

KNOWLEDGE-BASED STRATEGY FOR MARITIME LOGISTICS VALUE: AN INTER- ORGANISATIONAL RELATIONSHIP PERSPECTIVE

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ABSTRACT

Maximising maritime logistic value becomes one of the significant strategic goals that maritime operators (i.e. port operators, shipping lines and freight forwarders) want to achieve. The value is referred to as how well a maritime logistics system responds to customer demands, which is largely reflected in operational efficiency and service effectiveness. Despite its significance to sustainable competitiveness, existing literatures have yet clarified, in a systematic way, what kind of strategic directions should be taken so as to accomplish such a business objective. Drawing from central strategic management theories and practices, this paper aims to investigate the effectiveness of a knowledge-based strategy in enhancing maritime logistics value. This paper develops a conceptual framework that ensures the positive relationships between channels of knowledge acquisition, knowledge acquisition and maritime logistics value. An inter-organisational relationship approach, such as social network embeddedness and co-opetitive relationship, will be adopted when investigating those relationships possibly in presence among maritime operators. The proposed relationships are empirically examined through both an explorative case study and a Delphi analysis of an industry sector. Propositions and strategic implications for maritime operators will be then suggested.

Keywords: maritime logistics value, knowledge acquisition, social networks, co-opetition

INTRODUCTION

Historically, maritime transportation has been regarded as a simple and independent system which moved cargoes across the world by sea. The main required factor for this maritime transport system was to move cargoes at a lower cost. Today, the maritime transport system can be regarded as a component of globally inter-linked logistics functions, which is forced to

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offer wider logistics services in addition to carrying goods by ocean. Such a view has given rise to the use of the term of 'maritime logistics'. Maritime logistics is referred to as the process of planning, implementing and managing the movement of goods and information which is involved in the ocean carriage. Maritime logistics may reflect on both the traditional and currently required logistical role of maritime transportation. The principal aim of a maritime logistics system may be to maximise the value of the system, which is referred to as 'maritime logistics value' in this paper. The maritime logistics value can be enhanced when maritime operators offer quick, responsive, flexible and reliable services at a lower price. Greater maritime logistics value may contribute to the improvement of the entire logistics performance, as well as the competitive advantage of maritime operators themselves. Therefore, maritime logistics value has become a significant strategic consideration of maritime operators for their sustainable competitiveness.

Along with the increasing attention paid to the maritime business, maritime studies have also made a remarkable development. Previous maritime studies have attempted to illustrate the strategic significance of maritime transport within the context of global logistics (Bowersox, 1978; O'Leary-Kelly and Flores, 2002; Panayides and Song, 2008; Panayides, 2006). Despite the fact that the earlier studies have contributed significantly to the understanding of the strategic issue of maritime transport and logistics, an empirical approach that explores a suitable strategic option for maritime logistics value from a strategic management perspective has received relevantly less attention.

This paper attempts to suggest a strategic direction in order to improve maritime logistics value. On the basis of the influential theories in logistics and strategic management, this paper identifies that a knowledge-based strategy will be one of the desirable strategic alternatives. The reason for this argument may stem from the fact that existing literature ensures that organisational learning can help firms to improve their operational efficiency (i.e. cost and time) and service effectiveness (i.e. flexibility, responsiveness and reliability in services). Thus, it is expected that maritime operators can maximise maritime logistics value throughout successful organisational learning.

The question then becomes one of how maritime operators apply the knowledge-based strategy in order to enhance maritime logistics value. In order to answer such a research question, this paper attempts to apply the organisational learning process to maritime operations by examining how maritime operators successfully acquire the knowledge they need, and whether this acquired knowledge may help to improve their maritime logistics value. This process may allow us to diagnose the effectiveness of knowledge-based strategy for maritime logistics value. In accordance with the research objective, this paper introduces the concept of maritime logistics value and its strategic significance in the current business environment, reviews an organisational learning and social network perspectives, and establishes a theoretical framework which explores the channel of knowledge acquisition and its effectiveness on maritime logistics value. This is then followed by an empirical analysis, which encompasses an explorative case study and the Delphi survey method. The empirical work will, finally, provide the relevant propositions which may give meaningful insight into planning and implementing a knowledge-based strategy in maritime logistics.

THEORETICAL BACKGROUND

Maritime Logistics Value

Recent studies have noted that logistics performance is maximised when all of the globally dispersed entities work together as a single unit in a co-operative manner (Waters, 1999; O'Leary-Kelly and Flores, 2002). This logistics integration requires maritime transport operators to work and keep in pace with other logistics components, by swiftly connecting world-wide dispersed transportation linkages between a consigner and a consignee. The attention paid to the above trend has facilitated a number of studies on maritime transportation within a logistics integration context (Bowersox, 1978; O'Leary-Kelly and Flores, 2002; Panayides, 2006; Roh, Lalwani and Naim, 2007; Panayides and Song, 2008). These studies recognise maritime transport operators as a central member of the global logistics integration system.

The maritime transportation which responds to the logistics integrated demand can be referred to as a maritime logistics system (Panayides, 2006). This paper defines maritime logistics as the process of planning, implementing and managing the movement of goods and information which is involved in the ocean carriage, which definition itself is derived from the logistics concept. Maritime logistics consists of the three key parts of a maritime transport operation: shipping, port/terminal operation, and freight forwarding. The operators are inter-linked with each other as supplier or buyer, and thus the maritime logistics service is offered when all of the operators in the system are well coordinated as a single team. The value of the maritime logistics system, which is referred to in this paper as maritime logistics value, can be created when the customers of maritime operators perceive the service as valuable enough to willingly purchase (Anderson and Narus, 1991). The greater the customers that are satisfied with the service, the more the maritime logistics value may be improved. Therefore, the maritime logistics value relates to how well the system fulfils customer needs. In this sense, this paper defines the maritime logistics value as the extent of how well the maritime logistics system responds to the customer demands through successfully managing the flow of goods, services and information in maritime logistics.

The customers, in general, in a maritime logistics system seek a more efficient and effective service (Lai, Ngai and Cheng, 2000; O'Leary-Kelly and Flores, 2002). Baudin (2004) identifies that the final goals of logistics operators is to improve organisational efficiency and effectiveness. Logistics efficiency depends on how an organisation can provide their service with the lower costs and quicker time; and the effectiveness may be reflected in how the organisation delivers the goods in a more flexible, responsive and reliable manner (Lai et al., 2002). Drawing from Lai et al. (2002), this paper suggests two major indicators of maritime logistics value: reduction of lead time and business costs, and improvement in service quality (e.g. flexibility, responsiveness, and reliability).

In summary, improving maritime logistics value would be the decisive action for maritime logistics operators, in order that the operators can satisfy demands from customers. Furthermore, since all of the activities in a logistics integration system are inter-connected

with each other and their functions are mutually affected directly or indirectly, maritime logistics value greatly affects the performance of both individual entities and the entirety of the whole logistics system. Thus maritime logistics value has recently become a significant strategic issue that maritime operators need to consider in their operation. In order to explore how to enhance maritime logistics value, central theories and practices in strategic management will be reviewed in the following section.

Organisational Learning

Strategic management scholars primarily examine the determinants of firms' sustainable competitive advantage. A resource-based view (RBV) focuses on firm resources as being the key determinants of creating a unique bundle of idiosyncratic capabilities to a firm and facilitating firms' sustainable competitive advantage (Grant, 1996). Previous studies in strategic management address the significance of knowledge resource in improving organisational sustainable competency (Penrose, 1959; Spender, 1996; Liebeskind, 1996; Grant, 1996; Teece, 1998). Knowledge is defined as useful information or know-how for maritime logistics value (Spender, 1996; Liebeskind, 1996). The positive effectiveness of knowledge of a firm has been be illustrated by an organisational learning perspective. Organisational learning is referred to as a process of knowledge acquisition and application (Cohen and Levinthal, 1990; Huber, 1991). Numerous studies from an organisational learning perspective have noted that knowledge acquisition may help to improve firms' competitive advantage such as improving organisational efficiency and effectiveness and developing organisational innovative capability (Cohen and Levinthal, 1990; Huber, 1991; Yli-Renko, Autio and Sapienza, 2001).

Several earlier studies in logistics also stress the importance of organisational learning in improving firms' performance. Panayides (2007) investigates the positive influence of organisational learning on logistics service quality and performance of third-party logistics firms. Hult, Ketchen and Arrfelt (2007) empirically analyse the relationship between an learning organisation, knowledge acquisition, and performance in supply chains (e.g. cycle time performance). Christensen, Germain and Birou (2005) examine the positive influence of supply chain knowledge on market performance in supply chain business. These findings may verify and support the theoretical assumption about the positive relationship between organisational learning and maritime logistics value, since a maritime operator that provides maritime logistics services falls into the logistics firm category. In this sense, this study follows the organisational learning perspective to explore the strategic solution to enhance maritime logistics value.

As discussed in the above section, maritime logistics value is reflected in the improvement of operational efficiency and service effectiveness (e.g. reduction of lead time and business costs, and improvement in service flexibility, responsiveness, and reliability). It was also identified in the above that knowledge acquisition may facilitate organisational efficiency and effectiveness in logistics operations. Therefore, these previous contentions may ensure that knowledge acquisition would be the key factor which facilitates the maximisation of maritime logistics value. Knowledge can be acquired both within and between organisations. A great

number of studies have addressed that inter-organisational learning would be a more preferable way to successfully acquire knowledge (Cohen and Levinthal, 1990; Kogut and Zander, 1992; Yli-Renko et al., 2001; Ratten and Suseno, 2006). This paper therefore focuses on the inter-organisational learning for knowledge acquisition of maritime operators. In particular, this study points to the role of a social network in facilitating knowledge acquisition of maritime operators. Concepts and effectiveness of a social network in facilitating inter-organisational learning are illustrated in the next section.

Social Network and Knowledge Acquisition

A social network is defined as a set of ties between persons or organisations (Laumann, Galaskewicz, and Marsden, 1978). It has been widely acknowledged that co-operative networks facilitate inter-firm learning, and provide firms with a lot of opportunities to acquire knowledge (Kogut and Zander, 1992; Gulati, 1999; Rowley, Behrens and Krackhardt, 2000; Ratten and Suseno, 2006). Co-operative networks include two representative structural and relational dimensions: network density and tie strength (Gulati, 1998; Nahapiet and Ghoshal, 1998).

A network density is related to how many numbers of ties in a network are inter-connected, thus, the greater the interconnectedness, the higher the density (Granovetter, 1976). Previous studies have noted that the greater number of ties in a network (i.e. high density) may provide more chances to access other firms' knowledge, and as a result this facilitates knowledge exchange between players in the network (Granovetter, 1985). The tie strength relates to how closely players in a network are interconnected with each other. Recent studies have noted that actors who build up strong relationships with each other are likely to proactively share useful information and knowledge (Granovetter, 1985; Gulati, 1998; Rowley et al., 2000).

The above contention may ensure that high density and strong ties in a co-operative network would be the critical channel of knowledge acquisition for maritime operators. Like all other business organisations, maritime operators work by being embedded in a co-operative network in the same business. As maritime operators globally extend their business scope and scale example, their world-wide co-operative network has become bigger and more complex, and a player's strategic behaviours may affect all other players' strategic decisions in both direct and indirect manners. The co-operation may include both forms of formal such as strategic alliances, joint ventures, associations and consortium and various types of informal relations such as personal meetings, phoning or emails, and any other co-operative relations which are not contract-based.

The greater the numbers of co-operative ties maritime operators have, the more exposed they are to knowledge flows, and the greater the access they have to these knowledge flows. As a result, they can share more knowledge about the industry, market, or the firms' own technology. Thus, high numbers of network ties are likely to lead to a player having a higher volume and speed of knowledge acquisition (Galaskewicz, 1979). On the other hand, the strength of ties may also affect the knowledge acquisition of maritime operators. The strong

relationships with other players in a co-operative network can promote in-depth, two way communication, and facilitate the exchange of solid information between organisations (Krackhardt, 1992). If inter-organisational interactions become both closer and more frequent, they could accumulate mutual trust. Such trust could make them more open and able to control the opportunistic activities among organisations. As a result, maritime operators with strong ties are more likely to share valuable information and know-how with one another.

There is another contention to complement the relationship between co-operative networks and knowledge acquisition: inter-organisational competition in a network facilitates the inter-organisational learning in a co-operative network (Tsai, 2002). The competition per se may harm inter-organisational learning, since intensively competing firms hesitate to open their resource to their competitors. However, the competition between co-operating firms could help inter-organisational knowledge sharing, since the firms may be affected by the governance mechanisms of co-operative network relationship such as mutual gain, reciprocity and reputation effect (Coleman, 1988; Jones, Hesterly and Borgatti, 1997). Network governance mechanism is referred to as an implicit social mechanism that facilitates monitoring and coordinating inter-organisational exchanges of resources (Jones et al., 1997). Those mechanisms may force the actors to share knowledge with other partners or sometimes with direct competitors, so that they may maximise common interests in the network. Thus, competing players in a co-operative network tend to follow such a social mechanism, lest they have disadvantages due to the nonobservance of the social mechanism.

For example, if a firm competes intensively with one another, the firm may be more enthusiastic to acquire the knowledge of their competitors, as the competition may stimulate the desire to acquire the knowledge of other competitors. Since the firm's competitors in a co-operative network are forced to follow the social governance mechanism, the competitors could not completely protect their knowledge. Rather, they may have to open their knowledge as much as they wish to acquire others' knowledge. This may lead to vigorous knowledge exchange between competitors under a co-operative relationship. Consequently, the competition promotes mutual knowledge sharing with the highly co-operative partners (Tsai, 2002).

Such a positive interaction effect between co-operation and competition on knowledge sharing advantages can be referred to as the "co-opetition" effect. Co-opetition is referred to as the interdependent relationship in which competition and co-operation simultaneously occur between two or more rivals competing in global markets (Brandenburger and Nalebuff, 1996; Tsai, 2002). A great number of studies stress the learning-based co-opetitive advantages. Lado, Boyd and Nalón (1997) suggest that co-opetition promotes excellent knowledge acquisition, and enables firms to enhance the competitive position of firms by developing mutual idiosyncratic competencies and reducing firms' cost and risk. Tsai (2002) indicates that co-opetition allows multi-directional learning and knowledge sharing of organisations, which in turn may help to enhance firms' performance by improving their organisational efficiency and effectiveness. Bernal, Burr and Johnson (2002) also suggest

that freight forwarders make good use of their co-opetitive networks in order to share valuable resources.

Bearing the above in mind, it can be expected that the co-opetition in the network among maritime operators could promote knowledge acquisition. In this sense, the co-opetition in the network can be considered as the second channel of knowledge acquisition of maritime operators.

Knowledge Acquisition and Maritime Logistics Value

According to the organisational learning perspective, knowledge acquisition has a positive impact on organisational efficiency and effectiveness (Yli-Renko et al., 2001). As discussed in the previous section, the significant factors of maritime logistics value include reducing lead time and business costs (i.e. operational efficiency), and improving flexibility, responsiveness and reliability of their services (service effectiveness). The business costs are all the costs incurred to operate and manage the companies, and the lead time is the time which takes in operating and processing the management procedures. The flexible service is related to an ability to quickly adjust the service when unplanned or unexpected things happen. The responsive service is the extent to which maritime logistics operators respond to various demands of their customers by offering highly customised services. The reliable service is the extent to which the service is provided consistently and reliably in accordance with a planned schedule. Thus, this paper assumes that knowledge acquisition may have a positive influence on the improvement of maritime logistics value.

For example, through continuous learning, maritime operators can accurately forecast the market situation from both a medium- and long-term perspective. Knowledge acquisition about new patterns and business practices in the industry can also enable maritime operators to mitigate environmental uncertainty in the business, and eliminate wasteful activities. The acquired knowledge about market needs may allow maritime operators to make increasingly rapid decisions about their customers. Such benefits may contribute to the reduction of time and costs in their operations. In addition, by prominently acquiring and applying new knowledge, maritime operators can reform their business procedures in a more systematic and innovative manner. This may lead to more productive operations, and consequently, those organisations may improve operational efficiency.

Maritime operators who achieve significant customer information through continuous knowledge acquisition can constantly update on market demands. As maritime operators learn various requirements of their customers on their service, they can reflect the voice of the customers on their operation and then upgrade their service. This may help maritime operators to provide their service in a more responsive and flexible way. Learning operators can rapidly respond to other players' demands in a logistics flow, and this will elevate the grade of their service reliability. In addition, as they can also learn from other firms' know-how on the business, and apply it to their own situation, they can improve the uniqueness of their particular service. Consequently, knowledge acquisition may have a positive influence

on the high quality of maritime logistics service. The aforementioned theoretical contentions can be described in Figure 1.

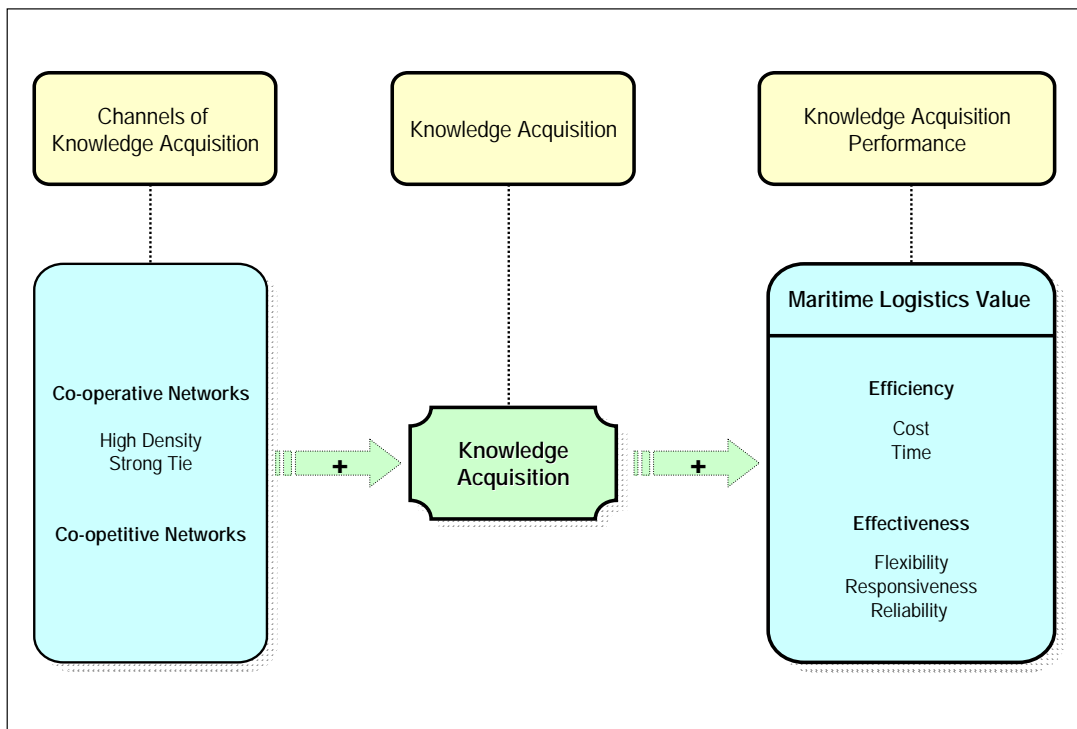


Figure 1 Conceptual Framework

RESEARCH METHOD

As the concepts of the conceptual framework such as knowledge acquisition, network density or strength, and maritime logistics value, are abstract, invisible, and socially complex, they could not be fully observed until that people’s subjective awareness of their socially intrinsic behaviours is examined. Furthermore, ‘the relationship between knowledge acquisition and maritime logistics value’ has yet to be sufficiently empirically tested in maritime studies. Thus such a relationship may not be easily examined or analysed with the objective, rigorous, single and statistical tools whose validation has yet to be fully assessed. Rather, the causal link could be measured more through a qualitative research method, which can reflect more subjective opinions of people on the research issue. In this sense, this paper adopts a qualitative approach which encompasses an explorative case study and the Delphi survey method. An explorative case analysis may enable us to identify the general patterns of the research issue by fully reflecting the subjective aspects of people’s perceptions on the issue; and the Delphi survey method aims to diagnose the effectiveness of knowledge acquisition on maritime logistics value in a more reliable manner by gaining benefits from judgments of a panel of experts in the industry on a collective basis (Linstone and Turoff, 1975). The geographical sector of the empirical analysis is Korea, where the strategic significance increases as a key logistics centre in Asia.

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An in-depth face-to-face interview method with an open-ended questionnaire was conducted for the explorative case study. A total of nine cases of maritime logistics companies in Korea were included for the interview. The sample cases of maritime operators consist of port/terminal operators, container shipping lines and freight forwarders. A brief profile of each of the companies that consented to the interview is described in Table 1. The interviewees consist of the presidents or general/assistant managers from each company, who have a rich knowledge of their operations and strategies and can discuss the research questions while providing a wide range of insight into the overall market situations in the industry. After performing the pre-test with the participation of two practitioners, the main interview was then conducted. Each interview lasted between 40 and 100 minutes.

Table I Profiles of the Interviewed Companies

Type of Company	Code	Name of the Company	Age of Business	Title of the Interviewee	Types of Business Origin
Port/terminal Operators	TO1	HANJIN PACIFIC CO., LTD.	4 years	Manager/ Planning & Marketing	General operations port-terminal
	TO2	KOREA EXPRESS CO., LTD.	44 years	General Manager/ Container Business Team	General operations port-terminal
	TO3	SEBANG CO., LTD.	44 years	Assistant Manager/ Planning Team	General operations port-terminal
Shipping Lines	SL1	HYUNDAI SHIPPING CO., LTD.	33 years	Assistant Manager	International sea transport of container cargoes by ships
	SL2	KMTC CO., LTD.	59 years	General Manger/ Business Strategy Team	International sea transport of container cargoes by ships
	SL3	SINOKOR CO., LTD.	20 years	General Manager/ Business Team	International sea transport of container cargoes by ships
Freight Forwarders	FF1	SAMMIN CO., LTD.	7 years	General Manager/ Marketing Team	International freight forwarding
	FF2	HIGHWAY LOGISITCS CO., LTD.	6 years	President	International freight forwarding
	FF3	KOOK YANG LOGITECH CO., LTD.	7 years	General Manager	International freight forwarding

Being based on the explorative case interview, a questionnaire for the Delphi survey was developed by the five point of Likert scale. Table 2 summarises all of the variables and measurements in the questionnaire. The two rounds of the Delphi survey were then conducted by the participation of the panel of experts in the Korean maritime logistics industry. "Experts" in this study are defined as qualified people with a deep insight into and broad understanding of maritime logistics business and strategy in Korea. As managers in a maritime logistics company were analysed in the explorative case study, the samples of the Delphi analysis focuses more on the experts who work in universities and research centres under both public or private companies, and policy makers of government institutions within the maritime logistics field. The experts should have many years of working experience in the industry, i.e. above three years in this study, and professional knowledge or rich research outputs in the industry; since they are regarded as being able to discuss the issue from both academic and practical points of view.

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However, managers of maritime logistics companies are excluded from the panel of experts group. During the case interview with company managers, it was revealed that the majority of the managers were not really engaging with the abstract terms of knowledge, knowledge management, social network and maritime logistics value. These managers therefore needed a detailed explanation from the researcher about each specific term, as well as guidance on how the terms related to the meaning of each particular question. As a result of this, it was decided that it may not be appropriate to include the managers in the expert group of the Delphi analysis, as the analysis is conducted through use of a survey method questionnaire without direct oral explanation by the researcher. Instead, it is believed that the more academic- or policy- centred participants, who make a systematic study of the patterns or practices of the industry in order to deeply analyse those patterns and practices, or to form a governmental policy for the industry, and who are more likely to enjoy debating or discussing with other experts, would provide a better sample for the Delphi surveys, in which the participants are supposed to answer the questionnaire without the researcher's assistance. Further, it is believed that the opinions of the managers on the research issue have been fully reflected in the current study throughout the explorative case study, in which the respondents were given enough explanation about the questionnaire directly by the researcher. Details of the information of the fifty panellists are summarised in Table 3.

Table 2 Variables and Measurements

Variables	Measurements
Inter-organisational co-operative networks	<i>Network density:</i> <ul style="list-style-type: none"> • the extent to which a great number of ties are actually observed in the co-operative network in the same business
	<i>Tie strength</i> <ul style="list-style-type: none"> • frequency of interaction in the co-operative network • the extent of mutual financial and mental commitment in the co-operative network
Inter-organisational competition in the network	<ol style="list-style-type: none"> 1. <i>Internal resource competition</i> <ul style="list-style-type: none"> • the extent to which firms perceive that its resource is similar to other firms in the network. 2. <i>External market competition</i> <ul style="list-style-type: none"> • the extent to which firms offer the same services as other players in the network • the extent to which firms offer their services to the same customers
Co-operative networks and knowledge acquisition	<ul style="list-style-type: none"> • The extent to which the higher numbers of co-operative network relationships maritime operators have influences the more useful information and know-how they acquire (i.e. network density and knowledge acquisition) • The extent to which the stronger co-operative network relationships maritime operators have influences the more useful information and know-how they acquire (i.e. strong tie and knowledge acquisition)
Co-opetition in the networks and knowledge acquisition	<ul style="list-style-type: none"> • The extent to which the competition facilitates the positive influence of co-operative networks on knowledge acquisition
Maritime Logistics Value	<ol style="list-style-type: none"> 1. Business cost <ul style="list-style-type: none"> • the extent to which firms' operation costs and service prices are low 2. Lead time <ul style="list-style-type: none"> • the extent to which firms' operation time is short 3. Service flexibility <ul style="list-style-type: none"> • the extent to which firms respond flexibly to their volatile customer needs 4. Service responsiveness <ul style="list-style-type: none"> • the extent to which firms customise services to meet various customer needs 4. Service reliability <ul style="list-style-type: none"> • the extent to which firms provide accurate information to their customers • the extent to which firms provide safe services (i.e. minimising loss or damage of cargoes)

Before launching the first round of the Delphi survey, a pilot survey was performed in order to correct possible problems with the questionnaire. One person in each group responded to

the pilot survey, making for a total of four experts. A total of fifty-six experts were invited to the survey. Those experts were approached by the researcher through calling or sending emails. They were initially given an explanation about the objective and the entire process of the survey, and were then asked to participate in the Delphi survey. A total of fifty-three experts agreed to take part in the survey. The researcher visited some panellists who preferred to meet and complete the paper-based questionnaire in person in order to directly collect their responses. The rest of the respondents were given an online link by email, which enabled them to electronically complete the questionnaire by following the link. A total of fifty respondents, including the four responses collected from the pilot test, were used in the first round of the Delphi analysis.

In the Delphi survey, the panellists are generally supposed to share other panellists' opinions on the questionnaire by being given summarised results of the previous round, and to reconsider the same questions again in the next round. In this research, based on previous studies on the Delphi survey, the group opinions in the first round of the survey were summarised by using the values of mean and standard deviation on each question (MacCarthy and Atthirawong 2003; Scholl, et al., 2004). The mean value indicates the extent of what the panellists think of the questions, and the standard deviation measures how widely spread the values in the data set are. The value of mean and standard deviation of each question, as a collective view of the panel, is then attached when distributing the second-round of questionnaires to the panellists, in order to enable the respondents to share with the participants and reconsider their initial thoughts. Generally speaking, as the rounds progress, a high decrease rate of the number of respondents appears in most Delphi surveys (Harrigan, 1985a; Scholl, Konig, Meyer and Heisig, 2004). In this study, as in previous Delphi studies, a total of thirty two judges, i.e. 64% of the panelists of the first round, responded to the second round of the survey. No special or systematic pattern was noted from the non-respondents of the second round. Considering the extremely hard working environment in the Korean maritime industry, the resulting 36% rate in non-respondents may be due mainly to the fact that most of the experts were just too busy with their work duties to answer the survey again.

Table 3 Personal Information of the Panes

Type of organisation	Years of working in the organisation		
University	16	3-5	30
Research centre in company	4	5-10	4
Research centre under the government	14	10-15	7
Government institution	16	Over 15 years	9
Total	50	Total	50

FINDINGS

The empirical results consist of the following three parts: co-operative network and knowledge acquisition, co-opetition in the network and knowledge acquisition, and the effectiveness of the acquired knowledge on maritime logistics value. The findings from the case study are presented based on the subjective answers of the interviewees. The results from the two rounds of the Delphi survey are presented all together, in order to easily compare the two rounds of results of each section of the questionnaire. Table 4 summarises

the results of two rounds of the survey. All of the questions of the survey were measured by the 5 Likert scale, from 1= least important or strongly disagree (i.e. negative level), to 5= most important or strongly agree (i.e. positive level). When interpreting the group opinions of the Delphi survey by the mean values, the judgement from the numerical results depends on the subjective view of the researcher, since there is no objective or statistically significant standard by which to evaluate the panellists' judgement (Sun and Scott, 2005; McKinnon and Forster's, 2000). This study provides the following subjective standard in interpreting the mean values of the responses. The mean values are categorised into three levels of interpretation: negative (below 2.5), moderate (between 2.5 and 3.5) and positive level (above 3.5).

The values of standard deviation of the two rounds of survey are almost the same, or slightly higher/lower in certain questions of the second round than in the first round. The goal of the Delphi survey of the current study aims not to drive a consensus of experts' thought, but to gather their various opinions and diagnose the effectiveness of knowledge management strategy in maritime logistics. Thus, the gap of standard deviation between the two rounds may not cause any problem in interpreting the results or suggesting a strategic direction for maritime operators. Rather, the standard deviations may help us to understand the degree of distribution of responses. The panellists answered the questions in a generally consistent manner between the two rounds, because the values of mean and standard deviation of the two rounds showed as mostly similar to each other. In cases where certain significant differences in the answers between the two rounds are observed, the judgement on those answers was based on the result of the second round, which is composed of the finally refined opinions of the panel. In the next section, all of the answers from the case study and Delphi survey are presented all together according to the aforementioned three parts.

Co-operative Networks and Knowledge Acquisition

The interviewees were initially given an explanation of the concept of knowledge and organisational learning, and maritime logistics value. The interviewees were then asked about the extent of co-operative network embeddedness of maritime operators through being asked the following: 'Do you think that your company cooperate with each other (e.g. in forms of strategic alliance, joint venture, marketing agreement, associations, and informal meetings) in the same business through a network?' and 'Does your company have a lot of cooperative relations in the network? (i.e. high density) Does your company keep close relationships with the cooperative players in the network? (i.e. tie strength)'

The answers from the interviewees show that shipping lines are the most proactive in being densely and strongly embedded in co-operative networks in the same business, in that they actively participate in co-operative relationships with their competitors by establishing a great number of ties in both formal and informal ways, and the closeness between these ties is generally strong. In contrast to the shipping lines, while port terminal operators and freight forwarders also form their own co-operative business networks, they are more likely to cooperate with their rivals through short-term based forms or other, more informal ways. This

implies that the extent of co-operation of port terminal operators and freight forwarders is not very high.

The interviewees were then asked about the extent of knowledge sharing with co-operating companies in the networks through being asked the following questions: 'Do you think that co-operative networks have a positive effect on your knowledge acquisition?', 'Do you think that a higher number of co-operative relationships have a positive effect on your knowledge acquisition? Why do you think this is the case?' 'Do you think that the stronger co-operative relationships have a positive effect on your knowledge acquisition? Why do you think this is the case?' All of the interviewees expressed the opinion that their co-operative networks with other participants in the same business have a positive effect on knowledge acquisition. The interviewee from SL3 mentioned that:

Our company gains a great deal of information through both formal and informal co-operation. For example, when we talk to each other by meeting, email or telephone, we share useful information or knowledge about general industrial trends or outlook for our customers, and the competitors' strategy and behaviour.

The interviewees from shipping lines also replied that both the strong and great numbers of co-operative relationships promote efficient information sharing amongst each other. The interviewee from SL3 also mentioned that:

We have a lot of co-operative partners. The great number of co-operative relations enable us to access the common pool of knowledge flow. We can even, through such co-operative relationships, get information about other entities with which we do not directly co-operate. There are some who are very close with us. We often communicate with the intimate partners through various forms of official conferences, assemblies, and private gatherings. Such relationships also allow us to exchange a lot of information about our business.

All of the interviewees from port/terminal operators and freight forwarders also said that they can make use of the high numbers of informal linkages and close relationships with other companies to acquire useful information. These answers ensure the positive influence of co-operative network embeddedness, i.e. higher number and strength of ties, on the knowledge acquisition of maritime operators. After the explorative analysis, the panellists of the Delphi survey were asked to indicate the extent to which they agree or disagree with the following statements: 'Do you think a lot of companies join the co-operative network relationships?' 'The co-operating firms frequently keep in touch with each other.' 'The firms invest a lot of money in the co-operative network relationships.' 'The firms consider the co-operative partners very important in their business and mutual interests.' The first question is asked in order to measure the extent of network density, and the other three questions are asked in order to illuminate tie strength. And the questions to investigate the effectiveness of network embeddedness on knowledge acquisition were then followed with the following statements: 'The higher numbers of co-operative network relationships they have, the more

useful information and know-how they acquire' (i.e. network density and knowledge acquisition), and 'The stronger co-operative network relationships they have, the more useful information and know-how they acquire' (i.e. strong tie and knowledge acquisition).

As shown in Table 4, the general mean score of both network density and tie strength is the highest in shipping lines. This implies that shipping lines are mostly proactively embedded in co-operative network relationships by establishing dense and strong ties within the network. By contrast, most of the mean values of network density and tie strength in port terminal and freight forwarding operations are at moderated level ranging from 2.5 to 3.4. This reveals that the extent of network formation with dense and strong ties appears at a moderate level in both port and freight forwarding operations. Nevertheless, all the operators regard the co-operative partners as relatively significant in their business. However, the degree of financial investment in the co-operative relationships is not high in all of the operations.

The extent of the positive effectiveness of network density on the knowledge acquisition is the highest in shipping lines, where the mean values rested at 3.9 in the first round and 4.0 in the second round. The mean values of freight forwarders are 3.9, and port terminal operators are 3.8 in both rounds. This result reveals that the greater the numbers of co-operative ties firms have, the more likely it is for them to share knowledge. Thus, high numbers of network ties are likely to lead to a player having a higher volume and speed of knowledge acquisition (Galaskiewicz, 1979). With respect to the relationship between strong ties and knowledge acquisition, all are given the mean value ratings above 3.5, which suggests that the operators are acquiring knowledge through keeping close relationships with their co-operative partners. In particular, as with the previous result, shipping lines who score the highest mean rating gain the most knowledge; while port terminal operators and freight forwarders are also acquiring knowledge through strong ties with their partners. Those results are interesting, because the extent of network density and tie strength of port operators and freight forwarders was all observed as resting at a moderate level. It can be assumed from this result that regardless of how high the network density/tie strength is in which an operator is embedded, the maritime operators who have relatively greater numbers of or stronger ties in a network can acquire more knowledge than others who do not.

The above results throughout the case study and Delphi survey ensures that the co-operative networks of maritime operators may have a positive influence on the knowledge acquisition of maritime operators. In particular, shipping lines appear to be the main beneficiary in acquiring knowledge, thanks to their proactive establishments of co-operative networks. Having these empirical findings in mind, this paper suggests the following propositions:

Proposition 1: *The extent of co-operative network among maritime operators is positively associated with the level of knowledge acquisition.*

P₁₁: *The greater number of ties a maritime operator has in its co-operative business network, the greater the positive effect on its knowledge acquisition.*

P₁₂: *The stronger ties a maritime operator has in its co-operative business network, the greater the positive effect on its knowledge acquisition.*

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Table 4 Results of Two Rounds of the Delphi Survey

Section		Questions	Business Type	1 st Round		2 nd Round	
				Mean	SD	Mean	SD
Co-operative Network	Formation of Network	The firms in the same business cooperate with each other (e.g. in forms of strategic alliance, joint venture, marketing agreement, associations, and informal meetings) through a network	TO	3.4	.78	3.3	.70
			SL	3.8	.83	3.8	.98
			FF	3.1	.93	3.0	.79
	Network density	Do you think a lot of companies join the co-operative network relationships?	TO	3.3	.81	3.2	.73
			SL	3.8	.87	3.9	.92
			FF	3.1	.84	3.0	.84
	Tie Strength in the network	The co-operating firms frequently keep in touch with each other.	TO	3.4	.78	3.1	.76
			SL	3.7	.89	3.7	.86
			FF	3.2	.89	3.1	.80
		The firms invest a lot of money in their co-operative network relationships.	TO	2.9	.89	2.8	.69
			SL	3.3	1.04	3.4	.81
			FF	2.5	.91	2.5	.66
	The firms consider the co-operative partners very important to their business and mutual interests.	TO	3.5	.91	3.5	.96	
		SL	3.9	.85	3.9	.85	
		FF	3.3	1.10	3.4	.81	
Competition in the network	Operational resources	Operational resources (e.g. facilities, equipment, and information system) in the network are similar to each other	TO	3.6	.88	3.6	.84
			SL	3.3	.97	3.3	.86
			FF	2.9	.99	2.8	.72
	Quality of employees	The quality of employees (e.g. the levels of education, skill, and knowledge and other ability to perform their job)	TO	3.4	.88	3.4	.83
			SL	3.4	1.07	3.4	.83
			FF	2.8	.98	3.0	.89
	Financial capability	The financial capability (e.g. funding ability or health of financial structure) in the network is similar to each other	TO	3.0	1.07	2.7	.78
			SL	2.7	1.08	2.3	.79
			FF	2.4	.89	2.4	.83
	Customers	The customers in the network are similar to each other	TO	4.0	.68	3.7	.86
			SL	4.0	.73	3.8	.98
			FF	3.8	.81	3.8	.88
	Service quality	The service qualities in the network are similar to each other	TO	3.6	.86	3.7	.79
			SL	3.5	.97	3.5	.88
			FF	3.0	.95	3.0	.84
Network embeddedness and knowledge acquisition	Co-operative Network and Knowledge Acquisition	The higher numbers of co-operative network relationships they have, the more useful information and know-how they acquire.	TO	3.8	.80	3.8	.71
			SL	3.9	.83	4.0	.62
			FF	3.9	.86	3.9	.66
	The stronger co-operative network relationships they have, the more useful information and know-how they acquire.	TO	3.9	.73	3.8	.75	
		SL	4.1	.67	4.0	.66	
		FF	4.1	.86	3.7	.86	
Co-opetition and Knowledge Acquisition	The acquisition of useful information and know-how through the co-operative network is facilitated more when the competition is high.	TO	3.4	.98	3.4	.67	
		SL	3.6	.99	3.8	.57	
		FF	3.2	1.08	3.3	.70	
Knowledge acquisition and maritime logistics value	Business cost	Knowledge acquisition has a positive effect on reducing business costs.	TO	3.8	.68	3.7	.60
			SL	3.8	.79	3.9	.75
			FF	3.6	.93	3.6	.84
	Lead time	Knowledge acquisition has a positive effect on reducing lead time.	TO	3.9	.71	3.9	.49
			SL	3.8	.66	3.9	.71
			FF	3.5	.79	3.4	.98
	On time	Knowledge acquisition has a positive effect on providing their service on time.	TO	3.9	.72	3.9	.62
			SL	4.0	.68	4.0	.69
			FF	3.8	.85	3.8	.80
	Responsiveness	Knowledge acquisition has a positive effect on providing customised services to their customers.	TO	3.8	.77	3.8	.71
			SL	4.0	.73	4.1	.77
			FF	4.0	.79	3.9	.76
	Flexibility	Knowledge acquisition has a positive effect on flexibly responding to unexpected circumstances or volatile customer needs.	TO	3.9	.74	3.9	.85
			SL	4.1	.71	3.9	.83
			FF	4.0	.75	3.8	.72
	Reliability	Knowledge acquisition has a positive effect on providing accurate information to their customers.	TO	3.9	.76	3.9	.63
			SL	4.0	.73	4.0	.75
			FF	4.0	.74	3.9	.79
Knowledge acquisition has a positive effect on providing safe services (i.e. minimising loss or damage of cargoes).		TO	3.8	.79	3.6	.73	
		SL	3.8	.74	3.7	.75	
FF	TO	3.6	.84	3.4	.51		
	SL	3.6	.84	3.4	.51		
Total				n= 50		n= 32	

Co-opetition in the Network and Knowledge Acquisition

In order to explore the relationship between co-opetition in the networks as the second channel of knowledge acquisition, the extent of the competitive appearance of maritime operators was initially examined by asking the interviewees the following question: 'how do you think of the extent of competition in your business?'. All of the interviewees from the port terminal operators answered that they compete very intensively with other terminal operators within the same port. All of the interviewees from the shipping lines answered that the extent of the competition in their operations is generally very high. In particular, they compete more with the companies that have regionally similar sea-ways. The interviewees of freight forwarders mentioned that as they connect shippers and shipping lines, the competition of their operations usually follows the shipping lines' competitive pattern, which is also intensive depending upon the similarity of regional sea-lanes, and the extent of the competition is generally high.

After specifying the pattern of competition of maritime operators, the interviewees were asked these questions: 'Do you think that knowledge acquisition through co-operative networks is facilitated more when you are competing with each other, rather than when you are not?', and 'Why do you think this is the case?' These questions could help to identify whether the competition could positively affect the knowledge acquisition through their co-operative networks.

Most of the interviewees agreed on the positive effect that competition in the co-operative network has on knowledge acquisition. In other words, they agreed that they could gain useful information or know-how when they are simultaneously co-operating and competing. For example, the interviewee from SL1 stressed the role of co-opetition in the network in acquiring knowledge, through saying the following:

In fact, we are more interested in knowledge of the firm which is in an intensive competition with us rather than others which are less competitive. Thus, we are more eager to acquire more information from such a competitive company, and as a result, we could acquire more knowledge from the competitors. But I think such an effort to acquire useful information from our competitors may work further when we also co-operate with the competitors.

The above answer implies that the competition stimulates the desire for knowledge acquisition. As a result, it facilitates the positive effectiveness of co-operation on knowledge acquisition. The interviewees from the areas of freight forwarders and port terminal operators all, with the exception of one company, also expressed similar views to the SL1's thought. The exception expressed a different opinion regarding the positive effect of co-opetition in the network on knowledge acquisition. The interviewee from TO1 expressed the following:

We hesitate to open our own know-how or useful information to our competitors at some levels, and we just try to catch up with the other companies' know-how or information. But in reality, it is very difficult to

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only achieve the competitors' informational resource; consequently, we cannot acquire a great deal of knowledge of the companies who are more intensively competing with us, even when in co-operative partnership with them.

From the above answer, it is evident that extreme competition among port terminal operators may hinder the vigorous sharing of knowledge between competitors. This means that the extreme competition may be an obstacle that impedes the amicable transferring of knowledge between organisations in the same business. It may also be expected that knowledge acquisition is facilitated more if a mutual transaction is made on the basis of companies mutually co-operating, or being open and friendly, in order that they can then share their knowledge through implementing a win-win strategy.

The possible tension between a positive or negative influence of competition on the knowledge sharing in a co-operative networks were analysed more detail in the Delphi survey. Prior to an exploration of co-opetition in the network, the extent of competition of the maritime operators was initially examined. The competition was measured by the following five aspects: the similarity of operational resources, employee quality, financial capability, customers, and service quality (Lorrain and White, 1971; Barney, 1991; Peteraf, 1993; Chen, 1996; Burt, 1997; Tsai, 2002). The first three factors are related to internal resource competition, and the latter two factors relate to external market competition. The panellists were asked to indicate the extent to which the five factors of competition of maritime operators are similar to each other within the co-operative networks. If the mean value of each question is high, it is regarded as indicating that the competition is respectively high.

The vast majority of mean values of internal resource competition, but one factor, lay within the range of 2.3 to 3.4, suggesting that the extent of internal resource competition of maritime operators is generally at a moderate level. The one factor outwith this is the operational resource of port terminal operators, which scores 3.6 in both rounds. Such a result reveals that despite the general tendency of a moderate level in the extent of internal resource competition of maritime operators, the operational resource competition in port terminal operations is exceptionally intensive. This tendency may be due to the fact that because the quality of the operational resources (i.e. port equipments or facilities) of port terminal operators directly affects their lead time and customer satisfaction, port terminal operators may struggle to catch up with competitors' operational resources. As a result, the level of competition of operational resources is high.

With respect to external market competition, i.e. the similarity of customers and service quality, all but one factor were given mean rating within the range 3.5 to 4.0, suggesting that the external market competition of maritime operators is generally tough. The one component outwith these figures is the service quality of freight forwarders. The mean value of the factor is 3.0 in both rounds. Such a result may be due the fact that, as there are over 1,300 numbers of freight forwarders operating in Korea, the extent of the variability of their services may be very high, and thus, the extent of similarity of their services may not be notable. However, as with shipping lines and port terminal operators, freight forwarders'

competition towards the customers is judged as tough since the mean value is 3.8 in both of the two rounds. The results indicate that they engage in intensive competition with each other in order to attract the greater number of customers at the external market.

Table 5 The Extent of Competition of Maritime Operators

Competition		Port terminal operators	Shipping lines	Freight forwarders
Internal resource competition	Operational resources	H	M	M
	Quality of employees	M	M	M
	Financial capability	M	M	M
External market competition	Customers	H	H	H
	Service quality	H	H	M

Notes: H= high, and M= moderate

Table 5 summarises the extent of maritime operators' competition according to both internal and external factors. Port terminal operators' intensive competition occurs within both an internal and external level. Shipping lines, despite the moderate level in internal resource competition, intensively compete with each other at the external market. The competition of freight forwarders is also tough, purely on the basis of attracting customers. Therefore, the extent of the competition appears to be the highest in port terminal operations; despite a level that is lower than that of port terminal operators, the extent of competition of shipping lines is also regarded as generally intensive, as the two components of external competition all fall at a high level; and the competition of freight forwarders seems to be at a generally moderate level, but the competition to attract customer is tough.

By integrating the above extent of competition and co-operation which were observed in the previous section, the level of co-opetition of each business can be identified (Bengtsson and Kock, 2000). Co-opetition is referred to as an interdependent relationship in which competition and co-operation simultaneously occur between two or more competitors (Luo, 2004; Tsai, 2002). As the extent of both competition and co-operation of the maritime operators are all at or above the moderate level, it can be assumed that the competition and co-operation in each maritime business occurs simultaneously. Thus, co-opetition in the network is observed in all the maritime businesses. However, levels of co-opetition of the maritime operators vary depending on the extent of competition and co-operation of each business (Bengtsson and Kock, 2000). Bengtsson and Kock (2000) classify co-opetition into three types according to the extent of competition and co-operation: co-operation-dominated, competition-dominated and equal relations. Drawing upon Bengtsson and Kock's (2000) classification, this thesis classifies the co-opetition of each business in terms of the extent of competition and co-operation. As seen in Figure 2, port terminal operators (TO) whose competition is the most extreme, and whose co-operation is at moderate level, fall into the 'competition-dominated co-opetition'; shipping lines (SL) whose competition and co-operation are both high would be 'equally high co-opetition'; and freight forwarders (FF) whose competition is modestly high (i.e. high but lower than port terminal operators and shipping lines) and whose co-operation is moderate is referred to as a type of 'competition-oriented co-opetition'. Thus, while the co-opetition of port terminal operators and freight forwarders tends to a relationship consisting of more competition than co-operation, the co-opetition of shipping lines is more likely to be a well balanced relationship, where competition and co-

operation are simultaneously high. This different type of co-opetition of each business may have a different influence on knowledge acquisition of maritime operators.

The effectiveness of co-opetition in the co-operative network on the knowledge acquisition was then examined by asking panellists the following question: 'Do you think that the acquisition of useful information and know-how through the co-operative network is facilitated more when the competition is high?' The higher rating of that question means the higher positive influence of co-opetition on knowledge acquisition (Tsai, 2002). Shipping lines lay the highest mean value of 3.8 in the second round, which reveals the positive effect of co-opetition on knowledge acquisition. The mean values of port terminal operators and freight forwarders are, respectively, 3.3 and 3.4 in the second round, suggesting that the extent of knowledge acquisition through co-opetition in the network is at a moderate level.

The above result indicates that despite the fact that all of the maritime operators establish co-opetitive relationships in the network, the positive influence of the co-opetition in acquiring knowledge occurred only in shipping operations. The difference in co-opetition of shipping lines from other two operators lies in the extent of co-operation, since only shipping lines have the higher level of co-operation (i.e. high density and strong ties) in the network, but the others have a moderate level of co-operation. Such a result indicates that the positive effectiveness of co-opetition may be different depending upon the extent of co-operation of the network where firms are embedded. Notably competition plays the role of a catalyst in acquiring knowledge only within the highly co-operative networks; but the positive influence of competition in the network is not effective when the extent of co-operation among actors is not great, like that of port and freight forwarder operations.

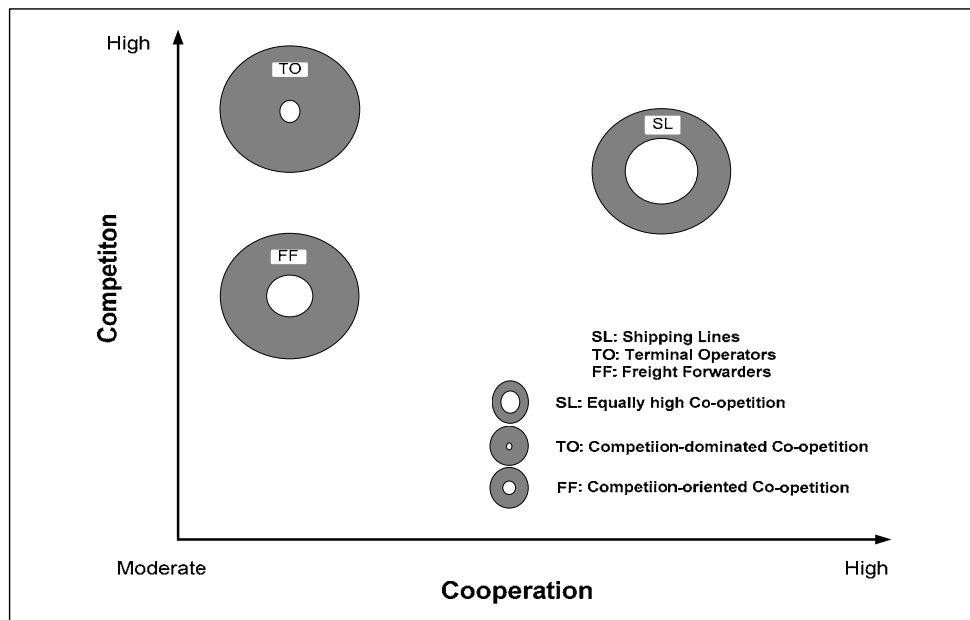


Figure 2 Types of Co-opetition in the Network of Korean Maritime Operators

Source: Modified from Bengtsson and Kock (2000)

The reason for the occurrence of the above tendency can be illustrated by the pattern of inter-organisational behaviours. Partnerships of highly dense and strong ties within co-operative networks are usually controlled by the following inter-organisational governance mechanisms: relational trust, norms of mutual gain, reciprocity, and long-term perspective (Coleman, 1988; Rowley et al., 2000). Those mechanisms may force the actors to mutually share resources with other partners or sometimes with direct competitors, in order to maximise common interests in the network.

Firms are generally more eager to achieve their competitors' knowledge, since the perceived competitive tension may stimulate the willingness to acquire the resource of the competitors. But at the same time, firms also wish to protect their resource from their competitors. However, firms under the above governance mechanisms of highly co-operative networks may no longer protect their knowledge absolutely. Instead, due to the reciprocity, mutuality and trust from a long-term perspective, they should open their knowledge as much as their desire to get competitors' knowledge. Otherwise, the firm that hesitates to open their knowledge but simultaneously looks to gain other firms' knowledge may easily garner a bad reputation, or lose the trust of other actors in the network, which in turn may negatively affect their business. Consequently, competition promotes mutual knowledge sharing with the highly co-operative partners under the social control mechanisms. By contrast, the actors under the networks where the level of co-operation is not high, like the port terminal operators and freight forwarders in this study, are less likely to be controlled by the above governance mechanisms. Thus, the competition may not positively affect the vigorous knowledge sharing with the partners in less co-operative networks. That may be the reason why the co-opetition in the networks of port terminal operators and freight forwarders do not have a positive influence on knowledge acquisition.

There exists, however, a contradiction about the findings that are concerned with the case of freight forwarders and port terminal operators between the two empirical methods. The interviewees from port terminal operators, except for the one interviewee indicated above, and all of the freight forwarding companies examined in the case study answered that, the co-opetition facilitated the knowledge acquisition from other companies. Thus, those companies included in the case study supported the positive effectiveness of the 'competition-dominated' co-opetition on knowledge acquisition. On the other hand, in the Delphi analysis, such a positive effectiveness was not supported, as the analysis revealed that the 'competition-dominated' co-opetition of port terminal operators and freight forwarders was not helpful in acquiring knowledge from their partners. It is therefore difficult to decide which of the two contradictory results would be more persuasive. As per the size of the sample used in each analysis, only three samples in each of the three respective business sectors were used in the case study; yet in the Delphi analysis, by contrast, a greater number of respondents were used. In addition, the result of the Delphi analysis was derived from the samples consisting of professional expertises in the field. Thus it is believed that the Delphi analysis could be more accurate and reliable. In this regard, this study would follow the findings from the Delphi analysis in judging the research results, and accordingly suggests the following proposition. The possible debate in relation to the different results would be

remained as a further research issue, and could be quantitatively investigated with sufficient company data.

Proposition 2: *The extent of co-opetition in the network is positively associated with the level of knowledge acquisition when maritime operators proactively co-operative with each other, rather than when they do not. More specifically, 'equally high co-opetition' (i.e. high in both competition and co-operation) in the network has a positive effect on knowledge acquisition of maritime operators.*

Knowledge Acquisition and Maritime Logistics Value

As a final part of the interview, knowledge acquisition performance was explored by asking all the interviewees these questions: 'Do you think that knowledge acquisition may have a positive effect on (i) operational efficiency: i.e. reducing lead time and business costs, (ii) improving service effectiveness: i.e. flexibility, responsiveness and reliability?' Most of the interviewees supported the positive influence of knowledge acquisition on every one of the five factors of maritime logistics value. Looking at the answers carefully, the interviewee from SL1 mentioned that:

Through the co-operative network, we share rich information on our customers as well as general knowledge of our industry with other companies. The knowledge shared through co-operation helps to quickly respond to market needs, quality improvement and aggressive marketing. Thus, knowledge sharing is crucial for survival in the industry.

This answer reveals that the acquired knowledge helps to reduce lead time and improve service responsiveness and flexibility. The interviewee from FF3 also pointed out the positive effectiveness of knowledge acquisition on maritime logistics value by mentioning that:

We apply knowledge acquired through our co-operative and co-opetitive relations to our business, and the application of this knowledge helps to develop innovative ideas on reducing our costs and time, as well as on how to improve the quality of our service. More specifically, as we can forecast the business trend of our market and customer behaviours thanks to the power of information, we can respond to customer demands more quickly and flexibly. As a result, the loyalty and reliability of our customers on our company simultaneously increases.

Despite the fact that the interviewees could not define the clear procedure of how the acquired knowledge is exploited and applied to their operation within an organisation, all of the interviewees agreed that the knowledge must help to improve operational efficiency and service effectiveness. Having recognised the above opinions of the interviewees, it is believed that knowledge acquisition through co-operative and co-opetitive networks may have a strong positive influence on the enhancement of maritime logistics value.

The results from the Delphi analysis also verify the positive effectiveness of the acquired knowledge on maritime logistics value. The maritime logistics value is measured by the following seven indicators: business cost, lead time, punctuality, responsiveness, flexibility, and reliability. The panellists are asked to indicate the extent to which they agree or disagree by being given the statements presenting the positive relation between knowledge acquisition and maritime logistics value. All of the mean values except two factors are above 3.5 and close to 4.0, suggesting that the acquired knowledge generally helps maritime operators to reduce business cost and lead time, provide service on time and improve service responsiveness, flexibility and reliability. On the other hand, the two factors which show moderate levels are lead time and safety factors in freight forwarding operation. Those results may be due to the industrial characteristic of freight forwarders. As the main function of freight forwarders is to arrange or intermediate ocean carriage as an agency of shippers, they are less likely to directly participate in moving cargoes with vessels or handling cargoes at ports. Thus, the extent to which they can control the reduction of lead time and minimise loss or damage of cargoes may be lower than that of shipping lines and port terminal operators. From these findings in the case study and Delphi analysis, the following proposition may be suggested.

Proposition 3: *The level of knowledge acquisition of maritime operators is positively associated with the improvement of maritime logistics value.*

The findings of this study empirically reflect the entirety of positive relationships between the co-operative and co-opetitive network embeddedness, knowledge acquisition, and maritime logistics value, which were proposed in the conceptual model. For instance, shipping lines were observed to acquire more knowledge than other types of maritime operators through their high levels of co-operation and co-opetition. The excellence of shipping lines in acquiring knowledge has consequently resulted in the highest level in improving maritime logistics value among maritime operators. With respect to port terminal operators and freight forwarders, which are less prone to co-operating with each other, the positive influence of inter-organisational co-operation and co-opetition on knowledge acquisition was weaker than that of shipping lines. As a result, the positive effectiveness of the acquired knowledge on maritime logistics value was slightly lower than that of shipping lines. From these results, it is possible to draw out a new awareness of the consecutive positive effectiveness between network embeddedness, knowledge acquisition and maritime logistics value. Such a causal and two-stage component of the positive relationship has yet to be investigated. Thus, the findings may give a new room for further meaningful empirical analysis.

DISCUSSIONS

This paper attempts to transfer and apply the social capital theory and organisational learning perspective from the business management domain to maritime logistics disciplines. The theoretical assertions built on previous findings were empirically analysed in this article. The empirical findings ensure that knowledge acquisition through inter-organisational learning would be one of the crucial strategic solutions to enhance maritime logistics value.

The central thesis of this paper can be offered from the following several views. Firstly, the relational channels of maritime operators have significant impacts on the amount of knowledge acquisition. In particular, the higher numbers of and strength in ties in co-operative networks would be the central relational resource facilitating knowledge acquisition of maritime operators. Secondly, given the positive relationship between co-operative networks and knowledge acquisition, inter-organisational competition in the network promotes the more vigorous knowledge sharing between the proactively co-operating parties with each other. This is consistent with previous contentions that stress the role of social capital, e.g. co-operative/co-opetitive networks in this study, in sharing knowledge among players in a network (Lado et al., 1997; Gulati, 1999; McEvily and Zaheer, 1999; Gnyawali and Madhavan, 2001; Tsai, 2001). Despite such a positive effectiveness of relational resource on knowledge acquisition, it is also evident that there may be a risk of too much intense competition harming the smooth knowledge exchange, as discovered from the empirical findings. This implies that the balance between co-operation and competition would also be a critical strategic consideration.

Further, the result of this research indicates that knowledge acquisition is positively related to the enhancement of maritime logistics value through the improvement of operational efficiency and service effectiveness. Much of the previous works ensure that knowledge acquisition contributes to the reduction of costs, price, operational time (i.e. efficiency) and the enhancement of firms' responsiveness, flexibility and reliability (i.e. effectiveness) (Nonaka, 1990; Grant, 1996; Li and Calantone, 1998; Autio, Sapienza and Almeida, 2000; Tsai, 2001; Zhao, Droge and Stank, 2001). Thus, the findings of this study also support the previous contention, and thus ensure that successful inter-organisational learning would be a key strategic tool towards the greater outperform of firms. This reminds maritime operators of the significance of the knowledge asset in their operations.

However, despite the above positive diagnosis of the effectiveness of organisational learning on maritime logistics value, we have found from the case interviews that the firms' understanding of the value of organisational learning and the extent to which they implement the organisational learning strategy in a systematic way is still at a rudimentary stage. Thus, it would be more necessary that they should recognise from the results of this paper the significance of the intellectual capital and organisational learning in refining their administration and flexibly and swiftly responding to rapidly changing environments. In addition, they may need to design unique plans of their own in order to effectively apply the organisational learning system to their own specific operations, since the successful implementation of the organisational learning strategy in a more unique and systematic way may contribute to the creation of differentiated capability and organisational innovation, and their sustainable competitive advantage.

In conclusion, this paper may give meaningful strategic insight into the effectiveness of knowledge-based strategy in maritime logistics operations. Further, it is also believed that this study provides a platform for researchers to facilitate a further empirical discussion on the matters associated with the effectiveness of organisational learning in the maritime logistics field. Finally, this research employed the qualitative method. Such a work could

contribute to the development of relevant hypotheses about the organisational learning strategy of maritime operators. It is expected that in future research, the hypotheses can be statistically tested by the usage of a quantitative research method. However, as this study focuses solely on the Korean maritime industry, limitations regarding generalisations of the empirical results may exist.

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