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Container Terminal Supply Chain Integration

How Supply Chain Integrated is Skandia Container terminal?

Master of Science Thesis in Nordic Master in Maritime Management

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Abstract

In the current literature, it is recognized that ports/container terminals are perceived as a member of supply chain which provides transportation and logistics services to the supply chain partners as well as infrastructure for loading/unloading of ships. Thus, their competitiveness is increasingly depending on the performance of the whole supply chain. In this basis, ports/container terminals have to be integrated in to supply chain in order to remain competitive and benefit from supply chain integration in the highly competitive environment. Therefore, evaluation of the supply chain integration of the ports has a great importance.

The major focus of this study concentrates on supply chain integration of container terminals by exploring the parameters for measurement of container terminal supply chain integration from the literature, including an empirical study about supply chain integration of Skandia Container Terminal by evaluating in which ways and aspects it is integrated into supply chain or not. Research methods consist of wide review of relevant literature of ports and supply chain integration and collection of empirical data on supply chain integration of Skandia Container terminal. Empirical study is based on interviews with two managers of the terminal and four shipping lines.

Findings of this research indicate that the terminal operators perceive their terminal is highly integrated in to the supply chain. On the other hand, shipping lines perceive the terminal relatively less supply chain integrated. The weakest links perceived by shipping lines are “terminal’s relationship with shipping lines” and “provision of value added services”. From the findings, it can be understood that there is a significant perception difference between the terminal operators and shipping lines. It has strategic importance to resolve this perception difference since the shipping lines play an important role in selection of container terminals. Additionally, the terminal operators should evaluate their terminal’s supply chain integration in essence of shipping lines perception along with theirs since it is likely that it would be a significant difference.

Key Words: Supply chain integration, container terminal, seaport, Skandia

Table of Contents

List of Tables

List of Figures

1. Introduction

As an introductory section, background, research focus and research aim and objectives of this thesis will be revealed under this chapter.

1.1. Background

In the current literature (Bichou, 2009; Alderton, 2008), the importance of ports as a catalyst to national economy and international trade is well established, as well as their contemporary role as logistics centers in supply chain. It has been stated that efficient ports increase labor, capital and profitability of producing units by the means of that they make possible the higher level of output, income and employment (Panayides and Song, 2008). Additionally, efficient ports as logistics centers, they can add value to the goods passing through them by facilitating efficient services.

It is difficult to find a standard definition for a port since they are varied according to their size or geographic area or the type of commodity handled inside them. In some cases a small buoy for barges can be considered as a port. On the other hand, very large ports which have different terminals and locate different industries are considered as port as well. According to Bichou (2009) a port is defined as a multimodal interface which provides sea and land connection and services for ships and their cargo, as well as logistics and distribution activities.

Historically, ports are considered as a facilitator which provides superstructure and infrastructure for ship operations, loading/unloading and temporary storage (Panayides and Song, 2008). On the other hand, ports are considered to have a new role in the contemporary environment (Tongzon *et al*, 2009). In the contemporary environment as a part of supply chain, ports are also considered to be a part of a cluster of organizations in which various logistics and transportation activities performed in order to bring value to the final customers (Panayides and Song, 2008).

The new role of ports can be traced back to emergence of containerization. In 60s, after the emergence of containers, general cargo went in to containers thereby this situation lead to radical changes in the port environment. Ports had to provide new infrastructure for container operations and size of ships got bigger so that port infrastructure had to be adapted to this change in order to provide facilities to container ships. As a consequence, modern container terminals have been arisen and become important aspects of global trade and movement of unitized goods.

Along with the traditional role of the ports, competition among them also has changed. In early times, location and price were the most important determinants of the competition. Then, their efficient and reliability of services, range and frequency of services, inter-connectibility of multimodal interface were drawn attention together with their price rate and location. Recently, ports terminals are not only competing thorough aforementioned determinants, but also quality and efficiency of links with supply chain partners and by creating performance and value for all supply chain partners (Bichou, 2009).

To fulfill this new role, ports must transform from the traditional function of providing infrastructure for loading/unloading and ship operations, to become a greater link in supply chain and global distribution channel (Panayides, P.M. and Song, D.W., 2008). For this instance Heaver (1995) stated that the high level of competition dealt with by ports more focused than previously on the performance of logistics systems of which the individual terminals in ports are critical hubs. To become a successful logistics or distribution chain a part of which is the ports needs to achieve a greater degree of integration (Panayides, P.M. and Song, D.W., 2008) (De Souza *et al*, 2003).

Ports are becoming increasingly integrated part of supply chain (Panayides, P.M. and Song, D.W., 2008). While providing their operations and services to the supply chain partners, ports need to enhance their integration in supply chain in order to fulfill requirements of supply chain partners and increase competitiveness (Tongzon, J., Chang, Y.T. and Lee, S.Y., 2009). In this manner, port operators need to find out how supply chain integrated is their port in order to achieve extended degree of integration.

1.2. Research Focus

The more the extent of integration among supply chain partners, the higher the performance and efficiency of the supply chain. It has been argued that there are dangers if the supply chain partners are not fully integrated into the supply chain in terms of their business processes. Researchers urge that in order for the port operators to improve performance outcomes, satisfy the port users' requirements and to cope with fierce competition, they need to achieve higher level of integration in the supply chain.

Clearly, larger scale of integration into supply chain is crucial for ports operators. In the literature related to ports, the importance of supply chain integration is well established but there are limited studies about the variables for the measurement and evaluation of extend of the integration. It is needed be taken out the context of the supply chain integration of ports being a vague term so that parameters and aspects of the supply chain integration of ports need to be studied. For this reason significance of this study is to understand and explore the variables and aspects for evaluation of seaport supply chain integration from the related literature. Because of the variety of the ports, it is difficult to study all different types of them so that this study will focus on container terminals supply chain integration. Additionally, by making an evaluation of supply chain integration of Skandia Container Terminal, this study is intending to make a contribution of the empirical studies in the area.

The major focus of this study will concentrate on supply chain integration of container terminals by exploring the parameters and variables for measurement for integration from the literature, including an empirical study about supply chain integration of container terminal (Skandia) of port of Goteborg by evaluating in which ways and aspects its integrated into supply chain or not. In this basis, answers for following questions will be put forward: What is the significance of seaports? What is supply chain management and logistics concepts and supply chain integration? What is the role of seaport container terminal in supply chain? What are the variables and measures for supply chain integration of container terminal? To get deeper understanding in this issues related to container terminals and their supply chain integration, two main activities need to be dealt with: a review of relevant literature to find out issues related to container terminals and their supply chain integration; an empirical study to evaluate supply chain integration of Skandia container terminal by practically using the data collected from the literature review.

1.3. Research Aim and Objectives

The overall aim of this study is to get deeper understanding of supply chain integration of container terminals by making an empirical study for evaluating supply chain integration of Skandia Container terminal. In order to understand container terminal supply chain integration, it felt necessary to explore the role of ports in logistics and supply chain context. Furthermore, to evaluate how supply chain integrated Skandia Container Terminal, it needs to be explored that what are the parameters indentified in the literature for measuring supply chain integration of container terminals. Further, views of Skandia Container Terminal operators and shipping lines about supply chain integration of Skandia container terminal will be evaluated by using the parameters for measuring supply chain integration of container terminal identified in the literature. In turn, two main activities will be carried out to facilitate this study: an in depth literature review and collection and analysis of empirical data. Research methods chapter contains the details of research strategy and data collections techniques to be used to obtain the empirical data.

The main research question of this study is:

How supply chain integrated is Skandia container terminal (container terminal of port of Goteborg)?

In order to facilitate the main research question some supplementary objective are generated. Those objectives involve:

- Explore the identified parameters and variables of supply chain integration of container terminals
- Evaluate Skandia Container terminal operators' and users' views regarding supply chain integration of Skandia container terminal
- Formulate recommendations regarding supply chain integration of Skandia Container terminal

It would be a mistake for the reader to see the objectives apart from each other, separate activities. They are necessarily interlinked with each other. First objective will attempt to explore the identified parameters in the literature by asking the questions what kind of supply chain integration parameters are identified in the literature related to supply chain integration of container terminals? First objective will be achieved by review of relevant literature in the subject area. The purpose of second objective is to obtain the empirical data on the Skandia container terminal operators' and users' views about supply chain integration of Scandia container terminal by using the parameters for measurement of supply chain integration explored as outcomes of first objective. The last objective is to formulate recommendations by critically evaluating outcomes of the first three objectives.

This study is attempted to make two main contributions. First, it will contribute to Skandia container terminal operators by evaluating their terminals supply chain integration with an outcome of how supply chain integrated their terminals in which ways and levels. It will also draw the terminal operators' attention to their integration with their supply chain partners. By this way, they can understand the importance of the supply chain integration and consider it while forming their future strategies. Second, this study will make contribution to the empirical studies in the subject area of supply chain integration of container terminals. As indicated before in the literature importance of supply chain integration of container terminals is well established but considering the subject area empirical studies are limited. This issue is also mentioned by researches in their studies (Tongzon *et al*, 2009; Panayides and Song, 2008; Bichou and Gray, 2004).

The next chapter examines the relevant literature pertinent to objectives of this study by beginning with defining seaports, stating the significance of seaports and explaining why the subject is focused on container terminals and mentioning about changing phase of port competition.

2. Seaports and Supply Chain

In order to achieve the objectives of this study, it is felt important to consider the literature that handle seaports and supply chain to address the role and importance of ports in general context, supply chain management and the role of seaports in the supply chain.

2.1. Seaports

Ports are important infrastructures which plays a key role for the international trade and transportation of goods. More than 90 percent of international trade carried by sea (IMO, 2010) so that ports are crucial for seaborne trade since they connect other modes of transportation such as rail and road with sea as a logistical focal point. With efficient port operations the cost imposed by delays in ports on logistics and supply chain through warehousing and inventory can be reduced (Bichou, 2009). Ports also considered as an economical catalyst in order that as an economic multiplier to the prosperity of citizens they are not only gateways to international trade but also attract commercial infrastructure (e.g. banks, agencies, etc.) as well as industrial production (Alderton, 2008)

In the current references number of ports is varied. It is estimated that the number of ports and terminal facilities differ between 2000 and 30.000 (Bichou, 2009). They can range from a place where a small vessel can anchor to very large port which contains many terminals and cluster of industries and services (e.g. Port of Singapore) (Alderton, 2008). They also differ in terms of their infrastructures, superstructures and functions. This situation makes it difficult to find a standard worldwide definition for ports. Anyhow Bichou's (2009) definition of a port is stated as:

> *"The interface between land and a sea or a waterway connection providing facilities as services to commercial ships and their cargo, as well as the associated multimodal, distribution, and logistics activities."*

Seaport are usually classified as of the cargo handled inside them such as oil terminal, dry bulk terminal, container terminal and Ro-Ro terminal etc. In some cases only one seaport may contain all of those mentioned terminals. Since the concern of this thesis is container terminals, they are the main focus of the upcoming literature.

2.1.1. Ports and Economical Development

It is not possible for a country to produce everything that its citizens need but it is possible to buy them from other countries. With the help of international trade, countries can focus on production of materials which they do best. On the other hand, they can buy the things which other countries do better than them. Additionally, businesses can keep up with recent developments in the World and improve themselves in terms of management and technology. International trade creates very big global markets to encourage investments and innovations. It also increases wealth of countries and ports are the gateways to international trade.

If there is no alternative port for the port users, this situation can create inefficiency and high prices. The goods passing through the port will have to bear the inefficiency and high costs. By this way, costs to all industries using the port will increase. The ports owned by the state can keep down the prices but inefficiency still is a barrier to international trade.

Lack of capacity in the port can also effect international trade badly and reduce economic development of the hinterland. Congestion in the port means long waiting time for ships in that time ship-owners have to cover his fixed costs. This puts extra burden on ship-owner and in extreme cases shipping line can boycott the port.

Efficient ports which have enough capacity to meet the demand and have fast customs clearance system can decrease the inventory and warehousing costs which imposed on logistics and supply chain activities of the companies by congestion. Additionally, efficiency can encourage trade which triggers an increase in production volume which can increase job opportunities and create new markets.

Ports can also attract the industries which depend on raw materials and subsidiary industries tend to be formed around the primary one. Warehouses and distribution centers usually located in or near to ports. Commercial entities such as banks, agencies, brokers and forwarders also tent to be located near ports.

2.1.2. Container Trade

In the mid 60s seaborne trade entered a new age called containerization. General cargo moved into containers and container vessels increased rapidly both number and size. In order to keep up with this change ports maintained their waterway drafts and their cargo handling technology as well as their infrastructure. As a consequence of this transformation, modern container ports have emerged.

As it can be seen in the below figure, from the beginning of container age, growth in the world container tonnage followed an increasing trend.

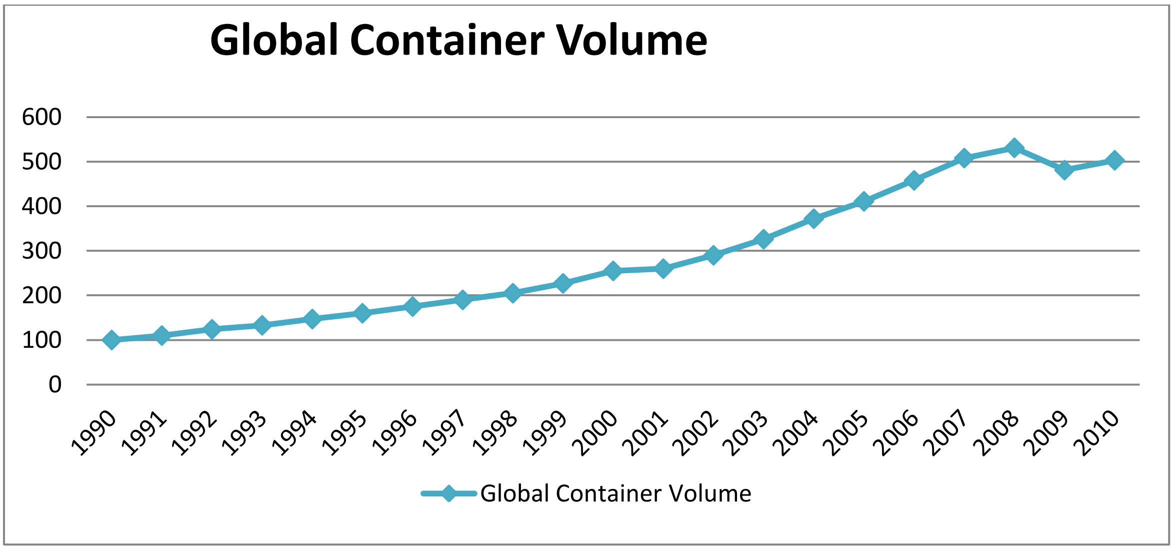

Figure 1 - Global Container Volume (IMO, 2010)

When it is looked from the whole picture, despite the global crisis, global container volume has been a trend of increase since the beginning of the containerization. In the future, it is likely to continue the same way so that container ports will keep its vital importance for the container transportation in the global supply chain.

2.1.3. Changing Phase of Port Competition

In the past, selection of the ports was dependent on the movement of the freight from its origin to destination. Ports were managed by public authorities and they are provided financial support and regulations against competition with foreign ports. They were doing business as a monopoly and in an environment of limited competition and rivalry.

In the recent three decades, competition and rivalry among ports has showed a rapid increase. This situation is the consequence of port privatization practices, increasing globalization of trade, development of containerization and new technologies of cargo handling and transportation. Nowadays, there is high competition between ports and other transport service providers in the port markets. As competition among global carriers and logistics providers increase so the competition between seaports (Bichou, 2009).

Through the different stages of port development, port competition moved from cost-centric competition to competition for a cost effective and high quality services in order to access to international markets. Location and port charges are still important factor of competition however port efficiency and reliability, range of port services, frequency of shipping service and connectivity to international trade route became important factors as well. Recently, competition among ports is shifting to a further level. They are competing not only based on their internal efficiency and performance, but also quality and efficiency of links with supply chain partners and by creating performance and value for all supply chain partners (Bichou, 2009).

2.2. Supply Chain Management and Logistics Concepts

As it is the concern of this study, supply chain management concept needs to be defined. Additionally, in the current literature importance of ports are emphasized in both logistics and supply chain contexts so that it is important to distinguish supply chain management and logistics concepts.

Both logistics and supply chain management terms has various definitions in the current literature. There are often disagreement and confusion among operational professionals and business practitioners concerning these terms (Rhonda *et al.*, 2001).

As an organization which is mostly associated with logistics and supply chain, Council of Supply Chain Management Professionals (2010) provides that *logistics is the process of planning, implementing, and controlling the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption*.

On the other hand, Council of Supply Chain Management Professionals (2010) defines supply chain management as "*Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. Supply Chain Management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high performing business model. It includes all of the logistics management activities* *noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, finance and information technology*".

Supply chain management is a broader concept which includes logistics, information systems integration, coordination of plan and control of activities (Cooper *et al.*, 1997). It is a strategic management tool used to enhance overall customer satisfaction that is intend to improve competitiveness and profitability and reduce costs (Giunipero, 1996).

2.3. The Role of Seaports in Supply Chains

For over past few decades the role of seaport has changed radically as a result of globalization and the changing trends in production and distribution of goods. In the current literature related to seaports there is an increasing interest to the changing role of the seaports (Bichou and Gray, 2004; Robinson, 2002; Carbone and De Maritno, 2003).

Historically, the seaports are considered as an interface by providing infrastructure for loading/discharging operations, temporary storage and cargo movement and operations inside the port. The importance of their role on the other parts of the supply chain is placed a little emphasis.

In the literature (Bichou and Gray, 2004; Robinson, 2002; Carbone and De Maritno, 2003), it is recognized that seaports have role to play in supply chain. The role of ports in supply chain can be traced back to the developments in port infrastructures and operations brought by containerization. Geography and design of ports and container terminals have been affected to provide services for the changing needs which brought by introduction of containerization in order to fulfill the needs of container ships and container transportation.

In the new trading environment which is characterized by globalization and corporatization, past paradigms are of interest but not problem solving relevance (Robinson, 2002). Competitive position of a port is not only determined by its internal performance in loading, unloading ships and hinterland connections but it is also affected by its links in a given supply chain. In other words, competitiveness of a port is becoming increasingly dependent on external co-ordination and control of the whole supply chain (Carbone, V. and De Maritno, M., 2003)

In their contemporary role as a member of supply chain, ports are considered to be part of a cluster of organizations in which various transport and logistics operators involved in the ultimate aim of bringing value to the final customer (Panayides and Song, 2008; Carbone and De Maritno, 2003). This value comes in to play when the port provides a package of logistics services differentiated on the basis of customers' requirements (Carbone and De Maritno, 2003).

3. Supply Chain Integration of Container Terminals

In order to achieve the objectives of this study, in this section the literature related with supply chain integration and seaport supply chain integration will be reviewed. First, to get a deeper understanding of port integration in the supply chain, the literature relating supply chain integration will be revealed and then the literature related with port integration in the supply chain will be reviewed.

3.1. Supply Chain Integration

According to O'Leary-Kelly and Flores (2002), supply chain integration refers to the extent to which separate parties work together in a cooperative manner to arrive at mutually acceptable outcomes. On this manner this definition includes constructs in relation to the degree of cooperation, coordination, interaction and collaboration (O'Leary-Kelly, S.W., and Flores, B.E., 2002). Supply chain integration continues to be a key issue for those who are seeking to understand how to harness potential of supply chain in order to create sustainable value (Kannan, V.R. and Tan K.C., 2010). In attempt to find out and discover the measurements and factors that affect supply chain integration of seaports, it is essential to review the relevant literature.

Supply chain integration is not a new concept. It can be traced back to (Porter, 1985) value chain model which indentified importance of the linkages inside and among the firms. However, in recent years, supply chain integration has been drawn firms attention since they seek to establish competitive advantage in increasingly competitive and global markets. The current literature acknowledges the importance of supply chain integration in respect to performance outcomes (Frohlich, M.T. and Wesbrook, R., 2001) (Narasimhan, R. and Kim, S.W., 2002) (Kim, 2006).

It is pointed out that partner integration in supply chain has critical importance for the companies in order to add value to their products and service offerings (Ragatz, G.L., Handfield, R.B. and Petersen, K.J., 2002). Companies can achieve significant improvements such as cost reductions, delivery quality and short cycle times by fully integrating themselves in the supply chain (Cousins, P.D. and Menguc, B. , 2006). On the other hand, if the firms are not fully integrated into supply chain in terms of their business processes, this situation can lead to serious consequences (Vickery, S.K., Jayaram, J., Droge, C. and Calantone, R., 2003) (Frohlich, M.T. and Wesbrook, R., 2001).

In the recent literature, supply chain integration is conceptualized. Three levels of integration are usually identified in the literature (Lee, C.W., Kwon, I.G., Severange, D., 2007) : a company's integration with customers, internal integration through the supply chain and integration with suppliers.

3.2. Supply Chain Integration of Container Terminals

Recognition that ports are increasingly integrated into supply chain is illustrated in the studies by Robinson (2002), Bichou and Gray (2004) and Paixao and Marlow (2008). These studies stated the importance of supply chain integration of seaport and their findings have relevant implications for seaport performance.

Bichou and Richard (2004) noted two concepts of seaport supply chain integration, intermodalism and organizational integration. Intermodalism is associated with aspects of container terminal management (UNCTAD, 2005) and it is usually associated with interlinks between different transport modes and nodes, not only as a technology but also inter-organizational process (Bichou, K. and Gray, R., 2004). Organizational cooperation and efficiency is the significant parameters in order to develop successful intermodal capabilities (Morash, E.A. and Clinton, S.R., 1997). The key in the organizational integration is the added value which ports can deliver (Robinson, 2002). Ports can provide advantage to the users by customizing their services and providing value added services even for higher prices (Tongzon *et al.*, 2009). UNCTAD (2005) defines third generation ports as those offering value added services.

Findings of Carbone and De Maritno (2003) point out important parameters which include information and communication technologies and aspects related to add value including customer relationships and satisfaction with respect to supplied services. Ports can make substantial gain by technology investments with guaranteeing that technology investments result cost savings to port users. There are also important gains by implementing programs on customer and stakeholder relationships and introduction of value added services. For instance, investments on more advanced technology to reduce turnaround times for ships can provide benefits for shipping lines and they can produce lower freight rates (Tongzon *et al.*, 2009).

There are quite limited empirical study considering supply chain integration of seaports and terminals. Carbone and De Maritno (2003) carried out a case study to investigate the contribution of the port of Le Havre to value creation in an automobile supply chain. Panayides and Song (Song and Panayides, 2007; Song and Panayides, 2008; Panayides and Song, 2008; Panayides and Song, 2009) developed measurement instrument which can be used by researchers to evaluate extent of the supply chain integration of seaport container terminals. They also made a research (Song, D.W. and Panayides, P.M., 2007) (Song, D.W. and Panayides, P.M., 2008) for relationship of integration of seaport container terminals with performance and competitiveness. Their conclusions based on survey of 32 terminals illustrated positive relationship between supply chain integration and performance and competitiveness. Additionally, (Tongzon, J., Chang, Y.T. and Lee, S.Y., 2009) contributed to the empirical literature by considering port of Incheon as a case and evaluating the degree of its supply chain integration based on certain measures drawn from the studies of Panayides and Song.

4. Container Terminal Supply Chain Integration Constructs

In this thesis, the empirical study concerns the evaluation of supply chain integration of Skandia Container terminal which is located Goteborg, Sweden. In the excising literature (Panayides, P.M. and Song, D.W., 2008) (Song, D.W. and Panayides, P.M., 2008) relevant parameters and measures for evaluating seaport container terminals' supply chain integration is illustrated and empirically tested. The empirical study will be based on constructs which include; "relationship with shipping lines", "information and communication systems", "value added services", "multimodal systems and operations" and "supply chain integration practices". They are explained in detail in the following section.

4.1. Relationship with Shipping Lines

This construct can be defined as having solid long-term relationships which is on the ground of strategic partnership and based on mutual trust and mutual benefits. It has been argued that supply chains based on solid relationships are more likely to produce unique solutions which are effective, efficient and relevant (Bowersox, D.J., Closs, D.J. and Stank, T.P., 2000). Panayides (2002) indicated that in order to achieve intermodal operational synchronization it is important to have an appropriate governance structure in the relationships between ports and shipping lines. The ports/container terminals which have solid relationships with supply chain partners based on high cooperation and mutual benefits and trusts are likely to achieve higher levels of supply chain integration.

4.2. Information and Communication Systems

Panayides and Song (2008) define Information and communication systems as the establishment and use of perfectly consistent and coherent communication systems that facilitate efficient servicing of supply chain operations and achievement of supply chain goals. Supply chain integration through Information sharing and consistent and coherent communication is widely discussed in the supply chain integration context (Narasimhan, R. and Kim, S.W., 2002) (Frohlich, M.T. and Wesbrook, R., 2001).

In their study Carbone and De Maritno (2003) found that an advanced information and communication technology is the one of the basic parameters to make possible and easier the integration of supply chain partners. Putting into use of latest and integrated information and communication technology reduces the total ports costs by extending the integration level; avoiding reproduction of documents and making faster data processing by all partners in the supply chain (Paixao, A.C., and Marlow, P.B., 2003).

4.3. Value Added Services

Panayides and Song (2008) define this variable as ability of a port to add value to the services it provides in the context of achieving further supply chain goals of the port. It is also indicated that ports are parts of value chain therefore they can add value to the cargo passing through them (Robinson, 2002). Additionally, Carbone and De Maritno (2003) found in their study that value added services such as procurement and pre-assembly are becoming more important and they may shape the future development of ports.

The level of value added service production in the seaport container terminals is considered to be an important parameter for supply chain integration of seaport container terminals (Panayides, P.M. and Song, D.W., 2008). Value added services facilitation is adding value in the context of different activities and capabilities rather than core services in the port. They can include container storage, container loading/unloading, container repair, warehouse for partial cargo, stuffing, stripping, full inspection, inspection and sampling (The World Bank, 2007). Other value added services involve ability to launch new tailored services, handle different types of cargo, provide service for specific needs of different market segments and to be adaptable to customer needs (Paixao, A.C., and Marlow, P.B., 2003) (Song, D.W. and Panayides, P.M., 2008).

4.4. Multimodal Connections and Operations

This variable stands for the existence of multimodal connections and systems to provide efficient and effective flow of goods from one mode to another. In their studies, Song and Panayides (2008) addressed ports as bi-directional logistics systems which receive goods from ships to be transported to the inland by rail or road and systems that they receive goods from inland transport operators for performing sea leg of the transportation. In this point of view this bi-directional logistics system needs high level of coordination, interconnectivity and inter-operability in the ports system (Song, D.W. and Panayides, P.M., 2008). Therefore, supply chain integrated ports should be able to provide efficient and effective connections and operations for rail/road interface.

In the contemporary environment, ports have a role to play in the supply chain integration by serving and providing multimodal intersection, operating as logistics center, adding value and linking flows (Bichou, K. and Gray, R., 2005). Robinson (2002) noted that ports are part of value chain and compete with other value chain systems. In this way, the cargo flow will seek lowest cost routes and ports which offer efficient, productive, reliable intermodal connections and operations for the multimodal interface. Ability of seaports and terminals to provide interconnection by multimodal infrastructure and systems to facilitate inter-modality is a significant variable for supply chain integration of seaport container terminals (Panayides, P.M. and Song, D.W. , 2009).

4.5. Supply Chain Integration Practices

Seaport supply chain integration practices include the extent to which ports plan, and organize activities processes and procedures beyond its borders and monitors performance in these activities (Bichou, K. and Gray, R., 2004) (Panayides, P.M. and Song, D.W., 2008). Furthermore, supply chain integration practices involve the extent to which port management collaborates with supply chain partners such as shipping lines, shippers, and rail and road operators in order to identify cost effective and supply chain performance, improving solutions for the goods passing through the port (Panayides, P.M. and Song, D.W. , 2009). As an example for supply chain integration practices, Notteboom and Rodrigue (2005) noted that this kind of practices may include introduction of a new shuttle train to the hinterland with the supply chain partners such as railway companies, rail operators, shipping companies and large shippers.

4.6. Measures of Container Terminal Supply Chain Integration

Measures of container terminal supply chain integration are stated below. These measures are identified and validated by Panayides and Song (Song and Panayides, 2007; Song, and Panayides, 2008; Panayides, and Song, 2008; Panayides and Song, 2006; Panayides and Song, 2009) in their studies.

Relationship with shipping lines

- Strategic partners in mutually designing the flow of goods and information
- Relationships based on mutual trust rather than contractual obligations
- Working with shipping lines to ensure higher quality of service
- Working with shipping lines to reduce costs
- Measuring satisfaction of users (Tongzon *et al.*, 2009)

Information and communication systems

- Integrated EDI for communication
- Integrated IT to share data
- Computerized port service systems
- Latest IT in the industry

Value Added Services

- Facilities to add value to cargoes
- Service adaptation to customers
- Launch tailored services
- Services to handle inter-mode transfers
- Capacity to efficiently convey cargo
- Tailored services to market segments

Multimodal operations and connectivity

- Connectivity for multimodal interface
- Reliability for multimodal operations
- Cost-effective multimodal operations
- Efficient multimodal operations

Supply chain integration practices

- Evaluate alternative routes for efficient transportation
- Collaborate with channel members for channel optimization
- Identify competing channels for cargoes that might flow through port
- Benchmark logistics/supply chain management options comparison with competing ports
- Identify least cost options for transport of cargoes to hinterland destination

5. Research Methods

This research study has a number of objectives which are related to each other. Those involve:

1. Explore the identified variables of supply chain integration of container terminals.
2. Evaluate Skandia Container terminal operators' and users' views regarding supply chain integration of Skandia container terminal.
3. Formulate recommendations regarding supply chain integration of Skandia Container terminal.

Significance of this study is related to third objective. The researcher will get an opportunity to add value to the research study by making an empirical study evaluating supply chain integration of Skandia container terminal. The opportunity to gain the terminal operators' and terminal users' view about supply chain integration of Skandia Container terminal will take out supply chain integration of container terminals being an abstract subject. As it was stated before, in the literature it is indicated that there are limited empirical studies related to subject area. A meaningful contribution of this study will be study and analysis of empirical data on supply chain integration of Skandia container terminal. First objective is identified in the previous section in by reviewing the literature. Second objective takes this study to a further level through collection and analysis of empirical data collected from Skandia terminal operators and users.

This chapter will provide details to research strategy which is adopted to address the research objectives identified above. Additionally, it will address the means of data collection methods, including selection of participants and analysis approach to be adopted. Limitations and problems related to research strategy and its implementation will stated at the end of the section.

5.1. Research Strategy

The second objective of this study is to explore the terminal operators' and users' views regarding supply chain integration of Skandia Container Terminal and this will be achieved through collection and analysis of empirical data.

The empirical study in this thesis is interested in views of terminal operators and shipping lines regarding the supply chain integration of Skandia terminal by the means of the measures of the constructs drawn from the current literature by literature review: relationship with shipping lines; information and communication technologies; value added service; multimodal connections and operations; supply chain integration practices. Data related to perspectives of shipping lines as well as shipping operators will be collected based on measures of these constructs.

Research approach conducting the empirical study will be qualitative rather than quantitative. Qualitative approach relates to studying things in their natural environment trying to make sense of, or interpret, phenomena in terms of meanings people attach to them (Denzin, N.K. and Lincoln, Y. S., 1994). On the other hand, quantitative approach most commonly used in natural sciences studying natural phenomena by using laboratory experiments and mathematical modeling though in quantitative approach, survey techniques can often used in social settings together with qualitative methods (Biggam, 2008).

To distinguish qualitative approach from quantitative Dabbs (1982) indicates that quality is related to nature of things. However, quantity is related to an amount of something. Quality is related to essence and ambience of a thing and it refers to what, how, where and when of a thing. Meanings, concepts, definitions, characteristics, metaphors, symbols and descriptions of things are the main concern of a qualitative research. On the other hand, quantitative research deals with counts and measures of things (Dabbs, 1982; Biggam, 2008).

Views of the terminal operators and shipping line companies will be explored by qualitative approach by conducting semi-structured interviews with open ended questions. The interview questions will be based on the measures of the constructs identified and tested by Panayides and Song in their studies. Although their model based on measures adopted for quantitative approach by using questionnaire surveys, in this research study their measures used for forming open ended questions for semi-structured interviews.

The research strategy of this study is formed around there processes which are described below:

Figure 2 - Research Strategy of the Study (Drawn by the author)

At the first step, interview questions will be formed by using the measures of container terminal supply chain integration. Those measures are identified by Panayides and song in their studies and explored in the previous section by literature review. As the second step, after formation of interview questions, interviews will be facilitated. All interviews will be recorded by sound recording devise. At the last step, a structured approach to analysis of the collected data will be adopted.

Data collection techniques, selection of interview participants will be addressed in the following section.

5.2. Data Collection

To achieve the objectives of this research study, two types of data need to be collected. Those are secondary and primary.

Secondary data described as preexisting data which is collected for other purposes. It might be gathered for another research study (Encyclopedia of qualitative research methods, 2008). Data collected by researcher by interview, experiment, observation or questionnaire for the purpose of achieving the research named primary data.

5.2.1. Secondary Data

Secondary data collected through literature review to achieve the first objective of this thesis. This objective is:

- Explore the identified variables of supply chain integration of container terminals.

The literature review conducted through review of relevant literature of logistics and supply chain management, supply chain integration and seaports. The source of the literature review was Chalmers University library databases, books, articles and web pages.

5.2.2. Primary Data

In order to facilitate the empirical study, to achieve the second objective of this study (explore Skandia container operators' and shipping line companies' views regarding the supply chain integration of Skandia container terminal), primary data will be collected by interviews.

5.2.2.1. Sample Size and Selection

Container terminal of Port of Goteborg is the case point of this research study thus two interviews have been conducted with the executive managers of the port. Since the time of the research is limited, only shipping lines were included in this study. Four international shipping lines which control vast majority of container flow through Skandia Container terminal have been involved. One participant from each shipping line and two participants from Skandia Container terminal have been selected. Non-random selection method is used while selecting the participants. First, companies identified and contacted them by email, phone or face to face to introduce the research study and to ask for most suitable personnel for conducting the interviews. All of the participants were experienced and at the management positions which can make strategic decisions. They were also familiar with the topic of the research study.

5.2.2.2. Interviews

Totally six interviews, two of them with the port operators and four of them with the shipping lines, were conducted. The interviews consist of twenty four open ended questions which are based on measures of conducts which are identified by Panayides and Song for container terminal supply chain integration. Type of interview method used in this study is semi-structured interviews. Since the aim of usage of interviews in this research study is to get deeper understanding of the views of participants by open ended questions, semi-structured interviews are the most suitable interview method to achieve this aim. During the interviews, clarifications of interview questions were provided by interviewer when it is needed. Thus, participants' understanding of interview questions was guaranteed. Additionally, all interviews were recorded by a sound recorder.

5.3. Framework for Data Analysis

For the aim of reflecting the main objectives of this study and ease the data analysis process, the data collected through interviews will be categorized according to constructs described in the literature review. These are relationships with shipping lines; information and communication technologies; multimodal connectivity and operability; value added services and supply chain integration practices.

Below table will reveal the breakdown of the interview questions. The interview questions modified from the original survey which is constructed by Panayides and Song in their studies.

Constructs	*Number of questions*
Information and communication technologies	4
Relationship with shipping lines	5
Value added services	6
Multimodal connectivity and operability	4
Supply chain integration practices	5

Table 1 - Breakdown of Interview Questions (Drawn by the Author)

In order to capture everything said by interview participants and concentrate on interview process, all interviews will be recorded by a sound recorder and all interviews will be transcribed. Data collected from interviews and questionnaire will be structured under the constructs which are addressed in the literature review. Collected data will be categorized for the analysis process.

As an important part of this study, empirical data will be analyzed by comparing and contrasting different respondents' responses. In terms of analysis, data collected from Skandia terminal will be described and analyzed at first. Then, findings from two different respondents from the Skandia terminal will be compared with each other. Second, data collected from the shipping lines will be described, analyzed and compared with each other. Finally, findings from the terminal will be compared with findings from the shipping lines. Below figure is formed to illustrate the data analysis process. The figure illustrates the approach for data analysis process which is based on the repeating process of description, analysis and interpretation.

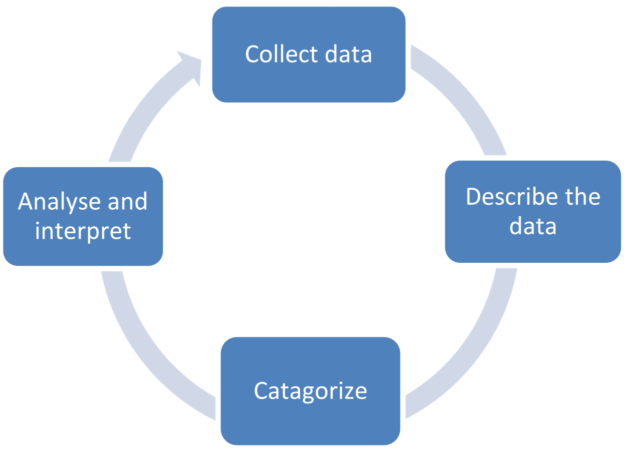

Figure 3 - Research Framework of the Study (Drawn by the Author)

5.4. Limitations and Potential Problems

For the means of conducting a trustworthy research, both qualitative and quantitative approach are used by the researcher in this study. On the other hand, the data is collected only from the terminal and shipping lines. In order to get the views of the all supply chain partners, other stakeholders could have been included in this research. However, because of the limited time only four shipping lines were included as supply chain partners of the terminal. Additionally, number of respondents could be criticized, since two respondents from the terminal and four respondents from different shipping lines were interviewed. However, considering the respondents' profiles (since they are all management level employees and familiar with the topic of this study), collected data is enough to produce reliable findings.

Case point of this study is Skandia Container terminal. Since the findings will be specific to this terminal and cannot be generalized. On the other hand, findings of this research can set an example for other terminals about the way of expanding their supply chain integration.

5.5. Validity and Reliability

Validity and reliability of this study was considered at every stage by the researcher. As indicated by Biggam (2008), valid research is the research which is acceptable by the research community. In order to provide a valid research, researcher used appropriate research strategy, appropriate data collection method, and appropriate data analysis method for achieving objectives of the empirical study. Suitability of research strategy, data collection methods and data analysis techniques were justified in previous sections.

Biggam (2008) argue that main point of reliability is trust: Can the results of the research be trusted? Reliability of this research is achieved through a number of steps. First of all, the companies which the empirical data collected from were selected carefully. They are international shipping lines which control the vast majority of the containers passing through the Skandia terminal. Then, interview respondents were identified by contacting the companies, introducing the research study and asking for the right respondents for collecting the empirical data. All the respondents were working at management level positions; they are responsible for operations department of their companies, and familiar with the topic of the study. Interview questions were based on measures which were identified and validated by Panayides and Song in their studies. During the interview process, interviewees were not interfered while they were responding questions although clarifications for interview questions were provided when it was needed.

6. Empirical Findings

This chapter reveals the results of the interviews and questionnaire survey which are described in the previous chapter. The research concentrates on the two groups, respondents from the container terminal and from the shipping lines. The interviews and the questionnaires approached a highly structured way. First, responses from the terminal operators will be described construct by construct and then responses from shipping lines will be described in the same way. At the end, results from two different groups will be compared and analyzed. Prior to the description and analysis of the study results, since the case point of this study is Skandia Container terminal, a brief presentation of Skandia Container Terminal is provided now.

Skandia Container Terminal AB. Established on February 1, 2010 and took over the operations of container terminal in Port of Goteborg. It is owned by city of Goteborg and its total throughput is nearly 900 million TEU's in 2010. Skandia Container terminal considered as the largest container terminal in Scandinavia and the only one in Sweden called by ocean going vessels.

In the following section, results from the terminal operators and shipping lines will be provided under the terminal supply chain integration constructs which are described in the previous chapters.

6.1. Findings from Skandia Terminal Operators

Results from the terminal operators will be described in this section and they will be presented under the constructs mentioned earlier: relationship with shipping lines; information and communication technologies; values added services; multimodal connectivity and operations and supply chain integrations.

6.1.1. Relationship with Shipping Lines

Five questions were asked to describe the terminal's relationship with the shipping lines.

Both respondents agree that they see the shipping lines as strategic partners designing the flow of containers and information. One respondent stated that they are trying to work closely together with shipping lines to improve the service level from vessels' calls to vessels' departures. Other respondent pointed out that they have meetings with the shipping lines and they are cooperating with them to find out what the shipping lines are looking for and what can they do better.

Respondents stated that their relationships with shipping line based on both contractual obligations and mutual trust. One respondent mentioned that *"We have joint projects with shipping lines. For example, we are working on developing rail shuttles to the hinterland, on these projects so we see our relationships with shipping lines as based on both contractual obligations and mutual trust"*

Both Interviewees also argued that they work together with shipping lines to ensure higher quality of services. One respondent stated that they come together with shipping lines to find out how they can provide better services to the shipping lines. Other respondent pointed that they have high proportion of cooperation with shipping lines to increase the productivity.

Regarding the terminals relationship with the shipping lines about costs, respondents stated that they work together with shipping lines to reduce the costs. One respondent put forward that *"We are trying to find different ways for less cost options such as using the rail instead of truck"*. Other respondent stated that "We are trying to find least cost options for shipping lines. It is a big focus for us".

Respondents stated that they periodically evaluate and measure the terminal users' satisfaction. One respondent addressed that every year they evaluate the satisfaction of their customers (shipping lines, rail operators, truck operators, etc) by making a survey to find out their perception about the terminal's service level.

6.1.2. Information and Communication Systems

The terminal operators stated that they use integrated EDI to communicate with their partners in supply chain. They use EDI to exchange documents with shipping lines, truck operators and rail operators. They have a container terminal operation system called CATOS. They stated that the system is fully updated and periodically maintained.

The respondents claimed that they have an integrated information/data sharing system with partners. They share information/data with their partner (shipping lines, rail operators, truck operators, etc) through either EDI or web by the same system. Users can login through their web page to place bookings and share data.

They adopted a computerized system in their terminal for their operations with shipping lines. The system they use for their operations is the same system as they use for data sharing. Their whole operations and data sharing are facilitated by one main system. One of the operators pointed out that the terminal operating system helps them to provide efficient operations.

> The respondents stated that the system is introduced to the terminal one and a half year ago. They argued that they use latest information technology in their terminal. One respondent stated that *"This system introduced to us one and a half year ago by a Korean company. As far as we know this is the latest technology for container terminal operations".*

6.1.3. Value Added Services

Terminal operators stated that in the port area they have adequate services to add value to the cargoes (such as stripping, stuffing, container load/unload, container repair etc.). However, services are not delivered by port operator. Terminal operators pointed out that the value added services delivered by third parties outside the terminal but inside the port area.

Regarding their capacity to provide services to customers' specifications, one of the respondents stated that they have capacity to provide services for customers' specifications. He also stated that if customers ask them for some services they try to give the contacts of the service providers that might help them. On the other hand, other respondent stated that their main focus is to handle the containers to different modes in an efficient way and in a minimum time. He also mentioned that if the customers have specific needs, they have to do it outside the terminal through third parties in the port area.

When it is asked to the terminal operators about the terminals ability to launch new tailored services, one of the respondents stated that terminal only provides service of handling containers from ships to shore then trucks and rail or from trucks and rail to ships or from ships to ships. He pointed out the services other than their core services provided by third party companies in the port area, if a partner asks them for a tailored service they provide assistance to find the right service supplier. Other respondent stated that they have capacity to grow, if partners demand new services, it would be negotiable and according to the type of service they would try their best.

Regarding variety services of the terminal for handing the cargo to different modes, terminal operators argued that they don't have cross docking but they have variety of services to handle the containers. One of the respondents stated they can easily handle all the modes; they can transfer the containers from ship to rail or trucks or from ship to ship or from container ship to a ro-ro ship. He also mentioned that they can handle heavy and high cargo rail to container ships.

Both respondents stated that they have the capacity to convey containers though the most diversified modes on a least possible time. Regarding this question, one of them stressed that the container terminal is working two shifts, rail shuttles have dedicated slot time in which they are handled. He also stated their turnaround time for container ships is compatible with large terminals such as Hamburg.

Regarding their tailor made services for different market segments; respondents stated that they have cooperation with big exporters such as Stora Enso and AvestaPolarit. They stressed that they make unique tailor made solutions for these companies. One of the respondents stated that they have capacity to provide new services, if the demand arises from the partners, it would be negotiable according to what is demanded but he stated that they would try their best.

6.1.4. Multimodal Connections and Operations

Terminal operators pointed out that the terminal has sufficient connectivity to Multimodal interface. One operator argued that "*Half of their throughput is carried by rail, nearly 5000 TEU's going in and out of the terminal by train every week and almost one thousand trucks go in and out of the terminal every day. The terminal has good infrastructure of multimodal connectivity."*

Respondents think that the terminal has reliable multimodal operations. One respondent stated *"The gates are open from 05:30 to 23:30 and rail entrance is open all the time. We have the ability to handle the containers as per shipping lines' preferences. The system that we handle the different modes is well developed".*

The terminal operators think that they achieve cost-effective multimodal operations. One respondent stated their focus is to improve the quality of service and keep the rate at a reasonable level. Both respondents stated they prove cost effective multimodal operations especially for rail option. One respondent stressed facilitating cost effective multimodal operation is a big focus for the terminal in order to attract shipping lines.

Respondents argued the terminal provides efficient multimodal operations. One respondent stated that "*In recent decades the terminal had a big volume growth on each mode (ship, rail, truck); I believe that this growth is the result of efficient operations*". Other respondent thinks that they have a plus on efficiency of operation. He stated that "*It is a never ending story costumers demand better and better services every day so we must iteratively improve our service level and efficiency*".

6.1.5. Supply Chain Integration Practices

Both of the terminal operators stated that they are evaluating the alternative routes for more efficient transportation of containers passing through their terminal. One respondent pointed out "*We are evaluating the alternative routes and modes for the containers passing through our port. For example if transportation of containers is expensive by truck we are evaluating the train option if it is cheaper or not*".

The respondents stated that they have collaboration with shipping line for greater supply chain optimization. One of the respondents pointed out that "*We have meetings with shipping line and discuss with them how we can improve our service level and learn what their expectations from us are"*. Other participant stressed that they are working with rail operators and shipping lines to increase productivity. They are working with rail operators to increase frequency of the trains and they work with custom authorities to improve custom clearance process.

Respondents stated that they are seeking to identify for containers that might flow through their terminal. One respondent stressed one of their sales processes to attract more shipping lines. Other respondent stated that they constantly trying to increase the volume of containers so that they are looking for containers that might flow through their terminal. He also stated that they have dialogs with big exporter companies such as Stora Enso and AvestaPolarit to find out how they can help them to straighten their business thus more containers can be flown trough their terminal.

Terminal operators mentioned they benchmark the logistics options for containers that might flow through their terminal in comparison with other terminals. One of the respondents pointed out "*For example some containers come to Hamburg and from Hamburg they can be put in a feeder ship to Stockholm. We promote the shipping line to bring the containers to Goteborg and then use rail to Stockholm instead or attract them to come directly to Goteborg without going to Hamburg. We are analyzing alternatives and trying to promote our solutions*".

When it is asked to the respondents that do they seek to identify least cost options for hinterland distribution, one respondent stated that it is the shipping lines responsibility and the other one pointed out they do seek to identify least cost options for hinterland distribution. He explained if it is expensive to carry the containers by truck, they investigate that if it is cheaper to transport them by rail. He also stated that they try to find alternatives to bring more cargo to Goteborg in a cost-efficient way. He pointed out that they understand that hinterland distribution is very costly for shipping lines so that they are trying to reduce hinterland cost by pushing rail operators for better services, longer trains and frequent trains.

6.2. Findings from Shipping Lines

Results of the interviews conducted with shipping lines will be presented under this heading categorized on the constructs described earlier sections.

6.2.1. Relationships with Shipping Lines

Three of respondents believe that the terminal operators see them as a strategic partner while mutually designing the flow of goods. One respondent disagree that statement by stating that

"*The terminal sees us as a strategic partner but designing the flow of goods and information, the terminal values only their internal ambition and beliefs rather than the customers' expectations*".

Only one of the shipping lines thinks that their relationship with the terminal based on mutual trust rather than contractual obligations. Three of the respondents stated that their relationship with port is more based on contractual obligations. One respondent pointed out that they have both contractual and trust based relationship with the terminal by having a proper contract and good relationship with the terminal but at the end it is more based on contractual obligations.

Three of the respondents stated that the terminal operators work together with the shipping lines to ensure higher quality of services. One of the respondents pointed out that the services delivered do not match what could be expected in such a mature market. Another one mentioned it could be better considering it is the biggest container terminal in Scandinavia.

All four respondents disagree with the statement that the terminal work together with shipping lines to reduces costs. All of the complained about high cost in the terminal and they stated that the terminal operators focus is not reducing the costs. One respondent pointed out that they are increasing the rates by giving the same quality of services.

All of the respondents agreed with the terminal operators do not evaluate/ measure shipping line's satisfaction. Two of the respondents stated that they are getting a survey, ones in a year but this not enough they would expect much more.

6.2.2. Information and Communication Systems

Two out of four respondents believe that the terminal operators use integrated electronic data interchange to communicate with partners in supply chain. Two of the respondents disagree with this statement. One respondent pointed out that "*They use EDI to communicate with us however implementation of the latest IT system has been far from successful and has shifted a lot of the responsibilities over to the ports' customers*". Other respondent also said that to use this system they have to manually go in the system and make adjustments, change and update information. And he added that is not as effective as they would like it to be.

Two of the shipping lines think that the terminal use integrated information system to share information with partners in the terminal. Other two respondents believe that terminals information sharing system is not as good as it should be.

Two of the respondents think that the terminal adopts port service systems for their operations with shipping lines. Two of the respondents stated that they have terminal operating system for operations but this system is not as efficient as they would like it to be.

Two out of four respondents think that the terminal uses the latest IT technology. Two respondents disagreed with that they do use latest IT technology. One of the respondent stated that the operation system they have in the terminal is difficult to work with. Other respondent stated that the system established one and a half years ago but it is still not highly efficient. The respondent also added that as per their perception comparing to other suppliers the IT system of the terminal is not up to date.

6.2.3. Value Added Services

Three of the respondents pointed out that the terminal has adequate services (e.g. stuffing, stripping, container repair, pre-assembly etc.) to add value to the cargo. One of them stated that value added services offered in the terminal are not sufficient.

Three of the respondents believe that the terminal does not have capacity to meet customers' specifications. One respondent stated that they offer same package of services to all the shipping lines. The respondent added that in some cases the terminal operators can make special offers to the sipping lines but it can happen unless the services are not taking resources from the terminal. Only one of the respondents thinks the terminal has this capacity.

Three of the respondents disagree with the statement that terminal has the capacity to launch new tailored services should the need arise. One respondent stressed that "*It is never known, until it is requested but chances are low that they would be able to do it*". Only one respondent thinks that they have this capacity.

Three of the respondents believe that they have the variety of services to handle the containers from one mode to another. Only one respondent believe that the terminal does not provide variety of service to handle the container from one mode to another.

Three of the respondents think that the terminal has the capacity to convey cargo through the most diversified modes at the least possible time. All three of the respondents stated that the terminal has very good turnaround time but when it comes to truck they complained that there is a very long queue to get in to the terminal and out of the terminal. Only one respondent thinks that the terminal does not have that capacity.

Three out of four respondents believe that the terminal does not have the capacity to deliver more tailored services to different market segments. One respondent stated that their objective is just to focus on discharging and loading the vessels and delivering the containers to trucks or to trains. Another one stated that they are only focusing on getting the job done. Only one respondent thinks that they have this capacity.

6.2.4. Multimodal Connections and Operations

Three of the respondents stated that the terminal has adequate connectivity to multimodal interface. All the respondents agreed that the rail connection of the terminal is very good. They added that from the terminal it is possible to transport the cargo by rail anywhere in Sweden and the terminal has rail connection to Norway as well. However, one respondent stressed that the terminal does not support rail to rail transshipment and this is not an option for Goteborg. One respondent mentioned about long tuck queues and added "*When it comes to connectivity to multimodal interface, truck is the weakest point*". Only one respondent disagrees that the terminal has adequate connectivity to multimodal interface.

Three of the respondents believe that the terminal provides reliable multimodal operations. All three of the respondents pointed that when they book containers on train or on truck, most of the time it is loaded and delivered on time. However, three of the respondents stressed that turnaround time for the trucks is very high and this sometimes affects delivery time for the final customers. One of the respondent stated that when it comes to reliability of multimodal operations, the trucks are the worst part.

Three of the respondents agreed that the terminal does not provide cost-effective multimodal operations. One of the respondent pointed that considering the large throughput they have in the terminal, multimodal operations are expensive. He added that some other terminals in Sweden are more cost effective than Goteborg even though they have lower volumes. Another respondent stated that Goteborg container terminal is the most expensive in the region considering all the cost items. Only one respondent agreed that they provide cost effective multimodal solutions.

Two of the respondents think that the terminal provides efficient multimodal operations. One of the respondent stated that he is not sure that they are efficient or not. The respondent added that "*Taking in to considerations the port is very expensive, maybe the reason for that is maybe the operations are not done in a most efficient way*". Only one respondent believes that the terminal does not provide efficient multimodal operations.

6.2.5. Supply Chain Integration Practices

One of the respondents stated that the terminal operators evaluate alternative routes for more efficient transportation of containers via their terminal. Two of them pointed out that they do not have any knowledge that the terminal operators evaluate alternative routes for more efficient transportation of containers. One of the respondents disagreed with the terminal operators evaluate alternative routes for more efficient transportation of containers via their terminal.

Three of the respondents stressed that the terminal operators do not collaborate with them to plan greater supply chain optimization. One respondent stated that "*They talk about supply chain but they never discussed with us how do we together get into supply chain and improve supply chain optimization*". One of the respondents pointed out the terminal has a well developed train solutions which helps the shipping companies in the total supply chain however they are only taking care of their own part but the terminal is not involved into total supply chain. Only one respondent stated that the terminal operators collaborate with them to plan greater supply chain optimization.

Three of the respondents stated that the terminal operators seek to identify other competing supply chains for containers that might flow through their terminal. One stated that the terminal operators are pretty active on that account; they are trying to get more transshipment containers to the Baltic region. Another one stressed that the terminal operators trying to have the flow of container that going through other terminals. He added that the terminal operators are trying to change the flow through their terminal by offering more rail connections. One respondent stated that "*Can not comment as not aware of it by the port however it is doubtful*"

Two of the respondents believe that the terminal operators benchmark logistics/supply chain options available for containers that will fly through their port in comparison with competing ports. Two of the respondents stated that they do not have the knowledge that they benchmark the logistics options for container in comparison with competing ports. One respondent stated the lack of knowledge on the issue but has doubts that the terminal operators do such a benchmark.

Two of the respondents agree that the terminal operators are looking for the least cost options for the transportation of containers to the hinterland destinations. One of the respondents stated that they are focusing on rail transportation since the rail is the least cost option. Another one stressed that the “terminal is not looking for that information however they are trying to develop more rail solutions, the terminal operators know that train solutions will lower the costs per km to hinterland destinations”. Other respondent stated that “the terminal is not looking for the least cost options for transportation of containers to the hinterland destinations. The terminal develops rail solutions because the terminal does not have infrastructure for trucks to facilitate the growth of the terminal so the terminal has to grow on the rail”. Another respondent pointed out that they are developing train options to compete with east coast feeder operators.

7. Analysis

Analysis of the results of the empirical study will be provided under this heading. Terminal operators' and shipping companies' responses under the terminal supply chain integration constructs described in the earlier chapters will be compared then analysis and interpretation will be provided.

7.1. Relationship with Shipping Lines

Relationship with shipping lines	Terminal Managers (TM)		Shipping Lines (SL)			
	TM1	TM2	SL1	SL2	SL3	SL4
Strategic partners in mutually designing the flow of goods and information	Yes	Yes	Yes	Yes	Yes	No
Relationships based on mutual trust rather than contractual obligations	Both	Both	No	Yes	No	No
Working with shipping lines to ensure higher quality of service	Yes	Yes	No	Yes	Yes	No
Working with shipping lines to reduce costs	Yes	Yes	No	No	No	No
Measuring satisfaction of users	Yes	Yes	No	No	No	No

Table 2 - Findings under the Parameter of RWSL

As it can be seen in the above table, in this construct of container terminal supply chain integration there are five measures identified in the literature. It can be understood from the responses of terminal operators that they perceive that the terminal fulfills all these measures. However, according to shipping lines the terminal only fulfills two of these measures and for the three of the measures the terminal is not perceived as supply chain integrated by the shipping lines. Based on the responses, it can be stated that the shipping lines think that the terminal operators see the shipping lines as strategic partners mutually designing the flow of container and information. Additionally, shipping lines believe that the terminal operators work together with the shipping lines to ensure higher quality of services. On the other hand, shipping lines think that their relationship with terminal based on contractual obligations rather that mutual trust. They also perceive that the terminal does not work together with shipping lines to reduce costs and the terminal does not evaluate/measure shipping lines' satisfaction.

7.2. Information and Communication Systems

Information and communication systems	Terminal Managers (TM)		Shipping Lines (SL)			
	TM1	TM2	SL1	SL2	SL3	SL4
Integrated EDI for communication	Yes	Yes	Yes	Yes	Yes	No
Integrated IT to share data	Yes	Yes	Yes	Yes	Yes	Yes
Computerized port service systems	Yes	Yes	Yes	Yes	Yes	Yes
Latest IT in the industry	Yes	Yes	Yes	Yes	Yes	No

Table 3 - Findings under the Parameter of ICS

Table 3 shows that all four measures of this construct. According to terminal operators' perceptions, the terminal is integrated to the supply chain under all the four measures. However, in the shipping lines' point of view, two out of the four shipping lines think that the terminal is fully integrated on the basis of its information and communications systems. Two out of the four shipping lines think the terminal does not use integrated EDI to communicate with them, terminal operators does not use integrated information systems sharing data with partners in the supply chain, the terminal does not adopt computerized terminal service system for the operations with shipping lines and terminal does not use latest IT technology in the industry. From these responses of the shipping lines it can be indicated that the shipping lines do not see the terminal as fully supply chain integrated as per its information and communication systems.

7.3. Value Added Services

Value Added Services	Terminal Managers (TM)		Shipping Lines (SL)			
	TM1	TM2	SL1	SL2	SL3	SL4
Facilities to add value to cargoes	Yes	Yes	Yes	Yes	Yes	No
Service adaptation to customers	Yes	Yes	No	Yes	Yes	No
Launch tailored services	Yes	Yes	No	No	No	No
Services to handle inter-mode transfers	No	Yes	No	Yes	Yes	No
Capacity to efficiently convey cargo	Yes	Yes	Yes	Yes	Yes	No
Tailored services to market segments	No	Yes	No	Yes	No	No

Table 4 - Findings under the Parameter of VAS

In the point of view of terminal operators, in terms of six measures of value added services, the terminal is fulfills all six measures. Summary of this construct illustrated in the table 4. When it comes to shipping lines' point of views, the terminal satisfies three measures of this construct. Three shipping lines think that terminal provides adequate facilities to add the value to the cargoes. Additionally, three shipping lines think that the terminal has the variety of services to handle the containers from one mode to another and the terminal has the capacity to convey cargo through the most diversified modes at the least possible time. On the other hand, three out of four shipping lines state that the terminal does not have capacity to meet customers' specifications, the terminal does not have the capacity to launch new tailored services should the need arise and the terminal does not have the capacity to deliver more tailored services to different market segments.

7.4. Multimodal Operations and Connectivity

Multimodal operations and connectivity	Terminal Managers (TM)		Shipping Lines (SL)			
	TM1	TM2	SL1	SL2	SL3	SL4
Connectivity for multimodal interface	Yes	Yes	Yes	Yes	Yes	No
Reliability for multimodal operations	Yes	Yes	Yes	Yes	Yes	No
Cost-effective multimodal operations	Yes	Yes	No	Yes	Yes	No
Efficient multimodal operations	Yes	Yes	No	Yes	yes	No

Table 5 - Findings under the Parameter of MOC

As it was stated in the table 5, out of four measures of this construct, terminal operators think that the terminal is supply chain integrated according to all four measures. According to shipping companies the terminal is supply chain integrated under three measures. They think that the terminal provides adequate connectivity to the multimodal interface; the terminal has reliable service operations for the multimodal interface and the terminal achieves efficient multimodal operations. On the other hand, three out of the four respondents do not perceive that the terminal provides cost-effective multimodal operations. As per shipping lines perception, the terminal is not fully supply chain integrated in essence of its multimodal connections and operations. In order to reach full integration in this construct, the terminal needs to satisfy the shipping lines' on the service level considering the price rates.

7.5. Supply Chain Integration Practices

Supply chain integration practices	Terminal Managers (TM)		Shipping Lines (SL)			
	TM1	TM2	SL1	SL2	SL3	SL4
Evaluate alternative routes for efficient transportation	Yes	Yes	Yes	Yes	Yes	No
Collaborate with channel members for channel optimization	Yes	Yes	No	Yes	No	No
Identify competing channels for cargoes that might flow through port	Yes	Yes	Yes	Yes	Yes	Not sure
Benchmark logistics/supply chain management options comparison with competing ports	Yes	Yes	Yes	Yes	Yes	Not sure
Identify least cost options for transport of cargoes to hinterland destinations	No	Yes	Yes	No	yes	No

Table 6 - Findings under the Parameter of SCIP

There are five measures under this construct and the summary of findings under this construct is illustrated in table 6. The terminal operators perceive their terminal is supply chain integrated under all of these measures. On the shipping lines' point of view, according to first measure, two shipping lines do not have enough knowledge that the terminal operator evaluates the alternative routes for more efficient transportation of containers via their terminal. It can be understood from these responses that it is not certain for the shipping lines that the terminal evaluates the alternative routes for more efficient transportation of containers via their terminal. Three out of four shipping lines think that the terminal operators do not collaborate with them for planning greater supply chain optimization. Responses for this measure suggest that the terminal needs to provide more involvement in the collaboration with shipping lines to improve supply chain optimization. Three out of four respondents believe that the terminal operators seek to identify other competing channels. Two out of four respondents believe that the terminal operators benchmark logistics options that are available for the containers in their terminal in comparison with other competing terminals. Two of the respondents stated that they do not have knowledge about the terminal makes such benchmarks. In the light of these responses it can be indicated that the terminal fulfills the both of these measures. For the response to the last measure in this construct, two out of four shipping lines believe that terminal operators seek to identify least cost options for the transport of container to the hinterland. The respondents stated that the terminal develop more and more rail solutions. However, the two of the respondents believe that it is the competition and infrastructure issues behind these rail solutions. In the essence of these responses, it can be understood that whatever is the motivation behind the rail solutions is can be interpreted differently but the terminal has well developed rail solutions which is the least cost option for the hinterland transportation. Thus, it can be said it is perceived by shipping lines that the terminal seeks to identify least cost options for the transport of container to the hinterland.

8. Discussion

With the respect of the analysis above, it can be seen that as per the terminal operators' perception the terminal is highly supply chain integrated in the essence on the measures of the container terminal supply chain integration constructs. On the contrary, shipping lines' point of view the terminal is relatively less supply chain integrated in comparison with terminal operators' perception. Additionally, with regard to supply chain integration of the terminal, the shipping lines indicated less charitable comments than the terminal operators. This perception difference between the two groups of respondent might be the result of the different focuses and priorities of the members of the two groups. Since both the terminal operators and shipping lines focus and their businesses' profitability and well being, they have their own priorities and those priorities do not always overlap with each other.

The relatively low perception of supply chain integration of the terminal by the shipping lines might be the result of the sale process of the Scandia Container terminal. In 2010, Skandia Container terminal split from the Port of Goteborg, for the reason to initiate for public sale. This issue is also indicated by all respondents from the shipping lines. The respondents believe that because of the sales of the terminal, terminal operators are more focused on their internal processes rather than paying attention to the customers' expectations. Some respondents added that because of the sale of the terminal, the terminal operators do not want to make investments on it. Thus this sales process might be one of the reasons for the low supply chain integration perception of the shipping lines.

As indicated in the literature review chapter, container terminals should be integrated in to the supply chain in order to compete with other container terminals. For some reasons, they might not be supply chain integrated as the theory suggests (Tongzon, J., Chang, Y.T. and Lee, S.Y., 2009). First of all, to achieve high level of supply chain integration, parties need to share information and there should be established trust between each other. In practice, it is difficult to achieve to have a relationship which is more based on mutual trust since companies are sensitive to share confidential information with outsiders. Other reason is that there is an issue of the division of the cost and gains resulted from the supply chain integration since there will be costs associated with the activities to extend the supply chain integration. At the last, the terminal is just one part of the supply chain so that all parts in the supply chain would have their own focuses and priorities. In this case, shipping lines' perception of lower supply chain integration of Skandia Container Terminal might have resulted from these reasons.

9. Conclusions and Recommendations

The overall aim of this study is to get deeper understanding of supply chain integration of container terminals by making an empirical study for evaluating supply chain integration of Skandia Container terminal. Objectives of this study are:

- Explore the identified parameters and variables of supply chain integration of container terminals
- Evaluate Skandia Container terminal operators' and users' views regarding supply chain integration of Skandia container terminal
- Formulate recommendations regarding supply chain integration of Skandia Container terminal

In this section, above mentioned objectives of this study will be revisited and a summary of finding will be provided. Then, conclusions will be drawn based on findings which are aimed to achieve objectives of this study. Finally, recommendations and limitations of this study will be revealed.

In order to achieve the first objective of this study, container terminal supply chain integration parameters which have been drawn by Panayides and Song are explored by reviewing relevant literature. These parameters include:

- Relationship with shipping lines
- Information and communication technologies
- Value added services
- Multimodal connections and operations
- Supply chain integration practices

In order to evaluate container terminal's supply chain integrations level, measures for each parameters have been developed by afore mentioned researchers. In this study, above mentioned parameters and measures were used for evolution of the terminal operators' and shipping lines' views regarding supply chain integration of Skandia Container Terminal.

The findings of this study reveals that there is a difference between the terminal operators' and shipping lines' perceptions regarding supply chain integration level of Scandia Container Terminal. The terminal operators believe that the terminal is integrated in supply chain in essence of all the parameters and measures which are described earlier. On the other hand, in the shipping lines' point of view, the terminal is perceived relatively less supply chain integrated in comparison with terminal operators' perceptions. On this point of view, the results of the empirical study seems to be overlapping with the study of Panayides and Song (2006) which pointed out that majority of the terminal operators perceive that their terminal is fully integrated into the supply chain.

The findings pointed out that in the perception of the shipping lines the weakest parameters are "relationships with shipping lines" and "provision of value added services". Additionally, most complained issues by the shipping lines were the costs arising from the terminal and the long truck queues. The shipping lines also expect more collaboration from the terminal operators' side with regard to their expectations and requirements. On the other hand, all of the shipping lines pointed out their gratitude about the well developed rail solutions in Skandia Container Terminal.

9.1. Recommendations

Some recommendations can be drawn from the above conclusions. First of all, it is significant that terminal operators evaluate their supply chain integration level on the basis of the perceptions of their supply chain partners (such as shipping lines, rail operators, truck operators and shippers) along with their own perspectives. It is likely that there would be significant differences in the perceptions.

As indicated in the conclusions, there are significant differences between shipping lines' and terminal operators' perceptions regarding to supply chain integration level of Skandia Container terminal. It is strategically important to reduce this difference to a minimum level since the shipping lines play an important role in the selection of container terminals.

In essence of the findings which indicate the perception of shipping lines, it is possible to produce series of recommendations for the terminal operators to reduce this perception difference. Since the one of the weakest link is the relationship with shipping lines, the terminal operators should identify their strategy with regard to management of the customer relations. They should also make meetings periodically with shipping lines in order to evaluate/measure their satisfaction from the services of the terminal. Additionally, they should work together with shipping lines to reduce costs. With respect to provision of value added services, which is the second weakest link, the terminal should try to meet customers specifications and provide more tailored services should the need arise. Concerning the multimodal connections and operations of the terminal, the terminal operators should adopt a pricing policy which benchmarks in comparison with other container terminal in the region. While setting up this pricing policy, terminal operators should also consider the shipping lines' extra costs arising from additional voyage of ocean going vessels calling Skandia Container Terminal instead of other terminals in the continent. The terminal operators should also try to collaborate with shipping lines to improve supply chain optimization. Regarding the information and communication system of the terminal, while designing the terminal's operating system and information flow, the terminal operators should consider the partners expectations and opinions.

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Appendix 1- Interview Questions for Skandia Container Terminal Managers

1. Do you view the shipping lines or other partners as strategic partners in mutually designing the flow of goods and information?
2. Does your relationship with the shipping lines or other partners is more based on mutual trust rather than on contractual obligations?
3. Do you work together with the port users to ensure higher quality of services?
4. Do you work together with port users to reduce costs?
5. Do you frequently measure and evaluate port users' satisfaction?
6. Do you use integrated electronic data interchange to communicate with partners in the supply chain for example shipping lines, shippers etc.
7. Do you use integrated information systems to share data/information with partners in the supply chain for example shipping lines, shippers etc.
8. Do you adopt computerized port service systems for your operations with supply chain partners (shipping lines, shippers, etc.)?
9. Do you use the latest IT technology in the industry to support supply chain goals.
10. In your terminal, do you have adequate facilities for adding value to cargoes (container storage, container loading/unloading, container repair, warehouse for partial cargo, stuffing, stripping, full inspection, inspection and sampling etc)
11. Do you have the capacity to adapt a service to meet the customers' specifications?
12. Do you have the capacity to launch new tailored services should the need arise.
13. Do you have a variety of services (e.g. cross-docking, etc.) to handle the transferring of cargo from one mode to another?
14. Do you have the capacity to convey cargo through the most diversified routes/modes at the least possible time?
15. Do you have the capacity to deliver even more tailored services to different market segments?
16. Does your terminal have adequate connectivity for the multimodal interface?
17. Does your terminal have reliable service operations for the multimodal interface?
18. Does your terminal provide cost-effective multimodal operations?
19. Does your terminal achieve efficient multimodal operations?
20. Do you evaluate alternative routes for more efficient transportation of containers via our terminal?
21. Do you collaborate with other supply chain partners (e.g. shipping lines, shippers, etc.) to plan for greater supply chain optimization?
22. Do you seek to identify other competing supply chains for containers that might flow through our terminal?
23. Do you benchmark the logistics/supply chain options available for cargoes that will flow through your port in comparison with alternative routes via competing ports?
24. Do you seek to identify least cost options for the transport of cargoes to hinterland destinations?

Appendix 2 - Interview Questions for Shipping Lines

1. Do you think the port view you as strategic partners in mutually designing the flow of goods and information?
2. Do you think your relationship with the port is more based on mutual trust rather than on contractual obligations?
3. Do you think the port works together with the port users to ensure higher quality of services?
4. Do you think the port works together with port users to reduce costs?
5. Do you think the port frequently measures and evaluates port users' satisfaction?
6. Does the terminal use integrated electronic data interchange to communicate with your company?
7. Does the terminal use integrated information systems to share data/information with your company?
8. Does the terminal adopt computerized port service systems for its operations with your company?
9. Does the terminal use the latest IT technology in the industry to support supply chain goals?
10. Does the container terminal have adequate facilities for adding value to cargoes? (container storage, container loading/unloading, container repair, warehouse for partial cargo, stuffing, stripping, full inspection, inspection and sampling etc)
11. Does the container terminal have the capacity to adapt a service to meet the customers' specifications?
12. Does the terminal have the capacity to launch new tailored services should the need arise.
13. Does the terminal have a variety of services (e.g. cross-docking, etc.) to handle the transferring of cargo from one mode to another?
14. Does the terminal have the capacity to convey cargo through the most diversified routes/modes at the least possible time?
15. Does the terminal have the capacity to deliver even more tailored services to different market segments?
16. Does the terminal have adequate connectivity for the multimodal interface?
17. Does the terminal have reliable service operations for the multimodal interface?
18. Does the terminal provide cost-effective multimodal operations?
19. Does the terminal achieve efficient multimodal operations?
20. Does the terminal evaluate alternative routes for more efficient transportation of containers via the terminal?
21. Does the terminal collaborate with your company to plan for greater supply chain optimization?
22. Does the terminal seek to identify other competing channels for containers that might flow through the terminal?
23. Does the terminal benchmark the logistics/supply chain options available for cargoes that will flow through the port in comparison with alternative routes via competing ports?
24. Does the terminal seek to identify least cost options for the transport of cargoes to hinterland destinations?