flows take place between partners, a.) Tangible resources which are physical assets such as cash, machinery, and buildings and b.) Intangible resources, such as information, status, management skill, and reputation (Arya & Lin, 2007). A firms ability to access and use network resources varies depends on their position in the network (Gnyawali, *et al*, 2006). Those members who have significant resources to contribute hold power positions within the collaborative network and are able to impose upon power deprived members (Morris, *et al*, 2007). These highly motivated power deprived members are generally small and medium sized enterprises, who benefit from the scale provided by the larger resources of the network; increased ability to compete in the market, entry to new markets and additional resources (Gnyawali & Madhavan, 2001). Smaller members have the most to gain from membership so their willingness to remain in the network allows a degree of imposition on it by the high power members (Morris, *et al*, 2007).

2.5 Logistics Coopetition

Logistics is frequently a low value adding activity in supply chains. It provides a place utility by relocating inventory or final goods to the place where they are more valuable to the customer. Cooperating on these low value adding activities can provide significant cost

savings to the chain, providing a competitive advantage that can then be leveraged in other more competitive activities (Crujssen, Dullaert & Fleuren, 2007). Long transport distances and growing environmental concerns further push supply chains to be as efficient in transport as possible (Frisk, et al, 2010). Cooperating on low value adding activities means that competition still provides the maximum market benefits possible by focusing on high value areas (Bengtsson & Kock, 2000). Table 3-3 provides a summary of the main current literature in relation to cooptation in logistics activities. The literature identifies that where logistics is the cooperative activity it is likely that parties will cooperate in transport activities, and compete in marketing and sales. Logistics cooptation has been examined in low value, high volume product industries such as dairy, forestry and the grocery industries.

Table 2-3: Summary of literature related to logistics cooperation research

Author	Industry	Cooperative activity	Competitive activity	3 rd party intermediary
Caputo & Mininno, 1996	Italian grocery	Transport, Distribution, Storage, Logistics	Market share, sales	3PL
Epstein, Morales, Jore Serón Weintraub 1999	Chile forestry	Transport, Production equipment, Planning	Market share, sales	x
Bengtsson & Kock, 2000	Finish Dairy	Transport - contributed to a pool of resources	Marketing, Sales	x
Bengtsson & Kock, 2000	Swedish Brewery	return logistics	outbound logistics	x
Song 2003	Hong Kong China Ports	Port Logistics	Marketing	Joint Venture
Palander & Väättäinen, 2005	Finland	Procurement, Transport	Market share, sales, Logistics	x
Crujssen, Dullaert, & Fleuren, 2007	Dutch Sweets Distribution	Storage, Distribution	Marketing, Sales	3PL
Frisk Göthe-Lundgren Jörnsten & Rönnqvist 2010	Sweden forestry transport	Transport	Procurement, Market share, sales	x
Prakash & Deshmukh, 2010	Generic Supply Chain	Distribution	Not identified	x
Frisk Göthe-Lundgren Jörnsten & Rönnqvist 2010	Swedish Forestry industry	Transport, Procurement	Sales, Marketing	x
Hingley, Lindgreen, Grant, Kane (2011), Leitner. Meizer Prochazka & Sihn 2011	UK Grocery retailing Romanian transport networks	Procurement, Logistics, Transport	Market share, sales Marketing	4PL x
Rusko 2011	Finish Forestry sector	Procurement, finished product transport	Marketing, Sales of finished goods	x

Cooperation in logistics activities improves resource use for the parties, reducing costs associated with transport and storage through improving resource utilisation. Reduced investment costs by improved economies of scale (Crujssen, *et al*, 2007) improves cash flow and allow organisations to benefit from significant levels of investment beyond their individual means. Cooperation in logistics activities can improve service levels provided to the customer, increase customer satisfaction and the value available for distribution through the chain (Björnfot & Torjussen, 2012). Hingley, *et al* (2011), argue that cooperation in logistics activities can remove financial and social barriers to operation, reducing the cost of investment and the

impact on the environment. Importantly collaboration on logistics activities allows supply chains to build structural flexibility. This flexibility allows organisations to be better able to respond to environmental turbulence (Björnfot & Torjussen, 2012) and to attend to profit making opportunities faster (Narus & Anderson, 1996).

Leitner, Meizer Prochazka and Sihn (2011) suggest that transport networks based on similar start and end destinations are a strong possible source for collaboration synergies. Dodgson (1994) contends that collaboration in logistics activities is a strong risk reduction strategy. By sharing risk with competitors allows for organisations to flex in uncertain and fluid market conditions (Prakash & Deshmukh, 2010; Björnfot & Torjussen, 2012). Collaborative logistics enables partners to seek novel solutions, using shared resources to provide new opportunities that can only be exploited through joint investment (Narus & Anderson, 1996).

Logistics collaboration and co-opetition is frequently found in the transport arena. In the maritime environment containers conferences are alliance of multiple carriers operating on one line. These carriers compete fiercely in the procurement and marketing areas but cooperate by sharing vessels to widen their markets they are able to service while reducing costs (Cruijssen, et al, 2007). In the aviation industry co-opetition occurs where several carriers work together to service a route (Cruijssen, et al, 2007). The 'Star alliance', an aviation alliance of sixteen airlines all operating at the same level of the market is a prime example of logistics clustering co-opetition (Gnyawali, et al, 2006). The airlines in the star alliance pool specific resources for the benefit of the group. Horizontal collaboration takes part in the logistics arm of the supply chain while the parties compete fiercely against each other for market share through marketing and sales activities (Cruijssen, et al, 2007). These alliances provide some of the smaller airlines access to markets and routes they would be unable to achieve alone. They are able to leverage the tangible resources such as runway allocations as well as the intangible resources such as their partner's reputations to create additional value. Customers benefit from a wider variety of available flights and consolidated systems such as reward programmes (Star Alliance, 2016).

One problem often encountered when trying to co-operate is that planning and decision-making becomes much more complicated large volumes and relatively long transport distances, together with increasing fuel prices and environmental concern makes it important to improve the transportation planning (Leitner et al, 2011).

2.6 Attributes that enable and obstruction coopetition

Once a catalyst has occurred to create a strategic co-opetitive alliance there are a number of factors that influence the ongoing success of the venture. Some of these are outlined in Table 3-4.

Table 2-4: Co-opetition facilitators and impediments (adapted from Cruijssen, Dullaert, & Fleuren, 2007 and Pöllumäe, Lilleleht, & Korjus 2016)

Enablers	Obstructors
Facility for Information sharing	Partner selection
Incentive alignment	Lack of mechanism for dividing gains
Relationship management	Co-ordination and negotiation skills
Internal environment alignment	General Disinterest
Third party intermediary	Lack of support mechanisms
Membership of an industry organisation	Time constraints

Pöllumäe, Lilleleht, and Korjus (2016) argue that in order to maximise resource efficiencies between organisations they must first be able to align the internal environment. Norms, practice, rules of play and contracts must all align before resource benefits could be achieved. Shared meaning and a consensus of views support information sharing and relationship management enablers (Bengtsson & Kock, 2000; Cruijssen, *et al*, 2007). Agreed norms and past experiences can assist in aligning incentives between the parties (Dahl, 2014). Coopetition can be supported by membership of an industry organisation that acts as a third party broker to the collaborative aspect of the relationship. Geographically close organisations benefit the most from these enablers due to the increased exposure to and existing interpersonal relationships with competitors experienced in a particular geographic region.

Pöllumäe, *et al*, (2016), also identified three pertinent barriers to collaboration: A general disinterest, a lack of support mechanisms such as a third party body, and time constraints. Diverse geography can make collaboration between parties difficult. Distance reduces the likelihood of strong bonds between organisations, creates difficulties in partner selection and relationship management (Cruijssen, *et al*, 2007). This can increase interfirm conflict and can create difficulty in information sharing and trust development (Sterr and Ott, 2004 cited by Reniers, Dullaert and Visser, 2010). Close geographical support reduces the incentive for either party to defect from the agreement (Lacomba, *et al*, 2011). Organisations who do not have individuals able to bridge organisational holes, due to insufficient ties between organisations may require a third party to provide connections in order to support a co-competitive relationship. Hingley, *et al*, (2011) maintain that third parties brokering horizontal collaboration provide independence to the parties. Where trust and information sharing is low, they argue a third party involvement can bridge these divides if the ties between the organisations and the third party are strong, and that the third party can remain objective. This intermediary player in co-competition can provide a strong enabler where there are low ties or high levels of conflict between parties.

2.7 Coopetition in the New Zealand and forest industry context

New Zealand is a producer driven economy, in a small island a considerable way from its primary markets. These elements all are strong drivers for New Zealand organisations to cooperate horizontally in order to reduce logistics costs (Heron, Penny, Paine, Sheath, Pedersen & Botha, 2001). Forestry is a divided industry, forest ownership internationally has traditionally been held primarily by governments. Where private ownership has been involved the industry is increasingly fragmented. As the global trend to increasing private ownership continues (Kittredge, 2005), the forest industry becomes increasingly made up of many small holdings with diverse interests. (Carlsson & Rönnqvist, 2005; D'Amours, Rönnqvist, & Weintraub, 2008; Pöllumäe, Lilleleht, & Korjus 2016). Logistics costs play a significant role for the forestry industry due to its low value, large volume items that require transport through a variety of states. New Zealand is a primary exporter of forestry products, about 50% of harvested volume is exported in its raw log state as inputs into processing in other markets (New Zealand Forest Owners Association, 2014).

Where collaboration has taken place globally in this space it has been supported by a third party such as a forest owners collective who is seen as independent enough by the many players to be trusted with activities such as marketing of wood sales (Pöllumäe, *et al*, 2016). Forest owner cooperatives where cooperation on marketing activities is undertaken drives the relationship strongly to the cooperative end of the compete or collaborate continuum (Kittredge, 2005). A report by Statistics New Zealand (2008) found that rates of industry innovation cooperation in 2007 for New Zealand companies were considered quite low. They identified factors that impeded more cooperation as being lack of management resource, lack of appropriate personal and thus a high cost to the relationship (Statistics New Zealand, 2008). In spite of the apparent low level of organisational cooperation, many New Zealand industries cooperate on marketing and logistics activities through the use of producer owned or led cooperatives. Increasingly these cooperatives are improving logistics collaboration between producers and processors by providing a trusted, independent intermediary to the relationship. There is most recently collaboration occurring between these cooperatives in logistics in order to pool and coordinate shipping services, the largest of these being through the initial partnership of the meat and dairy industry in their freight management joint venture, Kotahi. The two industry bodies have now expanded Kotahi with a number of other organisations joining to take advantage of the logistics savings offered by the scale of the business (Kotahi, 2014)

The Red meat industry has two such bodies Meat Industry Association of New Zealand and Beef and Lamb New Zealand. The Meat industry association of New Zealand is an incorporated society owned by meat producers which undertakes the processing and logistics activities (Meat Industry Association of New Zealand, 2016). The NZ dairy industry is largely made up of a cooperative of farmers known as Fonterra who also undertake the processing and logistics activities (Fonterra, 2014). The Kiwifruit industry includes Zespri, a largely grower owned harvesting, marketing and logistics organisation. Zespri has enabled the NZ kiwifruit industry to unlock several markets that would have been difficult to access without a collaborative approach (Zespri, n.d). ENZA provided the apple and pear industry the ability to collaborate on marketing in order to unlock new markets and was successful in operation for more than 50 years (ENZA, 2010).

The supply chain post the forest gate often involves a series of organisations responsible for various activities. Production and distribution are usually undertaken by separate organisations. In order to remove waste from the system created from the need to carry excess inventory there is commonly some form of coordination between post forest gate activity organisations (Frayret Boston D'Amours LeBel 2004). Globally horizontal logistics collaboration has been seen to occur in the road transport area, usually with the assistance of a third party and a strong power position held by the upstream or downstream partners that can impel the logistics parties to collaborate (Carlsson & Rönqvist, 2005). In New Zealand there are third party involvement in domestic logistics through the use of harvesting and management companies. Forest owners engage with these organisations who arrange for the harvesting and transport of logs domestically. Internationally logistics activities are undertaken by the exporters, while there has been discussion about cooperative logistics practices at this level of the supply chain there was no specific research available in this area.

2.8 Transport and Logistics Coopetition in the New Zealand Context

New Zealand has a significant number of small and medium sized businesses with close social network ties and where the sharing of resources will likely have benefit. It's geographically distant position provides an incentive for the need to constrain transport costs to export markets, coopetition offers a practical solution well founded in reason. New Zealand is characterised by a small network of related organisations, which provides an opportunity to investigate in depth the characteristics that support or hinder individual coopetitive relationships. These forces that both compel and provide for a coopetitive solution in this case study makes this an appropriate context to test and refine the theory. Figure 2-5 demonstrates the conceptual model that this research will follow. The research investigates the driver for coopetition in the form of shared resources reducing the pressure on costs. The combination of these shared resources with the social networks individuals in these organisations belong to help support the choice of partners. This research will then test if the enablers and barriers identified in early research that are argued to support those relationships enduring hold in this case.

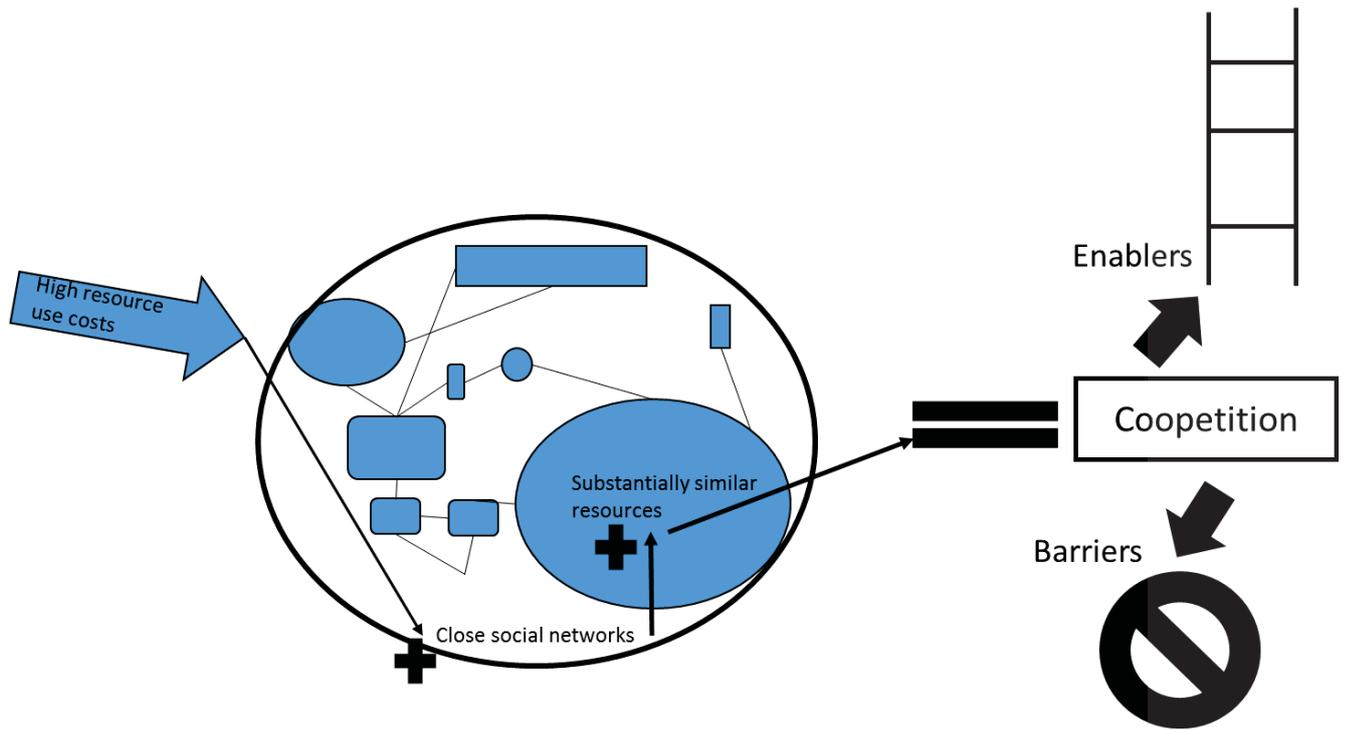


Figure 2-5: Testing Coopetition partnering theory in an extended resource based case

3 METHODOLOGY

3.1 Philosophy

Ontological perspectives seek to define the nature of the world and therefore the role of social actors in it (Bryman & Bell, 2011). There are two traditional ontological world views which date back to the beginning of western philosophy – objectivism and constructionism

Objectivism describes an understanding of the world as something tangible and external to the social actors that occupy it (Bryman & Bell, 2011). Objectivists believe that a ‘real’ world exists independent of the social constructs of the actors who engage with it and this world structures the reality of its social entities (Johnson, Onwuegbuzie, & Turner, 2007). In comparison constructionism is an alternative (potentially opposing) view that the world is constructed by the social actors engaging with it (Bryman & Bell, 2011).

There is no single ‘real’ world; rather, the world exists as a shared socially constructed reality between the people who inhabit it (Morgan, 2007).

Following from these ontological perspectives are a series of epistemological views that combine with ontology to define the paradigms that structure how one seeks to discover and define knowledge about the world. Epistemology defines how an investigator might come to understand something and is closely tied to the investigators ontological position (Bryman & Bell, 2011).

Positivist epistemology refers to a belief that an investigator should remain external, objective and impartial from the phenomenon being examined (Bryman & Bell, 2011).

Positivist paradigms tend to align with objectivist ontology’s. Researchers discover meaning through observation of the external, tangible ‘real’ world (Bryman & Bell).

They seek regulation, causation and the answer to a previously defined question.

Positivist paradigms encourage deductive reasoning, testing previously defined hypothesis and seeking high level, generalisable answers (Falconer & Mackay, 1999).

Interpretivism (or antipositivism) is an epistemological belief that reality is in a constant state of change; therefore meaning must be construed through interaction with (rather than observation of) the phenomenon being examined (Bryman & Bell, 2011). To generate knowledge in a socially relative world, interpretivist researchers must be immersed in shared understandings with the social actors they are interacting with (Bryman & Bell). Interpretive paradigms align most frequently with constructivism ontology's. Researchers subscribing to this paradigm seek rich, deep, contextually dependent meaning by engaging in a subjective, interactive manner with the reality they are examining (Falconer & Mackay, 1999). They seek to develop theories inductively about how social constructs impinge on the world (Falconer & Mackay).

More recently in the late 1900's another fundamental school of thought about the world emerged which sought to combine the best of both traditional philosophical schools of thought; this became known as pragmatism (Johnson, et al, 2007).

Pragmatics argue that there is more than one singular form of knowledge to be known about the world, and that to make full sense of reality a researcher may be required to examine it from multiple perspectives. Pragmatics understand that there are strengths and weakness to polarised world views such as objectivism and constructionism and that it is in the interaction and balancing of perspectives that knowledge exists (Johnson, et al, 2007).

Pragmatism as an ontological viewpoint argues that there is a 'real' physical world which remains external and observable; but that each social actor interprets this world in their own unique way and that this interpretation is significant (James, 2004). It is the "experience of actions *in* the world" [emphasis added] (Morgan, 2007, p68) that must be understood. From an epistemological viewpoint, pragmatists argue that knowledge arises from an appreciation of what difference is made by that uniquely interpreted view (Pihlström, 2011). Pragmatists insist that the research question itself should be at the driver that defines the philosophical epistemology required and technical methods used.

Through the lens of intersubjectivity pragmatists acknowledge that the relationship that a researcher has with the process should be relative to the question posed. Some knowledge is observable, and others require an understanding of the unique interpretations of the actors (Morgan, 2007). In a similar manner pragmatists dispute the notion of a single manner of obtaining knowledge, proposing that there is a time and a place for deductive and inductive practices to be used (Johnson, et al, 2007). Similarly transferability of knowledge should not be assumed but treated in an independent manner; some knowledge is generalisable; but other knowledge should be treated as useful only within a specific context (Morgan, 2007). Figure 3-1 depicts Morgan's (2007) argument that with the methodology the centre of the research the epistemological viewpoint becomes apparent as it overarches the methodology, and the methods fall naturally into place from the above.

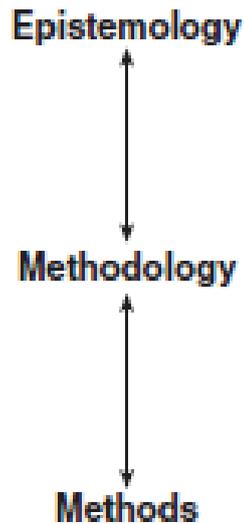


Figure 3-1: Methodology at the centre (Morgan, 2007 p 69)

I believe that reality is a complex construction that consists of an external and observable world that each actor interprets in a unique way to form a significant number of realities. In order to generate in depth understanding of a world that is influenced by these perceived realities I think it is essential to both observe the results of the actions on the world, but also to view these in light of an appreciation of those interpretations. A pragmatic viewpoint allows the combination of observing behaviours in the supply chain in an objective manner to test theory. It also allows the researcher to make sense of why behaviours occur by delving into the participants unique interpretations of the world and the drivers of those behaviours that impact on the physical systems. These observations then produce theory which can be tested in deductive ways (Strübing 2007). I think that this cyclical nature (See Figure 3-2) of a pragmatic viewpoint where theory drives hypothesis development, which in turn drives testing in a cyclic manner, enables a deeper understanding than constraining oneself to one perspective or the other.

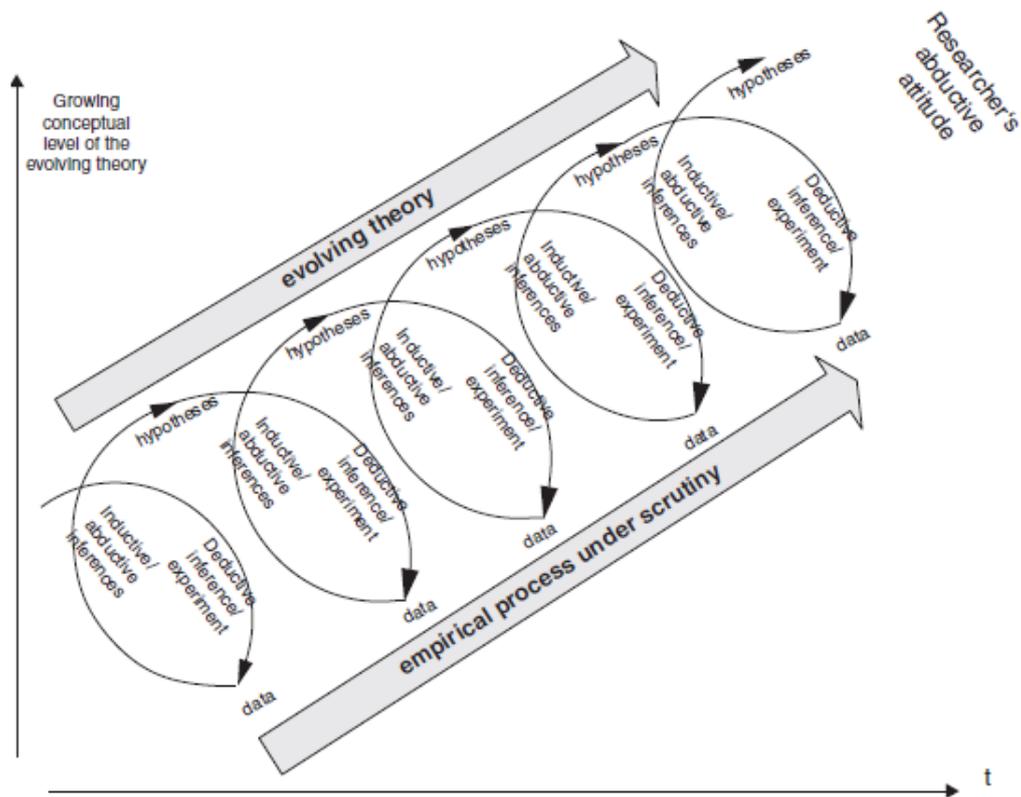


Figure 3-2: Abductive cyclical knowledge generation over time (From Strübing 2007 p567)

In respect of this research I believe that the physical nature of co-opetition is essential, without the creation of resource synergies there is no use to co-operating behaviours as each player would be just as well off remaining autonomous. It is this mutual resource efficiency that moves players towards the co-operate scale of the internal autonomy/improvement debate. Thus I believe that a focus on a positivist viewpoint when examining the phase one questions is appropriate. As a pragmatist I find myself acknowledging that if it were only these synergies that mattered then co-opetition would need little research as it would develop, without question, where these mutually beneficial synergies exist. Evidence that it does not always happen this way drives me to believe that the non-physical, or the relationship world must also play a significant role

in creating and maintaining these market mechanisms. It is the experience of the exporters in this physical world that defines their behaviour. I believe phase two can only be answered from a subjective viewpoint. Understanding the reasoning behind decision making cannot be achieved by observation but only from immersion in the world of the decision maker and thus must be studied from a constructivist perspective.

3.2 Strategy

Quantitative research is strongly connected with positivist, and objectivist philosophy. It has a focus on objective, impartial, observable behaviours (Bryman & Bell, 2011b).

Quantitative research seeks to analyse data to develop findings relating to a preconceived hypothesis. It is focused around measurement, used to describe differences between variables and define a relationship between them (Bryman & Bell, 2011b). Quantitative research seeks to provide an understanding of the meaning in the world (Bryman, 2012). Quantitative research is generalisable, providing a bigger picture view that can be extrapolated into generic situations. The biggest advantage of quantitative research is that it is replicable by others which provide overt validity to the work. Quantitative research however can have an inflated view of the accuracy and reliability of the measurement tools. It also fails to consider the impact of people and their impact on the world being studied (Bryman & Bell, 2011b). Quantitative research provides a snapshot view of the world and often by the time it has been produced change has occurred and the results may not be applicable (Bryman & Bell, 2011b).

Qualitative research has an emphasis on the generation of theory from subjective position (Bryman, 2012). It is strongly aligned with Interpretivist and constructivist philosophies. Qualitative research engages with people in order to grasp their

perceptions of the world (Bryman, 2007) and to make sense of their behaviour (Bryman, 2012). Because of this subjective view qualitative research is able to get an in-depth understanding of the social phenomena being studied. The flexibility of the subjective approach provides the opportunity to extrapolate theory based on interaction with the world (Bryman, 2012). Qualitative research is highly contextually bound, results that are gained from qualitative research cannot be applied universally they must remain bound to the conditions they were studied in (Bryman, 2007); this can be both a strength as well as a weakness of qualitative work.

The two phase design of the research questions leads to a multifaceted technique employed in order to examine the problem from two perspectives. In the first phase of the research, there is a need to use quantitative methods in order to describe the world in which the supply chain participants find themselves. This quantitative approach is appropriate for these types of questions, seeking meaning from the current snapshot of how the physical world is behaving. These questions are deductive, seeking an answer to a preconceived hypothesis that the antecedents for co-opetition do exist in this setting. It is important that the answers to these questions are valid, reliable and replicable as they provide the foundation for the more exploratory phase two.

It would however be unwise to ignore the impact of the supply chain member's perceptions of this world. Their unique perspectives of these relationships and the reality they find themselves in may have significant impact on how they interact with the world. In order to get a full understanding of these perceptions this research will also undertake some qualitative analysis, from a subjective position, to fully understand the participant's perceptions (Morgan, 2007). To make sense of the decisions that are made a researcher must be immersed in the decision makers world, their context.

Qualitative research allows the researcher to put aside observation and interact with the participants of the world that had been observed in phase one. This qualitative research, focused on asking questions and developing understanding through face to face interaction provides an understanding of the behaviours that drove the results in the first phase as well as allowing the research to propose theories as to what drove the meaning observed in the first phase results.

Johnson et al (2007) describe the link between qualitative and quantitative techniques as a continuum where pure mixed methods sits in the centre (See Figure 4-1). The techniques most aligned with this research proposal would be best construed as “*qualitative dominant mixed methods research*” (p124).

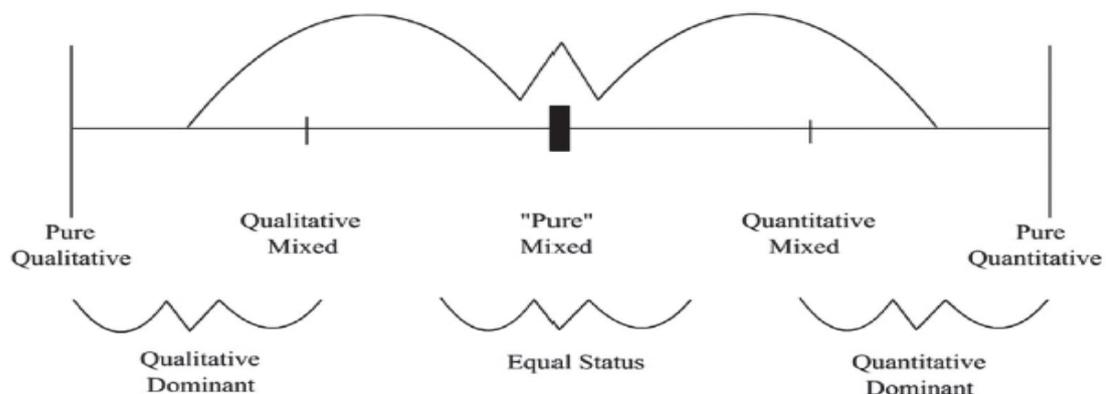


Table 3-1: Graphic of the Three Major Research Paradigms, Including Subtypes of Mixed Methods Research (from Johnson, Onwuegbuzie, & Turner, 2007, p124)

This approach is aligned with a philosophical viewpoint Rescher (2000) cited in Johnson, Onwuegbuzie & Turner, 2007) terms “pragmatism of the left”. Rescher (2000) describes this philosophical position as being flexible, able to accept that some things simply exist, they continue to exist without inference. As individuals interacting with these impermeable things, the way in which we experience and interact with them can

change for ourselves the nature of the thing in our experience. This is a particular form of pragmatic philosophy that aligns in the gap between the purely pragmatic and the ontological perspective of objectivism. This leads to a research design which uses a basis of quantitative analysis to provide the context of the world, which is the augmented with an extension of qualitative techniques used to add depth and richness to understanding of the ways in which the participants interact with the world as described by the outcome of the quantitative research (Johnson, *et al*, 2007).

3.3 Design

The design of a research project provides an outline of the framework for the rest of the research to be built upon (Hakim, 2000). The research design provides a plan for the relationships between aspects of the research and for the reasoning behind conduction of the research method (Cooper and Scindler, 2008). The research design outlines the researchers choices as to the purpose, scope, environment, structure, time frame, variable control, method of data collection and participant perceptions (see Table 6).

The proposed study requires a two phase research design and the outline of the framework for the research will be described in these two phases. Phase one will refer to the modifying and moderating perceptions of the supply chain participants. Phase two refers to the structural, observable physical elements of the supply chain.

Table 3-2: Research design outline (modified from Cooper and Scindler, 2008)

Category	Phase One	Phase Two
Purpose	Descriptive	Causal
Scope	Case	Statistical
Structure	Exploratory	Formal
Time Frame	Cross sectional	Cross-Sectional
Variable Control	Ex-Post Facto	Experiment
Method of data collection	Communication (interview)	Monitoring
Participant Perceptions	Modified Routine	Modified Routine
Technique employed	Qualitative	Quantitative

Purpose of research

The purpose of descriptive research is to outline the reality as it is; who, what, where, when and how of a situation (Cooper and Scindler, 2008). Phase one is a causal examination aiming to discover the barriers and supports that do, or could exist to support the realisation of those mutual gains. Causal research seeks to gain knowledge about why the situation is as it is. Causal research seeks to make contributory connections between variables (Cooper and Scindler, 2008). This phase of the research is aimed at describing the reasons behind the behaviour of individuals within the supply chain.

Phase two of the research design will be undertaken as descriptive research, aiming to outline where and when opportunities exist and for whom. This phase of the research seeks to prove a hypothesis gained from the literature review; that the presence of the

specified antecedents will enable mutual gains from resource sharing in a co-operative relationship spanning at least one section of the supply chain. This research seeks to define the impact of a variable on others

Scope of research

The research scope refers to the breadth and depth of the study (Cooper and Scindler, 2008). A case study provides an in-depth analysis of one specific contextual situation, looking at rich analysis; a statistical study examines a wide range of situations shallowly looking for connections between situations (Cooper and Scindler, 2008). For this research in the first phase a case study is appropriate. In depth interviews with a small sample of the population used in the first phase provide depth and richness to understanding the behaviour that may enable the results of phase one. The second phase will take place at a broad level, aiming to make inferences about the industry population. The use of a pragmatic mixed method of research is designed to provide a deeper, richer appreciation of a specific situation in which to test theory.

The research environment

The research environment refers to the conditions under which the research is conducted (Cooper and Scindler, 2008). The first phase of the research will be undertaken in the field, dealing with the supply chain participants. It will involve an in person, interactive conversation. The second phase of this research will be conducted using simulation. Simulation allow the researcher to examine the actual supply chain without making difficult, timely and expensive changes to the real world system (Chang & Makatsoris, 2003). The use of simulation for the second phase allows the researcher to examine potential scenarios of the case study supply chain without requiring any changes to be made.

Research structure

The research design includes an element of structure; in this instance the first phase will involve an exploratory study, loosely structured and with the objective of discovering the unknown. This will drive the second phase of the research will undertake a formal study, using precise procedures to answer a specific posed question. The first phase enables the researcher to gain a full understanding of the system being studied from one perspective, while the second phase adds to that understanding from a secondary perspective. The research is structured in this manner to make use of the system description gained during the in depth interviews to guide the model building for the simulations in phase two.

Time frame

Due to time constraints the research proposed will be a cross-sectional study examining the supply chain at a specific point in time.

Control of variables

The first phase of the research will be conducted ex post facto; the researcher will have no control over the variables and is limited to reporting results as they are discovered. The second phase of the research is a simulation based experiment where the variables will be controlled and manipulated by the researcher.

Method of data collection

The method of data collection involves monitoring the supply chain and replicating that in the simulation experiment. In the first phase of the research communication with subjects is required through interviews and face to face conversations. The second phase will involve a written questionnaire.

Participant's perceptions

The research is designed to modify participants from routine perspectives. Both phase one and phase two are modified situations from the routine supply chain configuration. Some of the questions asked in the interview especially in the first phase may significantly alter the participants perceptions of their own and others behaviours.

3.4 Research Questions

3.4.1 General Questions

This research seeks to test the theory of co-opetition in a logistics setting. The research seeks to answer the question - Can co-opetition be applied in this specific context?

Acknowledging that there may be other factors than operational costs Phase one of this research investigates the underlying business environment and probe it for factors that may support or hinder the logistics co-operation endeavours. The research also investigates if there are possible other areas of co-operative behaviour that could be explored apart from logistics.

Phase two of this research seeks to investigate what the financial gains could be if co-opetition was applied, and how extensive co-opetition would need to be to incite change. The null hypothesis is that there is no benefit to be gained from co-opetition in the New Zealand log export supply chain.

3.4.2 Specific Questions

- ? What are the potential mutual benefits that could be realised from logistical resource synergies in the New Zealand log export industry?
- ? Are there any specific characteristics in this context that may support or hinder the realisation of those gains?

- ? Are there any other supply chain activities where resource synergies could create a competitive situation other than logistics?

3.5 Ethical considerations

Prior to the commencement of any data collection a Massey University screening questionnaire was undertaken. The results of this screening questionnaire indicated that a low risk notification was reasonable. A notification of low risk research was made to the Research ethics office and filed without issue.

4 BACKGROUND TO THE NEW ZEALAND LOG EXPORT INDUSTRY CONTEXT OF THE RESEARCH.

New Zealand is a net producer of logs and lumber products, the export of these represents a 58% of 2014 exports by volume from New Zealand (Ministry for Primary Industries, 2015). Due to New Zealand's ocean locked geography and the bulky and heavy nature of the cargo logs and timber are shipped to export markets via sea freight (Sankaran, 2000). Most of this takes place on bulk carrier ships, designed to be cost effective means of carting large unpackaged material long distances. The availability of bulk carriers to come to New Zealand is limited by the depth of the harbour channels and berths at our ports. Traditionally New Zealand has been services by Handysize bulk carriers which are capable of carrying up to 40,000 tonnes of product. In most recent years due to port expansions there has been some arrivals of the Supramax size bulk ships capable of handling loads up to 60,000 tonnes. These Supramax size ships are limited to calls to ports which have deeper harbour and berth drafts, a number of New Zealand ports are working on expanding the depth of these areas to accommodate these size ships in the future.

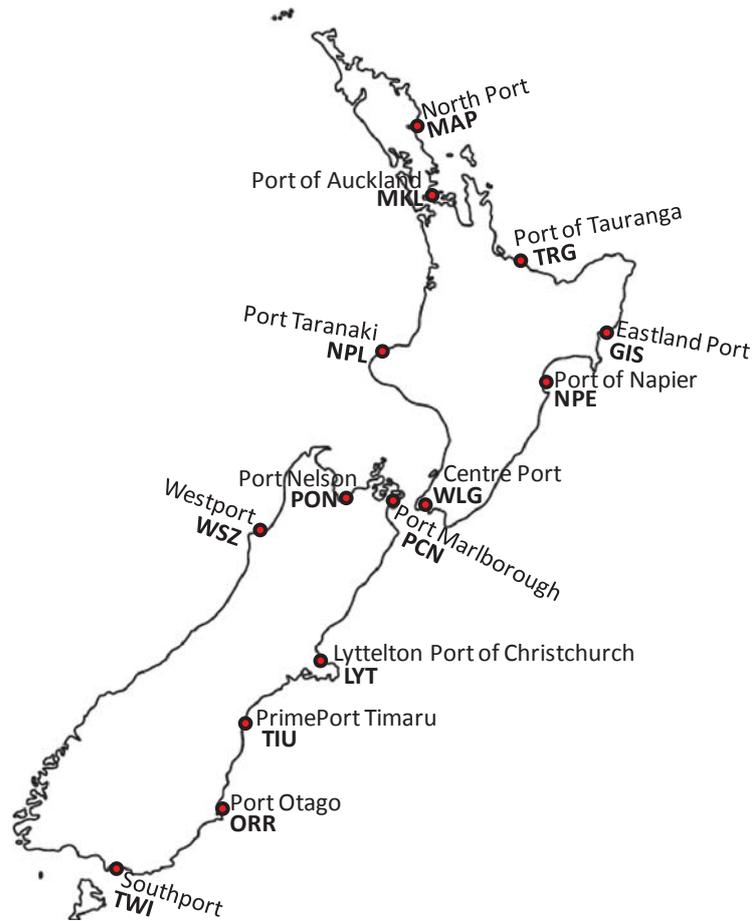


Figure 4-1: Map of New Zealand ports showing their International location codes (UN/LOCODE)

There are 18 sea ports in New Zealand, 12 of these are used to export logs in bulk form. Six of these are in the North Island of New Zealand: North Port (MAP), Port of Tauranga Tauranga (TRG), Eastland Port (GIS), Port Taranaki (NPL), Port of Napier (NPE) and CentrePort (WLG). There are a further 6 in the South Island: Port Nelson (PON), Port Marlborough (PCN), Lyttelton Port of Christchurch (LTY), PrimePort Timaru (TIU), Port Otago (ORR) and South Port (TWI).

NZ exports 90% of its log products to China, India and Korea (Ministry for Primary Industries, 2015). Phytosanitary requirements mean that ships exporting to China or India must load all the logs that will sit on the top deck at a port that offers a treatment service for this. Currently this is limited to North Port, Port of Tauranga and Port of

Napier.

The forest product supply chain in New Zealand traditionally begins at the standing forest. Forest ownership is split between very large Multi National forest organisations through to the smallest farm owners with a patch of forest block (New Zealand Forest Owner Association, 2014). Much of the smaller stands of forest are owned by investment groups with little or no physical connection to the forest. Small forestry blocks often sell the cutting rights to the forest to other entities or employ harvesting and management companies who manage the cutting and selling of the trees on behalf of the owner.

Forest owners (or their agents) then arrange to sell their logs. These sales are usually a combination of domestic sales to a local sawmill or paper product producer and export log sales. The percentage of export volume from a forest can vary from 30-70% depending on the availability of nearby processing facilities and silvicultural regimes.

There are four exporter types that are analysed in this research. Table 4-3 outlines the definitions of the terms used to describe each type briefly.

Table 4-1: Exporter business model definitions

Integrated Forestry Organisation Owns forests and sells the outputs to offshore buyers.	Marketer Markets logs to buyers on behalf of forest owners.
Service Provider Stores and ships logs on behalf of a forest owner or a log buyer.	Trader Buys wood from forest owners to sell to international buyers.

The first type of exporters are the only direct exporter. Larger forest owners who sell directly to international buyers and arrange their own shipping and export services, for this research they are referred to as integrated forest organisations.

Where a forest owner is not large enough to arrange their own marketing and shipping they rely on an intermediary exporter to provide this service. The remaining three types of exporters are all intermediaries. Some exporters may contain aspects of more than one type; for example integrated forestry organisations often also undertake some trader behaviour.

There are three main types of intermediary exporters operating in New Zealand.

- **Traders** buy logs and timber from forest and mill owners and sell it to overseas buyers. They take responsibility for the product once the seller has delivered it to the nearest wharf gate. Traders have ownership of the product from this point until it arrives on the importing port.
- Service providers act as agents for the seller, they do not buy and sell wood but arrange shipping, insurance and marketing services on behalf of the seller. Ownership remains with the forest owner until the product arrives on the importing port
- Marketers are a domestic intermediary, they are often also involved in harvesting management roles. They trade domestically, selling to other exporters on port. Their main role as an exporter is to market and sell the forest owners wood products on their behalf to international buyers. The marketer will arrange with the buyer to collect the wood from a New Zealand port, ownership

transfers to the buyer when the product passes over the ship's rail while being loaded.

All exporters except marketers charter ships, arranging with the ship's owner for the ship to travel to New Zealand and move through a specified series of port calls. The exporter is given a price for this journey, with a given number of days that the ship is available to complete the journey. If the vessel takes longer than expected the exporter will be liable for demurrage charges for exceeding the agreed charter time. The cost of these journeys are made up of a daily charter fee for the ship, plus the costs of bringing a ship into each of the specified ports. These port related costs are made up of the pilotage, tugs and marine fees to bring the ship into the port as well as the berthage fees for the ship to remain on the appropriate berth. The cost of these services are borne by the ship owner and passed along to the exporter in the journey fee. Exporters themselves are also liable for storage fees for storing product on the port as well as wharfage charges on all products loaded or unloaded on a port. All of these charges vary by port.

An exporter will arrange for space on each of the ports they plan to ship product from. How much space and the method of allocation to individual exporters is decided by the port company. In New Zealand some ports lease specific areas of land to exporters, others retain control of the land and space is allocated on a moving basis. This allocation method allows ports to use the space efficiently. Competition for space on ports is fierce as the more space available the less port calls a vessel is required to make.

The diverse nature of the forest resources and competition for space on ports results in ships being required to call at up to 5 ports to load. These excess port calls create waste in the supply chain, and provide the basis for the proposed competition benefits.

5 QUALITATIVE METHOD AND ANALYSIS

5.1 Research Method

5.1.1 Data Collection

The qualitative component of the research involved a 1 hour semi structured interview with a single representative individual from each organisation in the case study. Due to the small size of the case study population the entire population was selected for inclusion. Slightly less than half of the population responded affirmatively and took part in the interview.

In order to be able to enter their reality face to face interviews were undertaken. This allowed the researcher to develop mutual trust and respect, whereby the interviewees were more comfortable disclosing their personal opinions. For this reason interviews were not recorded, notes were taken about the discussions that took place as well as the observations of the interviewer.

To begin the interview all participants were asked to outline their organisations role in the supply chain and their personal role in the organisation. In the following section they were asked to explain their particular business model and queried about their perceptions of competitors, collaborators and methods of differentiation.

The interview structure sought to identify and instances of coepetitive behaviour, and circumstances that might enable this to occur. A table was created for participants to complete during the interview (see appendix A). This table was derived from the work of the Supply chain collaboration index created by Wilding and Humphies (2006).

Bezuidenhout, Bodhanya and Brenchley (2012) work furthered this and drew three profile categories around the supply chain collaboration index components. A pivotal component from each profile was selected as a proxy for identifying collaboration potential. The

characteristics that were chosen were Communication, Reliability and trust. These were the strongest indicators of each of the profiles they represented. During the course of the interview participants were asked to view a list of the population of exporters being examined and to rank from their own experience on a scale of 1 (high) through to 3 (low) their agreement with the following statements

- I communicate with this company
- This company is reliable
- I trust this company.

Communication was identified as the key criteria for cooperation, as it is the foundation of all the key enablers recognised in previous research. For this reason the next section of the interview focused on how exporters communicated between themselves.

Communication between organisations was then broken down with the participant asked to rank a series of possible conversation topics indicating how frequently they would discuss these with specific organisations. The specific organisations were chosen from those exporters that the interviewee had indicated a strong agreement (number 1) from the previous table. Following this an open conversation was held about what made communication easy, or difficult with various other industry organisations. The table was used to guide this conversation, probing for the elements that made communication possible with exporters scoring a 1 on the communication section of the table, and what made communication difficult with those exporters scoring a 3 in the table.

In the final section participants were asked to identify from their own perspective the potential for co-operative activities in the industry. They were asked to identify any activities in the wider supply chain that cooperative behaviour would lead to mutual

benefit from their perspective. They were asked to expand on the barriers and supports that do, or might, exist that they saw as significant to support or prevent their co-opetition scenario.

The interview notes were transcribed and a summary of each organisation and their perspective detailed. The notes were coded and a thematic analysis undertaken to identify the key common themes from the interviews.

5.1.2 Qualitative analysis approach

The cases are described in detail, narrating the main outcomes of each interview and the perceptions of the interviewer. The scores from the collaboration table are summed, with each category carrying the same weight. This gives for each interview a score between 3 and 9, the lower the score the higher the potential for co-opetition between parties. A graph plots the score relating to others perception of the interviewee alongside their own perception of others.

In order to draw together the themes to draw alignment between interview thoughts the interview notes are transcribed and coded by keyword and key ideas. The codes are analysed and some are combined together. The codes are then grouped into 6 categories of key identified themes. These key themes are compared to the enablers and obstructions identified in Cruijssen, Dullaert, & Fleuren, 2007 and Pöllumäe, Lilleleht, & Korjus 2016

5.1.3 Qualitative ethical considerations

The ethical issues that were identified in the Qualitative section of the study involved ensuring that individuals and organisations were protected from reputational and commercial risks given the sensitive nature of the subject matter and the small industry. All participants were initially contacted by email and a written outline of the project was

provided to them (see appendix C). This document outlined the project goals, a brief outline of the information that would be requested, how this information would be used and described in some detail the confidentiality provisions. These included that pseudonyms would be used so that no individual or company would be identified. In order to ensure no conflict of interest with the interviewer sitting within a forestry science organisation the identity of the participants was coded so results could be discussed with supervisors with only the researcher and the Massey University supervisor having access to link the information and the participants identities. The letter outlined contact details for the researcher and all supervisors. All participants received this letter prior to agreeing to participate in the interview. At the beginning of each interview this letter was re-read and expanded on where necessary so that participants understood clearly the confidentiality provisions in place, and how their information would be used. It was explained that they could choose not to answer any or all of the questions, and that they also had 30 days in which they could withdraw their information following the interview. All participants were asked to sign a copy of this document to indicate that this had been explained to them and they agreed at this point to participate.

Following the data collection it was decided that the data provided identified the respondents and that the use of pseudonyms would not be sufficient to ensure protection of the participant's anonymity. For that reason a decision was made to embargo the thesis for a period of 3 years.

6 QUALITATIVE RESULTS

6.1 Case study results

Individuals were interviewed representing eight exporting organisations in New Zealand. The eight organisations represent 80% of the export market by volume, and 50% of the initially identified exporting organisations. Each company interview is profiled and then a cross case analysis performed using a thematic analysis.

6.1.1 Company A

Company A describes themselves as “NZ’s largest independent 100% trading organisation”. They export around 1 million cubic metres of logs and lumber annually, which they report makes them the 3rd or 4th largest log exporter from New Zealand. They export from 8 New Zealand ports, and have at times exported from an additional 4 ports. Their business model is self-described as an “open book”, they buy logs at a lower price from forest owners and sell them at a higher price to an overseas buyer. Company A describes the main facet of their business as price negotiation the challenge to buy low and sell high. This trading behaviour exposes the organisation to a number of significant risks and mitigation of these drives a number of their behaviours. Company A believes their reduced logistics costs allows them to pay a superior purchase price and that this is what differentiates them in the market. They see themselves as a price leader in the log procurement market in New Zealand. Mr Peters is responsible for Procurement, operations and shipping, he has been in the role for 6 years.

Company A was able to describe a large number of organisations who it perceived to be competitors. Mr Peters was able to identify only one organisation that he perceived to be a collaborator, Company C. Mr Peters commented that there was “no advantage” to collaboration from Company A’s perspective. He added that they had “done it before” and “learned from experience” that working with other exporters “never ends well”. Mr Peters gave an example of one previous experience of a joint shipping venture with another exporter (not interviewed). The two companies shared a chartered vessel approximately 50/50, loading from two New Zealand ports and intending to offload at one Chinese port.

Upon arrival at the discharge port there were significant delays in obtaining a berth a situation expected to continue for several days. Waiting to unload at the intended port would result in a situation where the vessel charter would be out of time and demurrage payments by the exporters would be required. Company A's buyer was happy to off load the vessel at a different port and transport the product on land, however the other exporters clients were not willing to undertake this manoeuvre. The exporters were unable to agree on an alternative situation, thus causing the vessel to run over its agreed charter time and both exporters became liable for the extra costs of demurrage. Mr Peters used this example to highlight the difficulties of collaborative relationships where circumstances can change from the intended course of action. In this example the cost of the delay outweighed any benefit gained from reduced shipping cost.

Company A's "independence" is important to them. They associate independence with control, and believe that this control is vital to their organisation to manage and mitigate the credit, shipping and foreign exchange risk they face because of their position as a trader. With a small number of large scale international buyers Mr Peters argues that traders are market driven, many traders are selling to the same buyers leading to a "race between exporters for credits" from those organisations. Mr Peters commented that this resulted in the need to carry high levels of inventory in their system. He described this working capital as a "killer" because it tied up a significant amount of their cash flow.

Figure 6-1 outlines Company A's total score in relation to their level of communication, perception of reliability and level of trust with each of the other seven interviewed exporters as well as those organisations score in relation to their perception of Company A on the same characteristics. Company A is overall not well regarded in the industry as being trustworthy or reliable. Few organisations identified themselves as communicative with Company A. Largely this was also reflected in Company A's perceptions of others, they trusted very few and had low levels of communication. Company A's closest relationships were with exporters who owned their own forests. Mr Peters commented that they had an especially close relationship with Companies C and E.

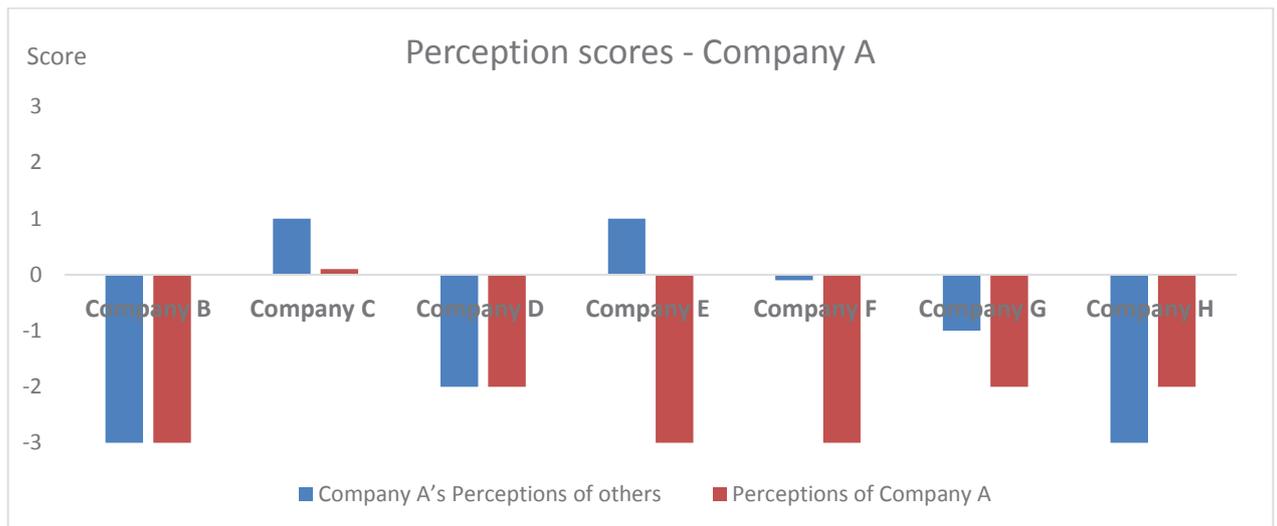


Figure 6-1: Summary of perceptions around Company A

6.1.2 Company B

Company B describe themselves as ‘supply chain managers’ they manage the activities in the supply chain from the forest owner to the buyer’s log yard. They describe their primary focus on acting as an agent for forest owners, managing the shipping and marketing functions for their supply chains. They are the largest exporter of logs from New Zealand, exporting around 5 million JASm³ annually. They export from 5 main ports in NZ and occasionally from another 2. Their major business model and point of difference in the market is in providing competitive advantage though shipping and marketing scale and expertise to forest owner customers. The company also engages in some trading services where they buy wood from forest owners, ship it and sell it to overseas buyers. This trading element makes up around 30% of their business, for the remainder 70% they are acting as the seller’s agent. Mr Jones is responsible for operations and shipping and has been in the role for 7 years.

Company B describes their main competition as other smaller traders. They didn’t perceive themselves to have any real competition when acting as an agent, while acknowledging that there are other business in the NZ market that undertake these functions. Mr Jones believed their relationships with their forest growing customers are long term and these customers were loyal and unlikely to switch for any reason to any other exporter who could offer a similar service. They easily identified potential collaborators, namely exporters who

were trading in logs. Mr Jones identified strong collaboration relationships with forest owners, including with those who undertake their own shipping and marketing functions.

Company B indicated that the primary requirement necessary for them to consider collaborative relationships with competitors were their perceived character. Exporters would need to be considered responsible, honest, reliable and trustworthy. Their main method of assessment of this related to previous observations or interactions with the organisations. Mr Jones referred to the “tactics” that some exporters deployed in the past when transacting as being unacceptable in their eyes, referring to some in the industry as “ratbags”. He gave an example of a competing trader, with whom they had no previous contact, who had recently “underhandedly” arranged for a shipment of logs to arrive at a port site. This trader had intentions to ship from this port but had failed to alert anyone at the port of the pending arrival. Mr Jones argued that this sort of uncommunicative “out for oneself” behaviour reinforced their perception of this company as having low value and lacking character. He was unable to describe any alternative way other than observation in which they would be able to reassess a competing exporters characteristics. Company B was open to the concept of co-operating in shipping areas but adamantly opposed to co-operation in any marketing activity. The main requirements from their perspective were the careful selection of partners with whom to co-operate were of sufficiently high character as well as an alignment of ‘methodology’ (similar procurement, storage and shipping functions).

Figure 6-2 outlines Company B’s global score in relation to their level of communication, perception of reliability and level of trust with each of the other seven interviewed exporters as well as those organisations score in relation to their perception of Company B on the same characteristics. Company B is well regarded in the industry as being very reliable. Few organisations identified a communicative relationship with Company B, they were described by several other exporters as being quite “closed off”. Conversely Company B has a higher appreciation for their competition. They describe several close relationships with other exporters, specifically several who own their own forests, or marketers who sell logs on a trading basis with them. Mr Jones commented that they had an especially close relationship with Companies C, D and E.



Figure 6-2: Summary of perceptions around Company B

6.1.3 Company C

Company C is a vertically integrated exporter who grow and manage their own forests as well as domestic primary processing plants. The domestic processing operations absorb approximately one third of Company C's forest output. They describe their export operation as a means to sell their remaining two thirds of the harvested logs to their customers overseas. They do not undertake any trading of other logs. Company C currently exports about 1 million JASm³ of logs per year from 3 North Island ports. Mr Owen who was interviewed is responsible for all shipping and logistics from arrival at port through to arrival at its destination overseas port. He has been in the role for 4 years.

Company C describe their competitors as "anyone who has the same customers", Mr Owen points out that there is a small market for customers and that other exporters often also sell to the same overseas wholesale buyers. This means their competitor could be a forest owner, or a trader depending on their marketing policy. They differentiate themselves by their long relationships with a small customer base. These relationships are close, and include frequent visits both ways. These personal visits create collaborative relationships and help company C and their customers to understand each other's constraints and nuances. Mr Owen gave an example of this where a customer requested a unique size and grade of log. Mr Owen referred to the customer's recent visit to a harvesting operation to

explain why this request was not easily achievable. Because the customer had viewed the harvesting operation in person he was able to follow the logic in Mr Owen's explanation and the relationship was not impaired by Company C's failure to provide the alternative product.

Company C stressed the importance of relationships. Mr Owen explained that the person who had previously held this role for the company was particularly charismatic, and well known and was liked throughout the industry. He believes that the relationships built by his predecessor have smoothed the operation beyond his personal involvement in the business. Company C has a strong set of values and a corporate culture that is well developed. Mr Owen believed that in order to be able to collaborate with other exporters they would need to share core values and have a similar culture. Company C's culture is open to co-operative practices and the main barriers for adoption have related to a lack of realisable benefits once the global costs of co-operation have been taken into account. There have been some occasions of contractual based relationships where joint shipping had occurred. Mr Owen explained that the relationships with other exporters were quite complex, and that their previous experiences had failed to convey this complexity into the contract. Mr Owen expounded that where the contract failed to cover a specific situation, the relationship between the exporters became strained and it was difficult to come to an agreement. Company C reviewed these joint shipping arrangements and discovered that the cost of time required to negotiate and manage the exporter-exporter relationship exceeded the benefits realised by joint shipping.

Figure 6-3 outlines Company C's global score in relation to their level of communication, perception of reliability and level of trust with each of the other seven interviewed exporters as well as those organisations score in relation to their perception of Company C on the same characteristics. Company C is well regarded in the industry as being trustworthy and reliable. Many organisations communicate with Company C, with several describing close and lasting ties at both an individual and organisational level. Company C trusts traders less than forest owners. They describe several close relationships with other forest owners, especially company D and moderate relationships with service providers such as company G. These perceptions of those relationships were borne out to be quite mutual in interviewing with the representative from those two organisations.



Figure 6-3: Summary of perceptions around Company C

6.1.4 Company D

Company D falls into the combined operations banner, they undertake a series of roles as a semi integrated forest owner, a service provider and also a trader. Company D's exports constitute 50% of their own harvested products and 50% of others. The 50% of logs that do not come from Company D is the 3rd largest forest owner in NZ with 60% of their harvest being sold domestically. The remaining 40% is exported to 4 core international markets. Primarily to ensure shipping rotations are reasonable, Company D also buys and sells logs to supplement this harvest and frequently ships logs for other forest owners who do not have their own shipping services. Company D exports about 1.6 million JASm³ of logs per year from 8 ports in NZ. They are a Multinational corporation where the bulk of their business is conducted offshore. Mr Hart is responsible for all export operations, excluding the sales processes, and has been in his current role for 6 years.

Company D described their competitors as those who "sell logs in NZ or overseas". Mr Hart was clear that Company D's view of competition has a strong focus on their domestic market sales. He described collaborative relationships with other forest owners who did not have any in-house shipping services and where Company D provided this service for them. Mr Hart explained that a large part of Company D's differentiation was around its

long strategic history in the sector, strong relationships built with buyers and its corporate structure strategic outlook.

Company D have a long history in the forestry sector spanning approximately 90 years. Their scale and the length of time they have been operating implies that there exist long, historic and personal relationships. Mr Hart explained that these relationships have developed higher levels of trust over time. The small size of the industry in NZ means that it is not difficult to manage relationships with most other exporters, which he claims to do extensively. Company D works with other forest owners in an agent capacity, allocating space on their ships to other exporters and has in the past engaged in joint sales with other exporters. Company D values its trustworthy reputation and places high value on active communication with others. They have a clearly outlined code of conduct and expectations of how they interact with others that provides assurances to others in regards to returning that trust. Mr Hart took a view that co-operation with competitors requires an “economic need, combined with a personal relationship conducted in a way that preserves the parties’ independence”. Mr Hart had an open attitude to the benefits of co-opetition. He felt that much of that was not realisable to Company D however because of legal constraints associated with its home country.

Figure 6-4 outlines Company D’s global score in relation to their level of communication, perception of reliability and level of trust with each of the other seven interviewed exporters as well as those organisations score in relation to their perception of Company D on the same characteristics. All but 1 organisation identified themselves as communicative with Company D. Mr Hart’s assertion that he had developed reputations with most organisations was upheld by those spoken with, Company D also had the most extensive list of conversations that organisations were willing to have with them. They were considered the most reliable of all exporters in the interviews and had high levels of trust. Company D’s active involvement in the industry is represented in their own perceptions of others. They describe several close relationships with other exporters, Mr Hart described slightly lower levels of trust with service providing and marketing organisations. Mr Hart commented that they had close and personal relationship with Companies C and E.



Figure 6-4: Summary of perceptions around Company D

6.1.5 Company E

Company E is a forest owner and manager, they are owned by a large overseas parent company who also owns forests in other locations. They harvest their trees primarily for the domestic market, with the excess grades (about 50% of harvest) being exported. In order to ensure regular shipping rotations Company E also buys logs from other forest owners and trades them. They currently ship their logs to overseas customers using free on board (FOB) services with shipping companies who sell space on a ship for a specific voyage. These shipping companies commonly act as amalgamators for logs to smaller markets, where it is cost prohibitive for any single exporter to charter a ship alone. Frequently these FOB services are used as a backload out of New Zealand for the shipping company. Company E exports approximately 300,000 JAS m³ per year out of 3 South Island ports. Mr Wang describes his current role as “project managing export logs” responsible for procurement, managing port services and shipping company relationships. His role has encompassed shipping roles prior to the recent move to FOB services, Mr Wang has been in this role for more than 10 years.

Mr Wang described Company E's main competitors as "Russia, North America and Australia". He argued that the industry did not take a consolidated enough view towards competition. If he considered competition more locally he described Companies B and G as his strongest competition. Mr Wang explained that he believed this to be the case as those service providing organisations did not have the same level of risk because they do not own all of the wood they ship. He argued that in his view these organisations would "keep trading no matter what and drive down the price". Mr Wang was able to point out a number of exporters and forest owners that he perceived to be allies. The main reasons were that they operated on the same ports and frequently "helped each other out" by swapping or selling each other logs. Company E named two exporters who had in the recent past engaged in joint shipping collaborations with them. Company E differentiates itself by its primary market being domestic. Their forest management regimes are aimed at maximising domestic sales. This strategic move minimised risk of fluctuations on the export market. He also argued that their large asset base allowed them to "turtle down" in times of low commodity prices further reducing their financial risk.

For Company E, Mr W argues that choices are somewhat more difficult. They are restricted in the ports they are able to access internationally due to the absence of fumigation in all of the ports from where they operate. This frequently requires them to make more port calls on average to discharge. Mr Wang talked lengthily about the two previous long term joint shipping agreements that were in place during the prior year. His opinion was that the three companies involved had developed strong relationships and they were able to problem solve without the need for onerous contracts. The decision to cease the co-operative shipping regimes was made at a strategic level, and reflected the larger parent companies' desire for more uniformity.

Mr Wang describes the difference in chartering your own ships, or shipping with others as akin to "renting a car, or waiting for the bus". When you control your own shipping you are able to depart and arrive at times that suit your own agenda. If you are reliant on shipping with others then there is more requirement to ensure that your product is in the right place at the right time to meet the service. Mr Wang describes the importance of having the same objectives as your partners, and emphasised that geography is critical. Mr W believes

mutual support is essential between exporters operating on small ports in an isolated area, those who don't "play the game" in this way are ostracised. Mr W explains that information in the industry is treated as a commodity. The peaks and flows of the market provide opportunities to exploit knowledge, his measure of trust in a company is closely linked to the prospect of how they will treat that information when the market is low.

Figure 6-5 outlines Company E's global score in relation to their level of communication, perception of reliability and level of trust with each of the other seven interviewed exporters as well as those organisations score in relation to their perception of Company E on the same characteristics. Company E are described as very reliable and trustworthy by others, including several exporters who do not communicate with them. Mr Wang had a negative view on companies that operated as traders, specifically Company A, arguing that they had a short term view and he would rather not deal with them at all. They were less likely to communicate with service providers than any other type of organisation.



Figure 6-5: Summary of perceptions around Company E

6.1.6 Company F

Company F is a semi integrated forest owner, who engaged in a small amount of trade to support their shipping rotations. They describe their business as 'plantation management', and they also

own primary production facilities. About 70% of their harvested logs are used in their own mills or sold to others domestically with the remainder being exported to overseas markets. Company F is a small exporter, shipping between 550,000 and 600,000 JASm³ annually from three ports in NZ with 65% of product going to the Korean market and the remainder to China. Mr Quin is responsible for marketing and sales for Company F and has been in the role for 15 years.

Company F describes its main competitors as other integrated forest owners, the small amount of trade that they engage with means that they are less exposed to competition with other traders. Other forest owners who do not own any processing facilities are identified as their closest allies due to the need to secure product for their mills. Mr Quin describes Company F's point of difference as having complete control over its product and processes both on and offshore. He describes a close knit network of contacts supported by the historical relationships that existed prior to them purchasing their NZ assets from a large global forestry company. Their strong emphasis on the domestic market reduces their exposure to commodity and shipping price risks and their focus on Korea as their primary market provides them more diversity than other exporters.

Company F engages in joint shipping with two other companies in distinctly different manners. The first involves a long term arrangement with a local forest owner who also serves the Korean market. Company F ships logs for this forest owner on their behalf as an agent. The second, and relatively new co-operative relationship is with another exporter. This relationship originates due to the geographical location of Company F's assets being in the South Island and the need for fumigation of deck cargo for Chinese exports. They have a collaborative relationship with a North Island exporter where they provide the deck cargo for Company F's ships travelling to China.

Mr Quin describes the small NZ log export industry as having "long memories and few secrets". He expressed concern about how to manage collaborative relationships given the legal environment around collusion. Company F's focus on the domestic market makes perceptions of price collusion a significant barrier to collaboration with other integrated forest owners. Mr Quin discussed the difficulty of information flow between organisations that have low levels of mutual trust. He described some information sharing that occurs about shipping in this area. There is a commonly used marshalling and stevedoring service provider who facilitates this sharing, removing the requirement of trust between many parties.

Figure 6-6 outlines Company F’s global score in relation to their level of communication, perception of reliability and level of trust with each of the other seven interviewed exporters as well as those organisations score in relation to their perception of Company F on the same characteristics. Few organisations identified communication with Company F, although they were regarded as highly reliable and trustworthy by all interviewed. Company F’s relationships were mostly centred on other forest owners where they had a domestic sales relationship. Organisations that operated extensively in China were less likely to be highly regarded by Company F.

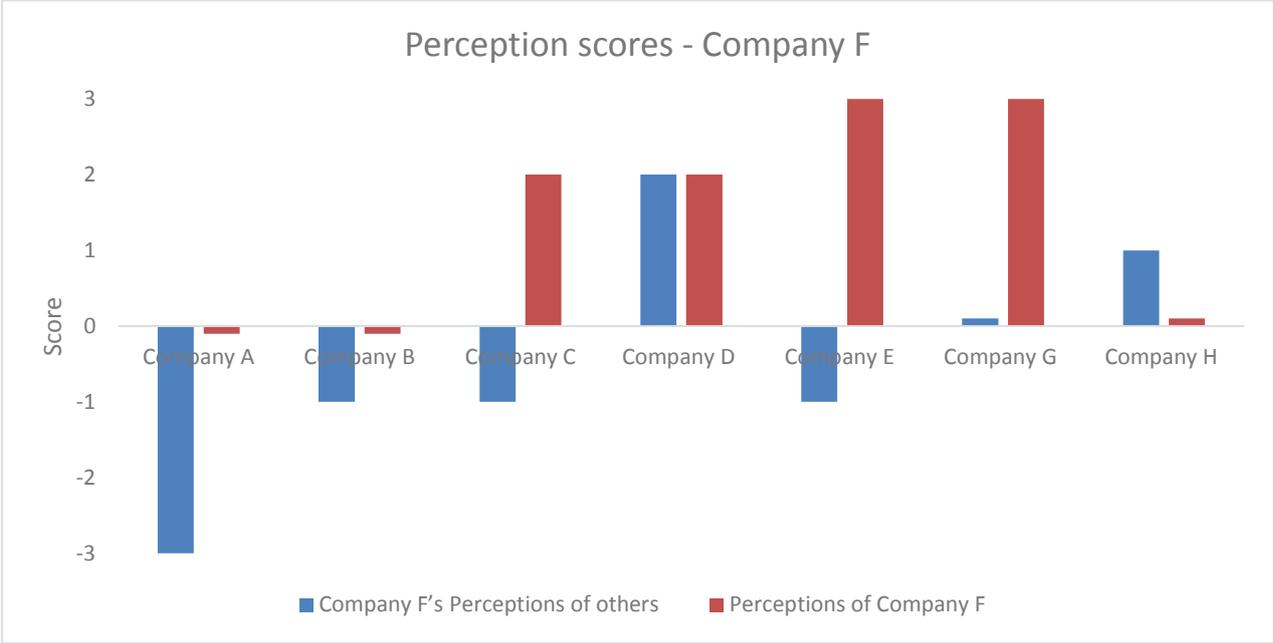


Figure 6-6: Summary of perceptions around Company F

6.1.7 Company G

Company G describes themselves as a post wharf gate service provider. They engage with forest owners, taking responsibility for the logs on arrival at the local port and are responsible for all future services past this point such as shipping, sales, marketing, and insurance. Company G acts as an outsourced “bolt on” addition to forest owners supply chains. They are a NZ based global exporter, exporting 4 million JASm³ annually from 9 ports around NZ and a further 1.5 million from other countries. Mr Norton is responsible primarily for chartering and shipping and has been in his role for 11 years.

Mr Norton argues that Company G has no direct competition, they are in a unique position in the industry. He describes some competition within regions for shipping services, but they face no competition for log procurement in his view. Mr Norton explains that Company G has a unique business model, they operate solely as a service provider and are adamantly opposed to trade. They view trading as a conflict of interest to their role as an agent for their clients. Company G has strong leverage power in shipping due to scale, which they consider a strategic advantage they pass along to their clients (the forest owners). Mr Norton was able to clearly identify a number of collaborating exporters. He described this collaboration as being informational rather than physical, the organisations he identified all belong to an industry organisation which facilitates information flow.

Company G's relationship with other exporters is quite hands off. The communication between them and others was relegated to operational business dealings. Mr Norton describes a barrier to collaboration of the level of fluidity in the smaller exporters where they tend to be "hard to find" when the markets are depressed, and "reinvent themselves" when markets recover. This lack of continuity made relationships difficult and impacted on his ability to trust these companies. Mr Norton described a willingness to collaborate in shipping with selective partners only. Mr Norton argues the reduced shipping rate they provide to clients should be protected and that collaboration with others could remove that. He argues that an open collaboration between all exporters would be bad for the industry, removing too many barriers to entry and increasing the number of incoming entrants. Mr Norton argues that competition for shipping services is good for the industry as a whole as it forces exporters to reduce excess.

Figure 6-7 outlines Company G's global score in relation to their level of communication, perception of reliability and level of trust with each of the other seven interviewed exporters as well as those organisations score in relation to their perception of Company G on the same characteristics. Those organisations who communicate with Company G regarded them as reliable and trustworthy. Those who did not had a low view of Company G. Company G's relationships were centred on other forest owners, some of which they had provided services for. They held a low view of trader organisations, due to this being the opposite of their own model.



Figure 6-7: Summary of perceptions around Company G

6.1.8 Company H

Company H is a service provider and marketer who work for forest owners. They take responsibility as far back as forest management activities. They are responsible for harvesting, transport, marketing, exporting, insurance and sales functions. Company H acts as an agent for the forest owner in these supply chain functions. They do not charter their own ships but frequently sell free on board (FOB) and to other exporters on the port. Company H act as a consolidator on port, bringing together many forest owners to give the benefit of scale in marketing. Once sufficient volume is accumulated Company H negotiates with buyers on behalf of the forest owners. Mr Yang is responsible for sales and relationship management, he has been in this role for 10 years.

Company H's main competitors were described as other forest harvesting and management companies. They differentiate themselves from these by their involvement in the on wharf section of the export chain. Mr Yang describes examples of co-operation between exporters on the ports whereby they will "swap" logs to meet shipping schedules. This may be by way of trade or by an informal log loan agreement. Mr Yang describes difficulties with quality control in these transactions and that they represent co-operation by necessity. Company H believes its competitive advantage lies in its independent nature, they do not own assets but manage contracting companies to provide the physical services. Their clients are forest owners and their

arm’s length sales transaction strategy provides these clients the best value for their assets. They have a long track record and have built trust and reputation in their approximately 40 years of operation.

Mr Yang highly values communication and reliability in dealing with exporters. The main drivers that facilitate strong relationships for him are that the individuals be clear communicators who are frank and straightforward. His relationship with exporters is based on his personal relationship with the day to day contact. The largest barriers for Mr Yang are the need to protect Company H from payment risk. This requires relationships to have a strong contractual basis with little room for trust and mutual problem solving. Mr Yang describes having bad experiences in dealing with exporters. He gives an example of Company A where a contract was breached and without the ability to mutually problem solve the relationship was damaged.

Figure 6-8 outlines Company H’s global score in relation to their level of communication, perception of reliability and level of trust with each of the other seven interviewed exporters as well as those organisations score in relation to their perception of Company H on the same characteristics. Company H has a strong relationship with Company E, which is reflected in their mutual score. For other organisations Company H has a better perception of others than the industry has of them. Their unusual position in the industry may polarise views in relation to their operation. They communicate with most exporters due to their role in domestic on port trade.

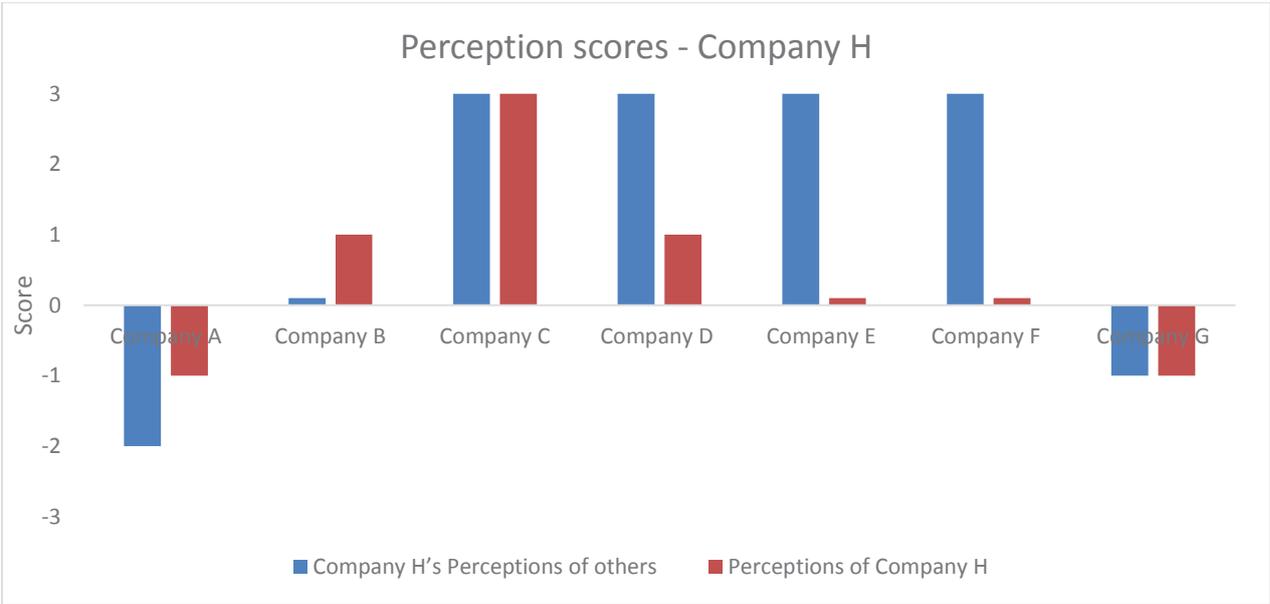


Figure 6-8: Summary of perceptions around Company H

6.2 Cross Company analysis

A thematic analysis was conducted on the interview notes which produced four main themes across the case study; these being

- a. The physical world
- b. Relationships
- c. Autonomy and risk
- d. Communication and third party involvement.

These outcomes align closely with the facilitators and impediments identified in Cruijssen, *et al*, (2007) and Põllumäe, *et al* (2016).

Communication provides the vehicle for information sharing and negotiation, a third party intermediary for communication can provide a support mechanism. Strategic decisions about the need for autonomy and control are strongly linked to an organisations top level interest in coopetition or not.

6.2.1 Alignment in the physical world

The physical world in which the exporters operate is argued to be necessary in that it provides a foundation for the cooperative element in co-opetitive behaviour. In order for co-opetition to be successful it requires an outcome that has mutual benefits to all parties. The interviewees all believed that for direct cooperative behaviour to be possible in shipping logistics the parties need to operate from compatible ports. In order for cooperation to be effective the interviewed parties believe that the ports from which exporters operate must be complimentary in regards to log quality, market destination and fumigation characteristics. The physical world provides facilitation in aligning the external environment of the organisations. This finding aligns with Põllumäe, *et al* (2016) who argued that the organisational environments must be aligned before coopetition can be successful.

6.2.2 Relationships

A strong theme that occurred through all of the interviews was that of the importance of both personal and interfirm relationships. Relationships are the foundation for several cooperation facilitators identified in Cruijssen, et al, (2007), namely partner selection, division of gains and relationship management. A strong emphasis is placed on congruence of values and similar corporate cultures in partner selection. Seventy five percent of individuals interviewed stressed the importance of having similar values and methods of operation to those that they perceived to be organisations with whom they could work with. A historic relationship was argued to provide support to collaborative relationships, the interpersonal relationships between individuals in the organisations were perceived to be most important. These relationships formed the basis of the partner selection criteria described in Cruijssen, et al, (2007). Where a predecessor had strong links with other exporters this opened doors for the current manager with those organisations even in the absence of a relationship themselves. Relationships with other exporters were linked strongly to the individual's personal experiences with their contemporary at the competing exporter organisation. These individuals formed social network ties that many organisations used to pool informational resources (Lin, 1999). The shipping and logistics function was described as being able to act as a relationship bridge; strong ties between lower level managers (specifically the shipping manager or similar role) were held to provide inter-organisational linkages in situations where the higher level management had negative or no relationship ties with the competing organisation (Lin, 1999).

Perceptions of reliability were strong drivers in partner selection for these organisations, efforts to develop relationships were curtailed where an organisation did not have a strong reputation for reliability. Exporters describe at times having no relationship with specific exporters essentially on the basis that they are not perceived to be reliable, that they did not "do what they say they will do". Exporters spoke of developing relationships with organisations that were seen to have a long term view over those who were newer to the industry and whose reliability could not be confidently appraised. Those organisations with long term outlooks made investment in managing the relationship possible. Forest owning exporters were seen as the most reliable and with the most long term views in the industry. They were identified in all cases as being the preferred relationships for shipping logistics cooperation both by other forest owners as well as all other categories. Traders were more distrusted by other groups, others commented on traders as having poor reputations based on unscrupulous behaviour. This behaviour led to most organisations identifying low levels of desired collaboration with trading organisations, they

described exchanges with them as being primarily economic and the relationship being more aligned with Bengtsson and Kock's (1999) definition of coexistence.

An essential element for co-competition to function well is that it must be mutually beneficial for all involved (Bengtsson and Kock, 1999). Several exporters expressed an opinion from previous experience once the cost of the relationship development and maintenance were included the reduction in operational costs were overshadowed. This is a valuable insight given that the simulation modelled only operational costs and did not consider the innate costs of relationship management.

6.2.3 Autonomy and Risk

A strong influence on the inclination of an organisation's willingness to engage in co-competition in this setting was the importance that the organisation placed on autonomy. Exporters related the need for autonomy with risk. Where perceptions of the risks involved for themselves were high, and for others were low these exporters emphasised the need to have control over the activities. Where organisational risk was high these exporters spoke of co-competition relationships as being contractually focused, their concerns about the ability of the contract to cover all eventualities was a strong barrier to them collaborating. The strongest group of exporters that fell into this category were those who identified as traders. Company A, a solely trading organisation, perceived themselves to carry significantly more business risks than other organisations, particularly more so than marketers or service providers. This is reflected in a high need to control their environment and created a significant barrier in co-competition with low risk organisations. Company C and D, both partial trading organisations, spoke of previous efforts at collaborative shipping logistics and tied the success of these to the fact that their organisation was in control of the process. For these organisations being in a power position in the relationship could support them to engage in co-competition with others.

6.2.4 A vehicle for communication

Industry communication is fragmented, there are no clear channels through which organisations can communicate with other exporters. There is one industry level organisation, but a number

of exporters are excluded from membership, including most trading organisations. Some members of this organisation may not engage in the shipping logistics function themselves. Most communication relies on personal relationships between contemporaries in the organisations, usually the shipping managers. A strong barrier to engaging in cooptation that was identified by the exporters was within the exchange of information. In situations with low levels of trust between organisations there were concerns about the safety and security of any data or information that might be provided in the exchange. Some exporters had previous experiences of operating in a joint venture with other exporters, these had shaped their perceptions about this barrier. A frequently voiced concern was the potential for competitors to leverage this shared information to undercut each other when commodity prices or demand were low.

An example was given by several interviewees where a third party was involved in collecting and disseminating information providing a facilitator for the communication to allow cooptation to occur. This example involved a third party service provider (a marshalling and stevedoring company) who provided a medium for exporters to communicate with each other indirectly. The third party enabled information exchange at a limited level between organisations that had no network ties at all. This amplified communication and information exchange was identified as easy and relatively risk free. All exporters who engaged in this information exchange appeared to have higher levels of trust in the third party.

7 QUANTITATIVE METHOD AND ANALYSIS

7.1 Research Method

7.1.1 Data Collection

The quantitative research method involved a high level model, simulating the port and shipping section of the NZ log export supply chain. The model depicts the flow of wood into storage areas on various ports, the arrival and the movement of ships to collect this wood and travel to international destinations. The model does not simulate the timing of wood flow arrivals or any of the activities that happen once the ship has arrived at its international destination. Table 8 displays the full year volume of logs travelling to each port destination.

In order to populate the model a written survey was presented to a representative of each of these 12 New Zealand ports. This survey results were then used to provide the data for the fields in the model including the number of berths available to bulk log ships, the area available to log storage and the relative split between exporters as well as the rate of vessel loading. The survey also identified the public tariff prices payable in order to bring in a ship and export logs from each port.

Table 7-1: Full year log volume by destination port

North Island Port	Full year inflow (JAS m ³)	South Island Port	Full year inflow (JAS m ³)
NorthPort	2,588,232	Port Nelson	585,030
Port of Tauranga	5,835,316	Port Marlborough	642,921
Eastland Port	2,251,960	Lyttelton Port	675,591
Port Taranaki	231,615	PrimePort Timaru	457,272
Port of Napier	1,108,236	Port Otago	810,284
Centre Port	820,342	Southport	395,503

Logs flow to ports is based on the NZ standard volume measurement of 1 cubic JAS metre. The level of flow to each port replicated the published 2014 data (MPI, 2014). With some allowance for the stochastic nature of the model, the total arrivals at each port replicated the full year 2014 volume of logs.

When the wood arrives at the port it is allocated to an exporter. There are 3 exporter types and 9 individual exporters in the model, Table 7-2 outlines which port each exporter operates from.

Table 7-2: Port operation locations by exporter in simulation model

	Agent		Trader			Forest			
	1	Agent 2	1	2	3	1	2	3	4
NorthPort	✓	✓	✓	✓	✓	×	×	×	×
Port of Tauranga	✓	✓	✓	✓	✓	×	×	×	×
Eastland Port	×	✓	✓	✓	×	×	✓	×	×
Port Taranaki	✓	×	✓	×	×	✓	×	×	×
Port of Napier	×	✓	✓	✓	×	×	×	✓	×
Centre Port	✓	×	✓	✓	✓	✓	×	×	×
Port Nelson	✓	×	✓	×	×	×	✓	×	×
Port Marlborough	✓	×	✓	✓	×	×	✓	×	×
Lyttelton Port	×	✓	✓	✓	×	×	×	×	✓
PrimePort Timaru	✓	×	✓	×	✓	×	×	×	✓
Port Otago	×	✓	✓	×	✓	×	×	×	✓
Southport	×	✓	✓	×	✓	×	×	×	×

There are two 'Agent' type exporters who are large scale, operate from about half of the ports, frequently opposite ports to the other agent type. Agent types are accumulators,

service providers or marketers who do not own the wood but ship it on behalf of the forest owner.

There are 3 'Trader' type exporters in the model. These represent traders, buying wood in NZ and selling it overseas. The number of ports they operate from vary from as little as 3 to as many as 12.

There are 4 'Forest' type exporters in the model. These represent exporters who own their own forest assets in NZ. They export from few ports, geographically located to near their forest resource. They may also do some trading (buying and selling) of wood, particularly in areas where their forest resources are smaller.

Table 7-3 displays the storage levels available by port. The maximum port storage value is derived from the survey sent to the ports (see appendix B), and then allocated to exporters operating on that port based on the combination of exporters. Logs can only accumulate up to these maximum volumes at any given time in the model.

Table 7-3: Maximum storage area available for each port, all exporters combined

Port	Maximum port storage (JASm ³)
NorthPort	247000
Port of Tauranga	294000
Eastland Port	130000
Port Taranaki	38580
Port of Napier	108000
Centre Port	85000
Port Nelson	75000
Port Marlborough	55951
Lyttelton Port	48000
PrimePort Timaru	96000
Port Otago	75600
Southport	36000

As the logs leave the storage area, their cost of storage is calculated by the following formula and stored as an informational attribute on the log

$$\text{Log dwell time} * \text{relevant daily tariff}$$

These cost of storage values are totalled to produce a storage cost for the load.

When ship items are generated the model records their capacity (in jasm³), the exporter they are operating for, the vessel dimensions (length and deadweight tonnage) and its first port of call. Once the ship arrives at its first port of call, the model derives a load for the ship and its next destination. The ship will attempt to load to capacity, if this is

possible the next destination will be an international location. If it is not possible to load to capacity the ship will load the available wood, and the next destination will be a domestic (NZ) port. The model does not allow vessels to call at more than 4 ports, once a vessel has made 3 prior port calls where logs have been loaded it will remain at the 4th port until it has loaded to capacity.

The model uses a standard loading rate of 100 jasm³, per hour per gang with the number of gangs available being randomly generated between 2 and 4 for each load. This simulated the differences in loading rates at the various ports. Once the load has been placed on the ship the model calculates the time the ship has spent in the port, the cost of Marine, Berthage and Wharfage charges incurred and combines these with the earlier calculation for storage to give an overall cost of the ship call. These costs are specific to the port visited. The model uses the public tariff prices for these provided in the earlier port survey. The model calculates the distance to the next port of call, derives a speed of travel from a distribution and then delays the ship for the relevant amount of time.

When the ship has fully loaded the model calculates the distance to its final international destination and derives a speed of travel from a distribution. The model includes a distribution of time required to unload at the international port destination. It does not include the cost of port calls at the international ports, and assumes a 1 port discharge. The model calculates the total cost of New Zealand port visits, the total time spent in the simulation and the travel costs. The travel and loading times are subtracted from the total time in the simulation to produce a waiting time value. The waiting time relates to the waste time that a vessel is waiting for space to berth at a port.

The model was run for 365 days and replicated 10 times to account for the variation caused by the stochastic elements in the model. The model outputs for each vessel that

arrives at its destination port the following values: the exporter, vessel dimensions, vessel capacity, total volume loaded, New Zealand ports visited, the volume loaded at each port, the summed port related costs, total travel time, total waiting time and total travel cost.

The model tests four scenarios of varying degrees of cooperation to identify the depth of logistics cooperation needed for cooperation to succeed in this setting.

The base scenario no exporters cooperate and each operate only from their own ports with their own storage space.

In scenario one, limited co-operation, exporters who co-operate are combined which results in the total number of exporters were reduced to 6, this represents approximately 30% of cooperation in the industry. In this scenario exporter Trader 2 co-operates with exporter Forest 1; Trader 3 co-operates with Forest 2 and Forest 3 cooperates with Forest 4. In this scenario the model is identical to the base scenario except alteration of the available space on each port to amalgamate the storage areas of co-operating exporters.

Scenario two, type co-operation, involves all exporters co-operating with all others of their own type. Exporters who co-operate have their port space combined which results in the total number of exporters were reduced to 3, this represents approximately 50% of cooperation in the industry. In this scenario exporter Agent 1 and Agent 2 cooperate. Traders 1, 2 and 3 cooperate with each other and Forest 1, 2, 3 and 4 cooperate with each other. There is no cooperation across exporter types. The model is identical to the base scenario except alteration of the available space on each port to amalgamate the storage areas of co-operating exporters.

In scenario three, full cooperation all exporters cooperate with all others. In this scenario the model is identical to the base scenario except there are no explicit storage areas on the ports, ships arrive and load from the common storage area which may involve product from multiple exporter's alteration of the available space on each port to amalgamate the storage areas of co-operating exporters. Ships are able to travel on to any domestic port if necessary to complete loading, the probability of any given port being selected is altered so that it is highest for neighbouring ports and reduces the further away the port is from the current port.

7.1.2 Quantitative Analysis Approach

The output of all the simulations are examined. The total logistics cost per ship is examined, identifying the minimum, maximum, medium, first and third quartiles of cost over all of the simulations for each of the four scenarios. A box and whisker plot is developed to analyse this information.

The number of ships making a 4th call is identified and this is divided by the total number of completed trips in the scenario in order to provide a percentage of ships that make the maximum number of port calls. This value used as a proxy to indicate if the scenario is reducing the number of port calls made. Finally, the waiting time for each ship in the simulation is analysed, with the total amount of time that all ships are waiting for a berth graphed.

7.1.3 Quantitative ethical issues

The ethical issues that were identified in the quantitative section of the study involved the need to identify the ports by name. Arising from this there was a need to protect organisations and individuals from reputational and commercial risk. The main issues

related to the visibility of the information they were asked to provide in the survey. A clear method was followed to ensure that the individuals and the companies they represented were clearly informed of the facts and were able to give informed consent to participate.

The ports were initially contacted by email and a written outline of the project was provided to them (see Appendix D). This document outlined the project goals, a brief outline of the information that would be requested, how this information would be used and that it may be published. Following this a telephone discussion was held with each individual which reiterated the ways in which the information would be used and how visible it would be in the output. During this conversation it was made clear that the ports name would be used to identify them, but that there would be no identification of the individual identity of any person involved. Following this conversation the individual was provided with a copy of the specific survey questions. At each stage it was reiterated to the individuals that participation was voluntary, that they were able to withdraw from involvement at any time and that the information may be published. To ensure that post completion of the survey no consent issues arose all participants were given 30 days to withdraw any or all information from study.

8 SIMULATION MODELLING RESULTS.

The results of the simulation model indicate that there is potential for cooperation to reduce the logistics cost in this case. Figure 8-1 indicates the total cost savings that the simulation model indicates could be achieved, by each level of cooperation examined. The largest savings occur where less than 50% of the industry is cooperating.



Figure 8-1: Total supply chain savings under four coopetition scenarios between exporters

This impact is again illustrated in Figure 8-2 by examining the impact of savings on a unit basis. There is an \$11 saving made in the initial 50% collaboration, adding in the rest of the industry where all parties are sharing space and ships has a much lesser impact on cost reduction.

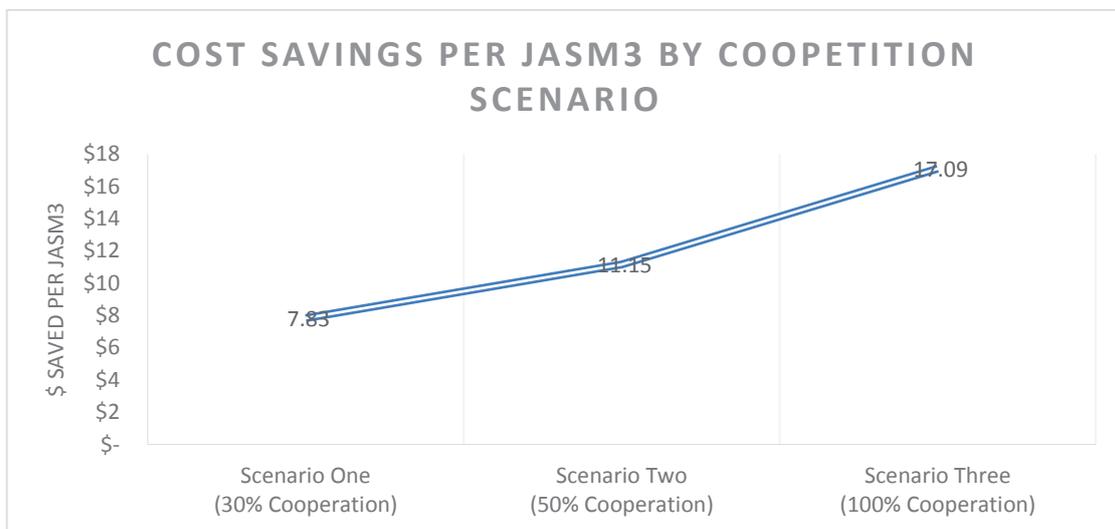


Figure 8-2: Savings per Jas m3 under four coopetition scenarios between exporters

Figure 8-3 displays the average (over all simulated journeys) cost per ship under each of the four scenarios. There are a small number of ships that due to the nature of variations in loading at given ports incur higher than normal costs. The more that the parties cooperate the less the risk of any particular shipment incurring disproportionately high costs. The range of probable costs becomes much narrower as parties cooperate.



Figure 8-3: Total logistics cost per ship under four cooperation scenarios between exporters

Port costs are saved where the number of port calls those ships are making is reduced. Fewer port visits compel the average volume being loaded per visit to increase. Reducing the number of port calls a ship is forced to make reduces both travel time and the cost of entering additional ports. Figure 8-4 displays the percentage of ships that are calling at four ports in the simulation.

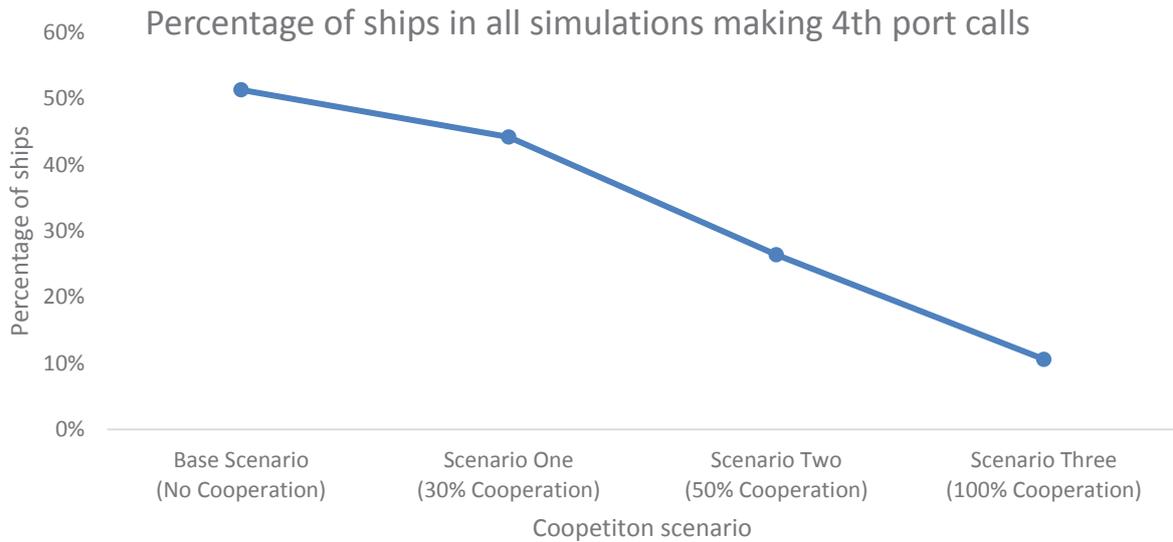


Figure 8-4: Percentage of ships making 4 port calls.

When the cost savings are broken down, the results show a large majority savings are absorbed in reduced port costs, with additional small saving in travel time (displayed in Figure 8-5). Exporters benefit from reduced port entrance charges and eliminated travel time between ports. Savings created by reduced calls are offset slightly in scenario three where ships require longer dwell times at individual ports to load the increased volume. In the base case ships make a number of port calls where they are able to load relatively less product at ports with high fees, and relatively more product at ports with low fees. Where coopetition increases ships make less port calls so are forced to load more product at ports that have higher fees and these higher port costs appear to eradicate some of the benefits of calling at fewer ports.

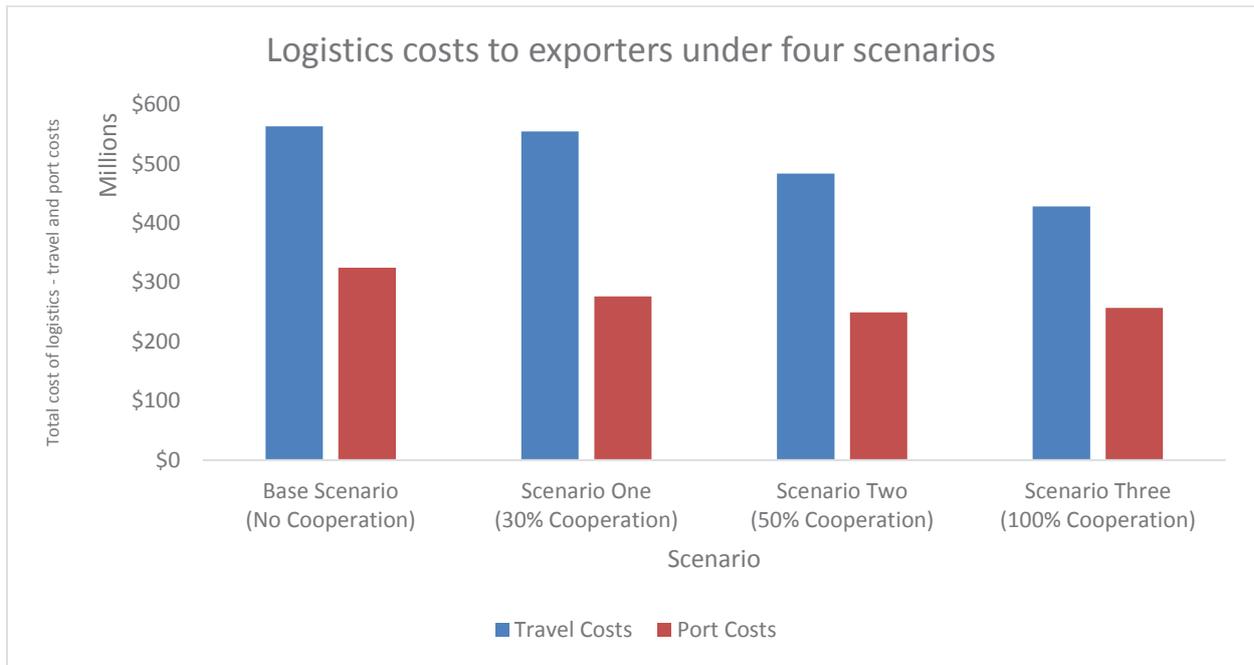


Figure 8-5: Total logistics cost to exporters by port logistics and shipping costs for four scenarios of cooperation

The total waiting time of all the ships is displayed in Figure 8-6. There is a significant improvement in waiting time when only a limited degree of cooperation is implemented. There are decreasing returns to scale with increased levels of cooperation and in the final scenario where all parties are cooperating there is a slight increase in this waiting time. When all parties cooperate ships are more frequently loading full loads on all ports, even inefficient ones. Inefficient ports take longer to load a given ship, and incur higher port charges as a result. In addition an incoming ship wanting to load at an inefficient port where there is already a ship loading spends more time waiting to get on the berth. Because ships will only wait for a set amount of time they may wait at one port but fail to obtain a berth in time, then depart for another port. Ships travelling to several ports and waiting without obtaining a berth increases the total time they spend waiting to berth (figure 8-6).

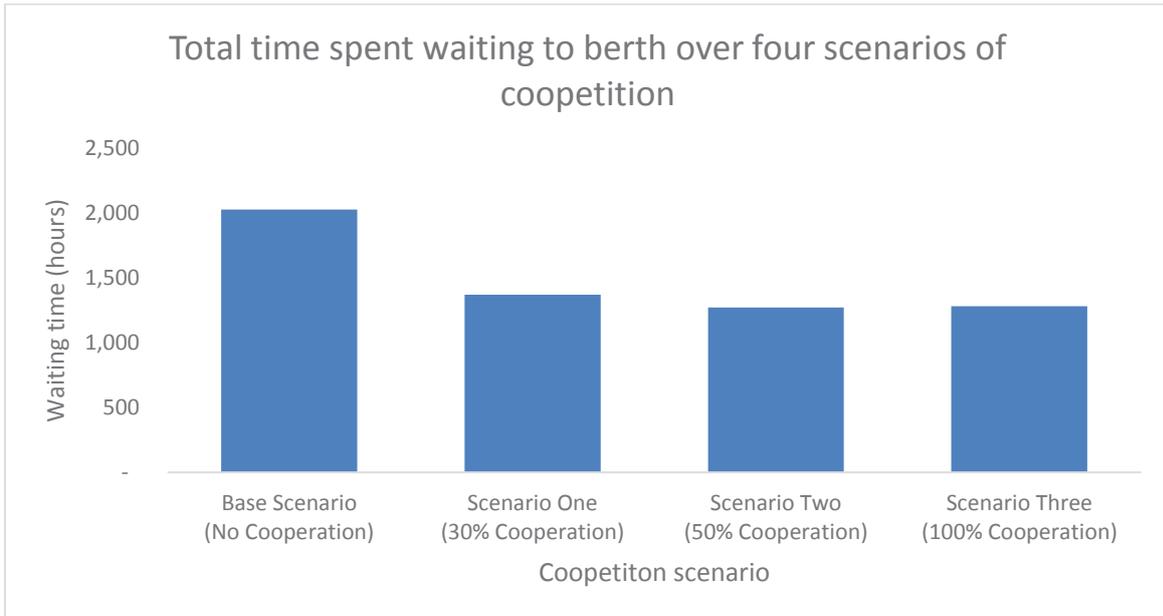


Figure 8-6: Total time spent waiting to berth for all ships over four scenarios of cooperation

9 Conclusion and recommendations for future research

9.1 Conclusion

This research identifies that the network that connects the competing log trade firms sampled is historic, personal, social and ongoing in nature. These historic and present social connections between individuals in the organisations provides these organisations the opportunity to interact with each other. Organisations consider alignment between values as most significant, similar organisational norms and culture are also considered important in selecting partners with whom they are willing to cooperate. Where this alignment exists there are stronger existing social ties which support the development of a cooperative relationship.

This research identified that the key enablers for a cooperative relationship were key relationships with strategic partners. These relationships needed to be with partners who shared the same values and outlook, while at the same time being cost efficient to maintain. Business type plays a strong role in partner selection, the strategic goals of the organisations must be compatible and where business models differ significantly it is improbable these goals will align. This finding aligns with Cruijssen *et al*, (2007) who argued that relationships management was the strongest facilitator and poor partner selection the strongest impediment.

Organisational characteristics were found to be significant. There is variation between organisational types in the industry. The key differential between organisations was associated with their strategic direction. For example organisations who sought to buy and sell for profit, referred to as traders have a strategic outlook at odds with those who seek to support forest grower's sales and marketing efforts (service providers). The importance of logistics as a core competence of the organisation is tied to their strategic view of their role in the supply chain. Organisations that view themselves as primarily production or sales and marketing organisations see logistics as a lower value adding activity. For these organisations cooperation is likely to provide benefits that exceed the costs. Organisations whom view logistics as a strategic core competency are more likely to consider themselves traders or service providers, these organisations appear to have higher barriers to cooperation in shipping and logistics. They value their autonomy in this area, and the benefits gained from cooperation must exceed the increased of risk that these organisations carry.

This research concludes that there are opportunities for selective co-opetition to occur in the log shipping logistics section of the value chain, these opportunities are higher for traders and forest owners who largely represent the small and medium sized exporters in the market. Cooperation by all of the shipping logistics industry is not indicated to be the ideal solution, but rather that smaller organisations work together to create pockets of collaboration. The simulation model identifies that there are savings of around 15-20% of costs achievable through these small collaborations representing approximately \$7-10 per JAS m³. The risk to exporters of a large cost blowout is significantly reduced with the variation in costs reducing as the size of the collaboration increased. Mutual benefits should consider more than just the operational costs identified in the simulation model. The qualitative results indicate that there are relationship costs associated with coordination, negotiation and information sharing that may outweigh the operational cost reductions that could be gained. There is some evidence that the involvement of an independent third party with whom the exporter organisations have some existing network ties too can provide a vehicle for this information sharing. If this was expanded upon it is possible that this third party organisation could also provide coordination and negotiation support which might reduce the impact of the relationship costs on the parties and allow for the gains from the co-opetition relationships to be realised. This finding ties closely with Pöllumäe et al (2016) who found that third party connections such as membership of an industry organisation could provide a vehicle for communication to occur where direct relationships were not possible. Pöllumäe et al (2016) identified time constraints and lack of support mechanisms as barriers to co-opetition. The time and the cost of maintaining multiple relationships with other small organisations is significant and could be reduced by the use of third party involvement, possibly even as a joint venture between exporters. Several interviewees had concerns about such a model dampening competition in the industry which could reduce benefits to other sections of the supply chain.

The research indicates potential realistic savings to New Zealand incorporated in the area of \$50 million annually, while requiring less than 40% of the industry to collaborate. Spread through the supply chain this presents significant value improvement by making small changes in one area. There were other logistics inefficiencies that were identified through the course of this research that may continue to improve this outcome further.

9.2 Recommendations for future research

This research identifies a number of areas of recommended future research.

1. There is little cross exporter communication in the industry, they could benefit from improved lines of communication to build trust between exporters. A way to improve communication would be through a third party such as the marshalling and stevedoring company identified.
2. There is no easily accessible central repository for logistics data in the industry, data is held within organisations and there is no standardisation of presentation, and not all organisations collect the same data. One recommendation would be to consider a central, independent industry organisation to collect data. Collection into one repository would encourage standardised collection and allow for analysis of data over a number of time points, this would enable the industry to further examine inefficiencies and make future research replicable.
3. There is an opportunity to investigate the potential of alternative cooperation activities in the log export value chain. This research examines only the possibility of logistics as the cooperation activity but further research might examine the possibility of supply or sales and marketing as the cooperating activities.
4. The benefits of lateral cooptation could be examined, investigating where both competitors and their suppliers could work together to provide mutual benefits. There are opportunities to investigate what other resources could be shared and which organisations would need to cooperate in order to benefit from this.
5. The role of a third party mechanism in this industry could be investigated to determine what role this sort of organisation could play, what its structure should look like, which barriers this could overcome and the impact on the gains that could be realised from cooptation.
6. This research identified that there is significant variation in operational cost due to waiting times. The waiting time results indicate there is a paramount strategy for how an exporter might use each port which would be drawn out in further research. There is an opportunity to identify common areas where waiting time is high and investigate port comparisons for efficiency. There is potentially an ideal route or combination of ports to use when loading that would result in optimal efficiency for vessels.

7. This study was limited to exporters that were based in New Zealand. Chinese and Indian based trading organisations were not included in this research. Future research might examine further the impact of culture on the relationships, their cultural and geographical difference in perspective might be meaningfully dissimilar to the New Zealand based organisations that were interviewed for this research. There are opportunities to investigate further the network of social interactions between the organisations to more clearly identify where opportunities for co-competition exist.

10 REFERENCES

- Arya, B., & Lin, Z. (2007). Understanding Collaboration Outcomes From an Extended Resource-Based View Perspective: The Roles of Organizational Characteristics, Partner Attributes, and Network Structures†. *Journal of Management*, 33(5), 697-723. doi:10.1177/0149206307305561
- Avdibegović, M., Nonić, D., Posavec, S., Petrović, N., Marić, B., Milijić, V., ... Krajter, S. (2010). Readiness of private forest owners in Croatia, Serbia and Bosnia-Herzegovina to cooperate in forest roads construction and maintenance. *Šumarski list*, 134(1-2), 55-64. Retrieved from <http://www.sumari.hr/sumlist/pdf/201000550.pdf>
Accessed 25/06/15
- Bahinipati, B. K., Kanda, A., & Deshmukh, S. G. (2009). Horizontal collaboration in semiconductor manufacturing industry supply chain: An evaluation of collaboration intensity index. *Computers & Industrial Engineering*, 57(3), 880–895.
doi:10.1016/j.cie.2009.03.003
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120. doi:10.1177/014920639101700108
- Bengtsson, M., & Kock, S. (1999). Cooperation and competition in relationships between competitors in business networks. *Journal of Business & Industrial Marketing*, 14(3), 178 - 194. doi:10.1108/08858629910272184
Accessed 23/06/2015
- Bengtsson, M., & Kock, S. (2000). "Coopetition" in Business Networks—to Cooperate and Compete Simultaneously. *Industrial Marketing Management*, 29(5), 411–426.
doi:10.1016/S0019-8501(99)00067-X
- Bentley, T. A., Parker, R. J., & Ashby, L. (2005). Understanding felling safety in the New Zealand forest industry. *Applied Ergonomics*, 36(2), 165–175.

doi:10.1016/j.apergo.2004.10.009

Accessed 26/06/2015

Björnfot, A., & Torjussen, L. (2012). Extent and effect of horizontal supply chain collaboration among construction SME. *Journal of Engineering, Project, and Production Management*, 2(1), 47-55. Retrieved from http://www.ppml.url.tw/EPPM_Journal/volumns/02_01_January_2012/ID_018_2_1_47_55.pdf

Bonel, E., & Rocco, E. (2007). Coopeting to Survive; Surviving Coopetition. *International Studies of Management and Organization*, 37(2), 70-96. doi:10.2753/IMO0020-8825370204

Accessed 24/06/2015

Brodrechtova, Y. (2008). Determinants of export marketing strategies of forest products companies in the context of transition — The case of Slovakia. *Forest Policy and Economics*, 10(7-8), 450–459. doi:10.1016/j.forpol.2007.12.004

Caputo, M., & Mininno, V. (1996). Internal, vertical and horizontal logistics integration in Italian grocery distribution. *International Journal of Physical Distribution & Logistics Management*, 26(9), 64-90. doi:10.1108/09600039610149101

Carlsson, D., & Rönnqvist, M. (2005). Supply chain management in forestry--case studies at Södra Cell AB. *European Journal of Operational Research*, 163(3), 589–616.

doi:10.1016/j.ejor.2004.02.001

Accessed 26/6/15

Cheng, H., Chen, M., & Mao, C. (2010). The evolutionary process and collaboration in supply chains. *Industrial Management and Data Systems*, 110(3), 453-474.

doi:10.1108/02635571011030079

- Chen, M. (2008). Reconceptualizing the Competition— Cooperation RelationshipA Transparadox Perspective. *Journal of Management Inquiry*, 17(4), 288-304.
doi:10.1177/1056492607312577
- Chin, K., Chan, B. L., & Lam, P. (2008). Identifying and prioritizing critical success factors for coopetition strategy. *Industr Mngmnt & Data Systems*, 108(4), 437-454.
doi:10.1108/02635570810868326
- Clemens, B., & Bakstran, L. (2010). A framework of theoretical lenses and strategic purposes to describe relationships among firm environmental strategy, financial performance, and environmental performance. *Management Research Review*, 33(4), 393 - 405.
doi:10.1108/01409171011030480
- Crujssen, F. C. (2006). Horizontal cooperation in transport and logistics (Doctoral dissertation, Tilburg University, Tilburg, Netherlands). Retrieved from <https://pure.uvt.nl/portal/en/publications/horizontal-cooperation-in-transport-and-logistics%28ab6dbe68-aebc-4b03-8eea-d31d05042fe6%29.html>
- Crujssen, F. C., Dullaert, W., & Joro, T. (2006). Logistics efficiency through horizontal cooperation: The case of Flemish road transportation companies. *Center Discussion Paper*, 2006-14, 1-20. Retrieved from <https://pure.uvt.nl/portal/en/publications/logistic-efficiency-through-horizontal-cooperation%28167e666f-cbde-452d-8a37-52a9eb0068fd%29.html>
- Crujssen, F. C., Dullaert, W., & Fleuren, H. A. (2007). Horizontal cooperation in transport and logistics: A literature review. *Transportation Journal*, 46(3), 22-39. Retrieved from <http://www.jstor.org/stable/20713677>
Accessed 23/06/2015

- Crujssen, F. C., Dullaert, W., & Joro, T. (2010). Freight transportation efficiency through horizontal cooperation in Flanders. *International Journal of Logistics Research and Applications*, 13(3), 161-178. doi:10.1080/13675560903224962
- Crujssen, F., Cools, M., & Dullaert, W. (2007). Horizontal cooperation in logistics: Opportunities and impediments. *Transportation Research Part E-logistics and Transportation Review*, 43(2), 129–142. doi:10.1016/j.tre.2005.09.007
- D'Amours, S., Rönnqvist, M., & Weintraub, A. (2008). Using Operational Research for Supply Chain Planning in the Forest Products Industry. *Information Systems and Operational Research*, 46(4), 265-281. doi:10.3138/infor.46.4.265
Accessed 26/06/2015
- Dodgson, M. (1994). Technological Collaboration and Innovation. In R. Rothwell & M. Dodgson (Eds.), *The Handbook of Industrial Innovation* (pp. 285-291). Cheltenham, UK: Edward Elgar.
- ENZA. (2010). Enza / About ENZA. Retrieved April 20, 2016, from <http://www.enza.co.nz/about-enza/>
- Epstein, R., Morales, R., Seron, J., & Weintraub, A. (1999). Use of OR Systems in the Chilean Forest Industries. *Interfaces*, 29(1), 7-29. doi:10.1287/inte.29.1.7
- Fonterra. (2014). Our Co-op | Fonterra. Retrieved April 20, 2016, from [http://www.fonterra.com/our-co-](http://www.fonterra.com/our-co-op)
<http://www.fonterra.com/nz/en/About/Company+Overview>
- Frayret, J. M., Boston, K., D'Amours, S., & LeBel, L. (2004, September). The e-nable supply chain – opportunities and challenges for forest business. Paper presented at Working Paper DT-2004-JMF-1. Retrieved from www.cirrelet.ca/DocumentsTravail/2004/DT-2004-JMF-1.pdf
Accessed 26/06/2015

- Friedkin, N. E., & Johnsen, E. C. (2011). *Social influence network theory: A sociological examination of small group dynamics*. Cambridge, NY: Cambridge University Press.
- Frisk, M., Göthe-Lundgren, M., Jörnsten, K., & Rönqvist, M. (2010). Cost allocation in collaborative forest transportation. *European Journal of Operational Research*, 205(2), 448–458. doi:10.1016/j.ejor.2010.01.015
Accessed 25/06/215
- Gnyawali, D. R., He, J., & Madhavan, R. (2006). Impact of Co-Opetition on Firm Competitive Behavior: An Empirical Examination. *Journal of Management*, 32(4), 507-530.
doi:10.1177/0149206305284550
- Gnyawali, D. R., & Madhavan, R. (2001). Cooperative networks and competitive dynamics: A structural embeddedness perspective. *The Academy of Management Review*, 26(3), 431-445. Retrieved from <http://www.jstor.org/stable/259186>
Accessed 3/7/15
- Gnyawali, D. R., & Park, B. (2009). Co-opetition and technological innovation in small and medium-sized enterprises: A multilevel conceptual model. *Journal of Small Business Management*, 47(3), 308–330. doi:10.1111/j.1540-627X.2009.00273.x
- Gomes-Casseres, B. (1996). *The alliance revolution: The new shape of business rivalry*. Cambridge, MA: Harvard University Press.
- Gow, H. R., Oliver, L. D., & Gow, N. G. (2002). Co-operating to compete in high velocity global markets: the strategic role of flexible supply chain architectures. *Journal on Chain and Network Science*, 2(1), 19-32. doi:10.3920/JCNS2002.x015
- Greis, N. P., & Kasarda, J. D. (1997). Enterprise logistics in the information era. *California Management Review*, 39, 55-78. Retrieved from www.aerotropolis.com/files/1997_CaliforniaManagementReview_EnterpriseLogistics.pdf

- Heron, R. L., Penny, G., Paine, M., Sheath, G., Pedersen, J., & Botha, N. (2001). Global supply chains and networking: A critical perspective on learning challenges in the New Zealand dairy and sheepmeat commodity chains. *Journal of Economic Geography*, 1(4), 439-456. doi:10.1093/jeg/1.4.439
- Hingley, M., Lindgreen, A., Grant, D. B., & Kane, C. (2011). Using fourth-party logistics management to improve horizontal collaboration among grocery retailers. *Supply Chain Management-an International Journal*, 16(5), 316-327. doi:10.1108/13598541111155839
- Kaplinsky, R. (2000). Spreading the gains from globalization: What can be learned from value chain analysis. *Problems of Economic Transition*, 47(2), 74-115. doi:10.1080/10611991.2004.11049908
accessed 26/06/2015
- Kaplinsky, R. (2004). Spreading the gains from globalization: What can be learned from value chain analysis. *Problems of Economic Transition*, 47(2), 74-115. doi:10.1080/10611991.2004.11049908
- Kilduff, M., & Tsai, W. (2003). *Social networks and organizations*. London, UK: SAGE.
- Kittredge, D. B. (2005). The cooperation of private forest owners on scales larger than one individual property: international examples and potential application in the United States. *Forest Policy and Economics*, 7(4), 671-688. doi:10.1016/j.forpol.2003.12.004
- Kotahi. (2014, June). Kotahi - Global Freight Solutions. Retrieved April 20, 2016, from <http://www.kotahi.co.nz/about-us>
- Kotzab, H., & Teller, C. (2003). Value-adding partnerships and co-opetition models in the grocery industry. *International Journal of Physical Distribution & Logistics Management*, 33(3), 268-281. doi:10.1108/09600030310472005

- Lacomba, J. A., Lagos, F., & Neugebauer, T. (2011). Who makes the pie bigger? An experimental study on co-opetition. *New Zealand Economic Papers*, 45(1-2), 59-68. doi:10.1080/00779954.2011.556070
- Lado, A. A., Boyd, N. G., & Hanlon, S. C. (1997). Competition, cooperation, and the search for economic rents: A syncretic model. *The Academy of Management Review*, 22(1), 110-141. Retrieved from <http://www.jstor.org/stable/259226>
- Leitner, R., Meizer, F., Prochazka, M., & Sihm, W. (2011). Structural concepts for horizontal cooperation to increase efficiency in logistics. *Cirp Journal of Manufacturing Science and Technology*, 4(3), 332–337. doi:10.1016/j.cirpj.2011.01.009
- Letourneau, B. (2004). Co-opetition: an alternative to competition. *Journal of Healthcare Management*, 49(2), 81-83. <http://ezproxy.massey.ac.nz/login?url=http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,cookie,url,uid&db=ccm&AN=2009393930&site=ehost-live&scope=sitib>
- Ling-yee, L., & Ogunmokun, G. O. (2001). Effect of export financing resources and supply-chain skills on export competitive advantages: implications for superior export performance. *Journal of World Business*, 36(3), 260-279. doi:10.1016/S1090-9516(01)00055-4
- Lin, N. (1999). Building a network theory of social capital. *Connections*, 22(1), 28-51. Retrieved from http://www.insna.org/PDF/Connections/v22/1999_I-1-4.pdf
- Meat Industry Association of New Zealand. (2016). Meat Industry Association of New Zealand (Inc) :: About Us. Retrieved from http://www.mia.co.nz/about_us/index.htm
- Meidutė, I., Litvinenko, M., & Aranskis, A. (2012). Logistics cooperation: integrated logistics services. *Verslas: teorija ir praktika - Business: theory and practice*, 13(4), 343-351.

doi:10.3846/btp.2012.36

Accessed 25/06/2015

Ministry for Primary Industries. (2015). Exports by forestry product and country of destination. Retrieved from Ministry for Primary Industries website:

<http://www.mpi.govt.nz/news-and-resources/open-data-and-forecasting/forestry/>

Mollenkopf, D., & Dapiran, G. (2005). The importance of developing logistics competencies: a study of Australian and New Zealand firms. *International Journal of Logistics*, 8(1), 1-14. doi:10.1080/13675560500092176

Motsa, C. (2011). Timber harvesting within a supply and value chain optimization context (FRST 497). Retrieved from University of British Columbia website:

elk.library.ubc.ca/handle/2429/36214

Nalebuff, B. J., & Brandenburger, A. M. (1997). Co-opetition: Competitive and cooperative business strategies for the digital economy. *Strategy & Leadership*, 25(6), 28 - 33.

doi:10.1108/eb054655

Narus, A. J., & Anderson, J. C. (1996). Rethinking distribution: Adaptive channels. *Harvard Business Review*, 74(4), 112-120. Retrieved from

<https://hbr.org/1996/07/rethinking-distribution-adaptive-channels>

Accessed 24/06/2015

New Zealand Forest Owners Association. (2014). Facts and figures. Retrieved from Ministry of Primary Industries website:

<http://www.nzfoa.org.nz/resources/publications/facts-and-figures>

Ouchi, W. G., & Bolton, M. K. (1988). The logic of joint research and development. *California Management Review*, 30(3), 9-33.

- Palander, T., & Väätäinen, J. (2005). Impacts of interenterprise collaboration and backhauling on wood procurement in Finland. *Scandinavian Journal of Forest Research*, 20(2), 177-183. doi:10.1080/02827580510008301
- Pathak, S., Wu, Z., & Johnston, D. (2014). Toward a structural view of co-opetition in supply networks. *Journal of Operations Management*, 32(5), 254-267. doi:10.1016/j.jom.2014.04.001
- Pikul-Biniak, J. (2009). An insight into forestry-wood clusters. *Drewno – Wood*, 52(181), 93-97. Retrieved from <http://yadda.icm.edu.pl/baztech/element/bwmeta1.element.baztech-article-BAT8-0013-0048>
- Prakash, A., & Deshmukh, S. G. (2010). Horizontal collaboration in flexible supply chains: a simulation study. *Journal of Studies on Manufacturing*, 1(1), 54-58. Retrieved from <http://www.researchgate.net/publication/228855926>
- Põllumäe, P., Lilleleht, A., & Korjus, H. (2016). Institutional barriers in forest owners' cooperation: The case of Estonia. *Forest Policy and Economics*, 65, 9-16. doi:10.1016/j.forpol.2016.01.005
- Raza-Ullah, T., Bengtsson, M., & Kock, S. (2014). The coopetition paradox and tension in coopetition at multiple levels. *Industrial Marketing Management*, 43(2), 189–198. doi:10.1016/j.indmarman.2013.11.001
- Reniers, G., Dullaert, W., & Visser, L. (2010). Empirically based development of a framework for advancing and stimulating collaboration in the chemical industry (ASC): creating sustainable chemical industrial parks. *Journal of Cleaner Production*, 18(16), 1587-1597. doi:10.1016/j.jclepro.2010.07.013
- Richardson, H. L. (1998). Pooling with competitors. *Transportation & Distribution*, 39(11), 105-110. Retrieved from <http://trid.trb.org/view.aspx?id=596624>

- Ritala, P. (2010). Coopetitive advantage – how firms create and appropriate value by collaborating with their competitors (Doctoral dissertation, Acta Universitatis, Brno, Czech Republic). Retrieved from <http://urn.fi/URN:ISBN:978-952-214-938-1>
- Rusko, R. (2011). Exploring the concept of coopetition: A typology for the strategic moves of the Finnish forest industry. *Industrial Marketing Management*, 40(2), 311–320. doi:10.1016/j.indmarman.2010.10.002
- Rusko, R. (2012). Perspectives on value creation and coopetition. *Problems and Perspectives in Management*, 10(2), 60-72. Retrieved from businessperspectives.org/journals_free/ppm/2012/PPM_2012_02_Rusko.pdf
- Sankaran, J. (2000). Freight logistics in the New Zealand context. *International Journal of Physical Distribution & Logistics Management*, 30(2), 145-164. doi:10.1108/09600030010318856
- Shockley, J., & Fetter, G. (2015). Distribution co-opetition and multi-level inventory management performance: An industry analysis and simulation. *Journal of Purchasing & Supply Management*, 21(1), 51–63. doi:10.1016/j.pursup.2014.09.002
- Simatupang, T. M., & Sridharan, R. (2002). The collaborative supply chain. *The International Journal of Logistics Management*, 13(1), 15-30. doi:10.1108/09574090210806333
- Song, D. (2003). Port co-opetition in concept and practice. *Maritime Policy & Management*, 30(1), 29-44. doi:10.1080/0308883032000051612
- Spanjaard, L., & Warburton, R. (2012). Supply chain innovation: New Zealand logistics and innovation (494). Retrieved from NZ Transport Agency website: <http://www.nzta.govt.nz/resources/research/reports/494/index.html>
- Star Alliance. (2016). Home - Star Alliance. Retrieved April 21, 2016, from <http://www.staralliance.com/en/home>

- Statistics New Zealand. (2008). *Innovation in New Zealand 2007*. Wellington, New Zealand: Author.
- Stebbins, H., & Braganza, A. (2009). Exploring Continuous Organizational Transformation: Morphing through Network Interdependence. *Journal of Change Management*, 9(1), 27-48. doi:10.1080/14697010902727161
- Stephens, C. (2006). *Enablers and inhibitors to horizontal collaboration between competitors: an investigation in UK retail supply chains* (Doctoral dissertation, Cranfield University, Bedford, United Kingdom). Retrieved from <https://dspace.lib.cranfield.ac.uk/handle/1826/1574>
- Stephens, C., & Wright, D. (2002). The contribution of physical distribution management to the competitive supply chain strategies of major UK food retailers. *International Journal of Logistics*, 5(1), 91-108. doi:10.1080/13675560110114234
- Thirkell, P. C., & Dau, R. (1998). Export performance: success determinants for New Zealand manufacturing exporters. *European Journal of Marketing*, 32(9/10), 813-829. doi:10.1108/03090569810232273
- Tidström, A. (2014). Managing tensions in coopetition. *Industrial Marketing Management*, 43(2), 261–271. doi:10.1016/j.indmarman.2013.12.001
- Tsai, W. (2002). Social Structure of “Coopetition” Within a Multiunit Organization: Coordination, Competition, and Intraorganizational Knowledge Sharing. *Organization Science*, 13(2), 179-190. doi:10.1287/orsc.13.2.179.536
- Velde, D. W., Rushton, J., Schreckenberg, K., Marshall, E., Edouard, F., Newton, A., & Arancibia, E. (2006). Entrepreneurship in value chains of non-timber forest products. *Forest Policy and Economics*, 8(7), 725–741. doi:10.1016/j.forpol.2005.06.010
- Accessed 26/06/15

- Von Friedrichs Grängsjö, Y. (2001). Destination marketing : A study of tourism from a producer perspective (0000-0003-2951-9204) (Doctoral dissertation, Mid University, Stockholm, Sweden). Retrieved from Diva-Portal. (0000-0003-2951-9204)
- Von Friedrichs Grängsjö, Y. (2003). Destination networking. *International Journal of Physical Distribution & Logistics Management*, 33(5), 427-448.
doi:10.1108/09600030310481997
- Walley, K. (2007). Coopetition: An introduction to the subject and an agenda for research. *International Studies of Management and Organization*, 37(2), 11-31.
doi:10.2753/IMO0020-8825370201
- Walley, K., & Custance, P. (2010). Coopetition: insights from the agri-food supply chain. *Journal on Chain and Network Science*, 10(3), 185-192. doi:10.3920/JCNS2010.x187
- Wilhelm, M. M., & Kohlbacher, F. (2011). Co-opetition and knowledge co-creation in Japanese supplier-networks: The case of Toyota. *Asian Business & Management*, 10(1), 66–86. Retrieved from www.palgrave-journals.com/abm/
- Zespri. (n.d.). About Zespri. Retrieved April 20, 2016, from <http://www.zespri.com/companyinformation>

11 APPENDIX A

Please indicate for the following three statements how strongly you agree with the following statements

1. Highly agree
2. Somewhat agree
3. Do not agree at all.

- I communicate with this Company
- This company is Reliable
- I trust this company

	I communicate with this Company	This company is Reliable	I trust this company
	<ol style="list-style-type: none"> 1. Very Much 2. Somewhat 3. Not at all 	<ol style="list-style-type: none"> 1. Very Much 2. Somewhat 3. Not at all 	<ol style="list-style-type: none"> 1. Very Much 2. Somewhat 3. Not at all
Aubade			
DNS forest products			
Ernslaw 1			
Global Forest Products Ltd			
Greenheart			
Japan FOB			
NAC trading			
Nelson Forests			
Pentarch			
PF Olsen			
PFP			
Rayonier			
Summit			
Superchain			
Tenco			
TPT			
Zindia			

12 APPENDIX B

Shipping Related

- How many ship calls to this Port in 2014?
- How many of those were loading logs?
- How many berths are available for ships to load logs?
- What is the average berth utilisation of these berths? (ie How often are log ships waiting for a berth to be available)
- What is the Max draft a ship can have to use this port? Can ships always get into port fully loaded? Are there any tidal restrictions?
- What is the maximum length a ship can be to berth at this port?

Storage Related

- What is the total log storage capacity (identifying any surge areas) in jas?
- How many exporters operate out of this Port? ('exporters' being defined as the party that charters the ship – they may be exporting logs they own, or on behalf of others)
- What is the distribution of available storage areas by exporter (see definition above)
- What is the speed of Logs flowing into the port? – how much jas/day (2014)?
- Is there any seasonality to log inflow?
- What is the average &/or maximum log length of time (dwell time) on port.

Loading Related

- What is the average/maximum/minimum volumes loaded (jas) per ship on South port (2014 year if possible)
- What is the average/maximum/minimum time waiting for berth/at anchor (2014 year if possible)
- What is the average/maximum/minimum time required to load a log ship
- How much of the ships time spent in a port is generally on 'other' activities (ie not loading logs)?

Fumigation related

- Is there any log fumigation that happens on port?
- Is this in the ship holds or deck cargo?
- Who is provider?
- Are there any port related costs for fumigation charged to the exporter?

Costs

- What are the costs that the log exporters bear on port – ie Marine, Berthage, Wharfage?

13 APPENDIX C



MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

An evaluation of resource synergies in NZ log export logistics, towards potential co-opetitive supply chain practices.

This research project is being conducted by Virginia (Ginny) Christians in partial fulfilment of a Master of Supply Chain management qualification with Massey University. The project is supported and co-supervised by SCION, a crown research institute that specialises in forestry related science.

The research

The research involves a review of the forestry related configuration and performance of various ports throughout New Zealand. A discrete event simulation model from a “NZ Inc.” perspective of log exports will be built. The simulation model will replicate the typical flow of logs and ships through NZ ports under a variety of logistical co-operation structures between log exporters. The research theoretically examines the opportunities for exporters to co-operate on logistics activities in order to provide resource synergies to benefit both parties; while competing in all other supply chain activities. The research also analyses human, organisational and business factors that may hinder or support co-operative behaviour in the logistics arena. The current focus of the work involves a qualitative examination of the supply chain relationships and the elements of those that may hinder or support the model outcomes. This is a large-scale model and no attempt will be made to simulate any attributes of specific companies.

What does your participation in the research involve?

Participation in this research is entirely voluntary. Participation in this part of the project will involve a 1 hour interview with Mrs Christians. The interview will involve discussions about your organisation’s operations, supply chain relationships and their drivers. For confidentiality reasons you do not need to answer all questions.

Will participation in the research be confidential?

Participants’ identities will be kept confidential. Pseudonyms (e.g. “Company A”) will be used to ensure individual and organisational anonymity are maintained. Individuals and organisations’ real identities will be known to the researcher and her supervisors.

All data will be stored for a maximum of five years after which it will be deleted/disposed of securely. Participants have the right to withdraw their involvement at any time without question and can decline to answer any of questions posed to them. Participants have the right to withdraw their data from the research within 30 days of the interview; after this time the data cannot be withdrawn.

How will the information provided be used?

The information will be aggregated to outline the business environment of the log export trade in New Zealand. The information will be used to examine the human, organisational and business factors that may hinder or support the adaptation of physical co-operation in logistics activities among the competing NZ log exporters. On completion this information will be disseminated to you.

Further Information

For any further information please contact the researcher or the supervisors listed below.

Ginny Christians (Researcher)

Phone: 07 343 5814

Email: Ginny.Christians@scionresearch.com

Prof Paul Childerhouse

(Supervisor/Head of Department)

Phone 06 356 9099 ext. 83757

Email: P.H.J.Childerhouse@massey.ac.nz

Prof. Carel Bezuidenhout (Supervisor)

Phone: 07 343 5615

Email: Carel.Bezuidenhout@scionresearch.com

Graham West (Co-supervisor)

Phone: 07 343 5674

Email: Graham.West@scionresearch.com

I (Full Name) have read the research outline. I have been informed about what my participation in the research will involve, I am aware that my participation will be kept confidential and I have been informed of my rights to withdraw my information from the study; I understand that I can terminate the interview at any time. I consent to take part in this interview.

Signed:

Date:

14 APPENDIX D



MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

An evaluation of resource synergies in NZ log export logistics, towards potential co-opetitive supply chain practices.

This research is being conducted by Virginia (Ginny) Christians as partial fulfilment of a Master of Supply Chain management qualification with Massey University. This research project is supported and supervised by SCION, a crown research institute that specialises in forestry related science.

The research

The research involves a review of the forestry related configuration and performance of various ports throughout New Zealand. A discrete event simulation model from a “NZ Inc.” perspective of log exports will be built. The simulation model will replicate the typical flow of logs and ships through NZ ports under a variety of logistical co-operation structures between log exporters. The research theoretically examines the opportunities for exporters to co-operate on logistics activities in order to provide resource synergies to benefit both parties; while still competing in all other supply chain activities. The research will also analyse some human and/or organisational factors that may hinder or support co-operative behaviour in the logistics arena. The current focus of the work involves a model configuration of all the ports in New Zealand.

What does participation in the research involve?

Participation in this part of the project will involve provision of port configuration related data to construct a simulation model.

The sort of data requested will be outlined in detail but will include:

- Number and relative size of exporters operating out of a port (no names required)
- Berth availability and shipping restrictions
- On-port and off-port storage space available for export logs
- Marine, berth, storage, wharfage, marshalling, stevedoring and other related costs
- Shipping information such as total ship calls, log ship calls, volume loaded (and similar) For confidentiality reasons the participant’s contribution does not require all questions to be answered.

Will participation in the research be confidential?

Participation in this research is entirely voluntary. The information gathered during this exercise will be regarded as general knowledge and may form part of the published materials associated with this study. While we wish to acknowledge the participants, their names could be suppressed and kept confidential, if so requested.

All data will be stored for a maximum of five years after which time it will be deleted/disposed of securely. Participants have the right to withdraw from involvement at any time without question and can decline to answer any and all questions they wish. Participants have the right to withdraw their data from the research up to 30 days following provision; after this time the data cannot be withdrawn.

How will the information provided be used?

The information provided will be used to review the various port performance and configurations throughout New Zealand at a macro scale and to populate the fields in the model with the necessary values to run the simulations. This information may be published. *Page 2 of 2*

Further Information

For any further information please contact the researcher or the supervisors listed below.

Ginny Christians (Researcher)

Phone: 07 343 5814

Email: Ginny.Christians@scionresearch.com

Prof. Carel Bezuidenhout (Supervisor)

Phone: 07 343 5615

Email: Carel.Bezuidenhout@scionresearch.com

Prof Paul Childerhouse
(Supervisor/Head of Department)

Phone 06 356 9099 ext. 83757

Email: P.H.J.Childerhouse@massey.ac.nz

Graham West (Supervisor)

Phone: 07 343 5674

Email: Graham.West@scionresearch.com