University College of Southeast Norway

The Relationship between Port Stakeholders and their Supply Chain Strategies: Empirical Evidence from the Oslo Fjord Region

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Abstract

Purpose: The purpose of this thesis is to investigate the choice and the effect of port stakeholders' supply chain strategies and their effect on port performance.

Design/methodology/approach: In this study, a qualitative research methodology is applied. Semi-structured interviews were conducted to collect data from various port stakeholders (located in the Oslo Fjord region). The collected data was analyzed by using NVivo software.

Findings: The findings of this study illustrate various port stakeholders' objectives and constraints related to the facilitation of corresponding supply chains. Once those factors are recognized, the supply chain strategies for port stakeholders are identified - port authorities apply lean or leagile supply chain strategy, port operators tends towards leagile supply chain strategy and port users employ agile supply chain strategy. Additionally, various port stakeholders' perceptions on how their supply chain strategies are contributing to the port performance – as improvements in efficiency and responsiveness - are acknowledged.

Contribution: This thesis contributes to knowledge creation of port authorities', port operators' and port users' supply chain strategies, while considering the impact on port performance.

Originality: This thesis strengthens empirical literature of Oslo Fjord port sector.

Keywords: Supply chain management, supply chain strategy, port stakeholders, port performance.

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1. Introduction

Nowadays ports hold immerse economic and strategic importance because they facilitate international trade and set location's global competitiveness by attracting a variety of economic activities (Zhang, Lam, & Huang, 2014; Wang, 2011; Lam, 2015). Ports are strategically positioned in global supply chains and offer a dynamic environment where value-added services interact with a complex transport and logistics systems, redefining ports' role towards an efficient distributor of products across corresponding supply chains (Pettit & Beresford, 2009). This has increased the necessity for integrated logistics and transport services, making ports and their operations an indivisible part of supply chain management (Panayides, 2006). Supply chain management for port sector stakeholders provides understanding about necessary resources and activities to become an effective part of the supply chain network and improve added-value creation components (Ascencio, Gonzalez-Ramirez, Bearzotti, Smith, & Camacho-Vallejo, 2014).

The United Nations Conference on Trade and Development (UNCTAD) has illuminated the main transformations in global patterns of port activities by creating Generation Port Model (see Table 1.1). This model conceptualizes the transition of ports through illustrating the increasing integration of ports within the logistics and transport service networks and the development of port-related added-value logistics activities (Review of Maritime Transport, 1990; Coto-Millan, Angel-Pesquera, & Castanedo, 2010). This has resulted in structural and operational changes in port environment leading towards more complex linkages and relations between various port-related stakeholders and customers (Pettit & Beresford, 2009).

Port related research (Tongzon, Chan, & Lee, 2009; Herz & Flaming, 2014) acknowledges that the competitive advantage of different port stakeholders is based on operational efficiency, port's location and port's ability to provide and generate extra value from and to their respective supply chains. However, port stakeholders such as port

authorities, port operators and port users are strategically interdependent on each other, and this strategic connection strongly affects port's performance and port stakeholders' competitiveness (Song & Parola, 2015). Furthermore, the organizational complexity of port environment and port-related stakeholders is increasing and by that creating multi-directional stimulus towards port authorities, which interfere with ports' capabilities of responding proactively to market dynamics (Song & Parola, 2015). To cope with this situation and to manage ports' logistics systems, port authorities are transforming their role by implementing managerial and entrepreneurial activities (Cepolina & Ghiara, 2013).

Table 1.1 The Four Generations of Ports

Generation of port	Characteristics	Ports role in global supply chains
First generation Prior to 1960	• Exchange functions between two modes of transport • No development strategies for port development • No management of offered services and storages • Port activities are based on the quay • Authorities and agencies are overlapping • Supply dominates	• Provides low value-added • Limited hinterlands for most ports
Second generation After 1960	• Transport centre for its environments' commercial and industrial activities • With transformation activities, services to the ships • Development and expansion strategies of the port area • Closer relations between port and its users • Relationships between the city and the port	• Cargo transformation and improved value-added services • Development of inland container deports (ICD)
Third generation Since 1980	• Integrated transport centre/logistics platform for international trade with development strategies • Distribution centre of goods and logistics activities • Implementation of information systems in the port (EDI) • Rational usage of port spaces • United and active port community, coordinating activities • Close relationships between the city and the port	• Development of distriparks • Integration of port with trade and transport chain • High value-added • Emergence of port clusters
Fourth generation Since 2000	• Network of physically separated ports (terminals) linked through common operators (or common administration) • Internationalization strategies and variety of activities • Organization of logistics services by dockers • EDI network integrated into port areas • Search for port spaces distributed abroad • Cooperation between port communities	• Vertical integration of ports with global logistics services • Lean and agile logistics • Port centric logistics

(Adapted from Coto-Millan, Angel Pesquera & Castanedo, 2010, p. 251; Pettit & Beresford, 2009, p. 256)

Increasing role of ports in the logistics and transport systems and intrinsic complexity of ports' operations, provide valuable content for the strategic management research. This

emerging research area has, particularly, focused on the strategic actions of port stakeholders due to the development of global supply chains (Van der Lugt, Dooms, & Parola 2013; Zhang et al., 2014). Studies (Tongzon et al., 2009; Zhang et al., 2014) indicate, that port stakeholders are confronting difficulties to identify suitable strategic intents and fundamental capabilities of their operations by emphasizing that there is significant gap between various port stakeholders' strategic objectives. There is a need within the industry for improvement of mutual understanding between port stakeholders to enhance coherence between integrated ports' logistics systems and port stakeholders' supply chain strategies (Herz & Flaming, 2014).

Research (Song & Panayides, 2008; Jacobs & Hall, 2007; Song & Parola, 2015) has emphasized that strategically adopted supply chain integration practices positively influence port performance and it increasingly depends on port stakeholders' strategic relationships to other supply chain actors. However, Talley, Ng, & Marsillac (2014) notes that port performance literature is emphasising ports' quayside operations without connecting them with the other actors of the port's supply chain network. This is resulting in inadequate view on port performance. The increasing role of ports in the logistics and transport systems invites for a more comprehensive examination on this issue – coherence of port stakeholders' supply chain strategies, while assessing the impact on port performance.

The aim of this study is to investigate the port stakeholders' supply chain strategies and how these strategies contribute to the port performance from efficiency and responsiveness spectrum. This thesis covers port stakeholders' located in the Oslo Fjord region. A qualitative approach is applied to collect the required data from port stakeholders' about their supply chain strategies in connection with port performance. To examine my research question, first the antecedents – objectives and constraints - of port stakeholders' supply chain management are investigated. It follows with the examination of the relationships between supply chain

objectives and constraints by defining supply chain strategies of various port stakeholders. Finally, the supply chain strategy is linked with port performance to identify the contribution.

This thesis has six chapters. After the introduction chapter, the following chapter summaries previous and current research on the importance of port integration, supply chain management, strategic port stakeholders and their strategies in accomplishing better port performance. This chapter concludes by developing research model based on reviewed theoretical principles. Chapter 3 addresses the methodology and the subsequent chapter cover data analysis and results. Chapter 5 outlines discussion, limitations and recommendations for further research. In the last chapter, concluding remarks are given.

2. Literature review

This chapter provides systematic examination of academic literature within port research. The first section reviews port literature relevant to the supply chain integration and management. It is followed with examination of multi-layered port actor landscape and their conflicting interests. The third section provides review on conceptualization of the ports from the strategic management perspective. The fourth section presents concepts of the port performance in era of supply chain management. To conclude this chapter, research model is developed based on reviewed theoretical underpinnings.

2.1 Port and supply chain integration

Discussions about the port integration into supply chains are often based on paradigm – ports as elements in value-driven chain systems, arguing that paradigms – ports as places, ports as operating systems, ports as economic units and ports as administrative units - are no longer valid for characterizing the complex nature of today's ports (Robinson, 2002). Ports have changed from their centre-stage positions as being an independent interface of cargo

exchange, into elements in value-driven logistics chain systems as substantial link of global and regional supply chain networks (Robinson, 2002; Verhoeven, 2010). Robinson (2002) claims that port is third party service provider of value-driven chain system, which requires clear indication of its value propositions by choosing the right customer segmentation. By pointing out the changing role of the ports, Carbone & de Martino (2003) argues that integration practices of port operators are increasing port's competitiveness. This statement is based on investigation of the role of every operator involved in the automotive supply chain for the case of Le Havre port (Carbone & de Martino, 2003).

However, Song & Panayides (2008) points outs the fact that despite the extensive research in this area, there is incomplete conceptualization of port and terminal integration practices. Therefore, Song & Panayides (2008) are conceptualizing measures of port integration by giving a perspective towards ports' competitiveness from supply chain integration aspect. Six parameters meant for assessing the degree of port integration were developed and subsequently tested - value added services, information and communication technologies, inter-connectivity with inland modes of transport, relationships with shipping lines and inland transport operators, and channel integration (Song & Panayides, 2008). As a result, they claim that there are positive relationships between various parameters and port integration (Song & Panayides, 2008). Panayides & Song (2009) proceeds from the same aspect by limiting measurements to four key parameters - supply chain integration practices, value-added services, information and communication systems and multimodal systems. These dimensions are documented as support assistance on how better practice supply chain integration strategies for container terminals by helping port executives to understand customer expectations (Panayides & Song, 2009).

Following this rationale, Panayides & Song (2009) integration measurement parameters are applied in practice where Tongzon et al. (2009) studies port operator and port user supply

chain management perspectives by questioning the level of supply chain orientation within the port sector, and controversially concluding that ports in reality are not as supply chain oriented as literature proposes. Tongzon et al. (2009) argues that results indicate that there is a significant gap between the perceptions of the terminal operators and the shipping lines, particularly, within the value-added services field. By trying to limit this gap, Herz & Flaming (2014) emphasis the need for improvement of mutual understanding between port users and port operators and for better consensus between integrated port logistics system and port users' supply chain strategies.

The latest contributions to port integration practices into supply chains are significantly different. By taking recommendations from previous research, supply chain integration is approached from other industry's perspective – biofuel industry - by defining the value propositions of activities and resources that a port needs in order to integrate within the specific supply chain network (Stevens & Vis, 2015). Stevens & Vis (2015) states that port authorities can accomplish integration within the supply chain by forming a clear idea of its value propositions and by increasing their role beyond the function as supply chain facilitator, but towards initiator and coordinator, supported with execution of value-added activities in the port area and performing as a knowledge centre.

Different approach presents Clott & Hartman (2016) arguing that ports have conventionally been focus of maritime supply chains but changing production and manufacturing patterns are supporting notion of greater endwise visibility by customers and approachability to key inland population centres. Clott & Hartman (2016) notes that there is lack of research about hinterland networks efficiency, which is effected by a large group of stakeholders, emphasizing that there has to be active and trusted involvement of representatives of the public to articulate the benefits of supply chain integration.

Port integration into supply chain networks have been studied from various aspects (see

Table 2.1). However, research shows controversial results, declaring that ports today are not as supply chain focused as theory claims.

Table 2.1 Port and supply chain integration

Study	Research objective	Findings
Robinson (2002)	Examines ports' functions and operational activities in supply chains	Ports play a vital role in value chains
Carbone & de Martino (2003)	Analyses port operators integration practices	Higher integration amid supply chain actors rises the performance of the entire supply chain
Song & Panayides (2008)	Develops parameters of port integration in supply chains	Positive relationships between parameters and port integration
Panayides & Song (2009)	Develops parameters of port integration in supply chains	Dimensions used as support on how to better manage a supply chain integration
Tongzon, Chang, & Lee (2009)	Measures port operator/port user supply chain orientation	Perceptions between the terminal operators and shipping lines not matching
Herz & Flaming (2014)	Examines port stakeholders supply chain management perceptions	Port represents a potential threat and opportunity for shippers
Stevens & Vis (2015)	Examines operational performance of ports integration into supply chain	Port authority achieves integration by extending their role as initiator/coordinator of flows
Clott & Hartman (2016)	Supply chain integration from landside operations/port accessibility perspective	Supply chain seeks for places that offer mobility, accessibility and integration potential

2.2 Ports in multi-layered network

The growing complexity of port environment due to embeddedness into supply chains has created port system network of stakeholders that carry out a number of activities and inter-organizational relationships are most significant strategic assets, because these relationships involves collaborations, which create access to other stakeholders' resources and by that contributes to the added-value creation (Zhang et al., 2014; Song & Parola, 2015). Talley (2009) divides port actors into port users and port service providers. Port users are the ones that demand and utilize port services - sea and land based carriers as well as shippers and passengers, but port service providers are ones who supply the needed services - port operators, port authorities, terminal operators, stevedores, ship agents, freight forwarders, third-party logistics companies, etc. (Talley, 2009).

But, as studies confirm (see Table 2.2), due to ports' increasing complexity, port stakeholders and customers request ports to improve their flexibility and awareness of socio-

economic and environmental matters in order to maintain operational goals and international competitiveness (Song & Parola, 2015). This has made platform for stakeholder and conflict management.

Table 2.2 Port stakeholders and conflicts of interests

Study	Research objective	Findings
De Langen (2007)	Analysis of conflicting interests in ports	Five conflicts of interests are identified; All related to economic development of ports
Verhoeven (2010)	Examines the port authorities' role under the pressure of stakeholders	Four governance-related factors have been identified
Parola & Maugeri (2013)	Investigates the nature of the main conflicts arising in ports	Conflicts arise due to the variety of stakeholders involved in port operations
Dooms, Haezendonck, & Verbeke (2015)	Develops guidelines for conflict management	Research shows multiplicity in measures of economic impacts
Notteboom, Parola, Satta, & Penco (2015)	Application of stakeholder management principle to port sector	Increasing attention on matters related to the broader community

De Langen (2007) argues that due to the fact that port's economical development is influenced by various stakeholders, it creates the base for an conflicting interests. After analyizng the interests of various stakeholders, De Langen (2007) have identified five areas of conflict – environemtal protection versus port development, urban development versus port development, labour conditions versus port development, resident interests versus port development, and overall economic development versus port development. Establishment of proper practices for conflict resolution are seen as solution for contributing to a prompt and effective resolution, which subsequently will improve port's competitiveness (De Langen, 2007). Verhoeven (2010), particularly, claims that the higher bargaining power of port stakeholders, the relations with government, and the pressure of society position port executives to be elaborated in various matters. This has resulted into multi-directional influence on port authorities, which leave them confounded with the issue of reacting pro-actively to market dynamics and of satisfying the expectations and objectives of the various stakeholders (Verhoeven, 2010; Parola & Maugeri, 2013; Song & Parola, 2015).

Parola & Maugeri (2013) proceeds this topic from stakeholders' view towards various

types of port conflicts and its impact on port management. Parola & Maugeri (2013) arguments are similar that the "*conflicts are central due to the multiplicity of stakeholders involved in port operation"* (p.120)*,* adding new elements as *" the importance of port organization and economy in the performance of logistics chains, the nature and the scope of negative externalities created by the port, and the growing antagonism between ports and cities"* (p.120). Despite the fact that ports generate added value and employment, local societies recognize ports from negative aspect as adverse contribution to environmental pollution, security risks and traffic congestions (Parola & Maugeri, 2013). Parola & Maugeri (2013) concludes that port's complex role in logistics and transport networks as well as in local regions inevitably makes ports a prodigious origin of conflicts (Parola & Maugeri, 2013).

Due to that, Dooms, Haezendonck, & Verbeke (2015) discusses socio-economic issues by emphasising that port authorities progressively need to interconnect with a variety of stakeholders in order to sustain, support and strengthen the societal acceptance of port activities. The legitimate stakeholder management tool is seen as solution for this situation (Dooms et al., 2015). Notteboom, Parola, Satta, & Penco (2015) advises that communication strategies could be one way how to adopt disclosure to critical issues arguing that supply chain networks has activated debates on the suitability of the authorities' arrangement of ports. The results reflect relative increase of the focus on the community-linked matters such as the environment, safety and security (Notteboom et al., 2015).

2.3 Port sector strategic landscape

Intrinsic complexity of port operations and port's logistics systems is forcing port authorities to modify their role by developing appropriate strategies (Var der Lugt, Dooms, & Parola, 2013; Cepolina & Ghiara, 2013). Van der Lugt et al., (2013) confirms the significance

of port strategy formulation and analysis due to the port authorities development from landlords *"that are strongly embedded in the public domain to more autonomous acting organizations with stronger requirements for 'business like' performance"* (p.103). Strategic challenges', which port authorities encounter in current port environment,

> *Reflect the evolution in strategic management thinking, whereby more actor-related attributes are added to the various research frameworks, loosening the traditional strict conditions of profit maximization, rationality and transparency and whereby more integrated concepts like co-evolution and network theory gain importance* (p.103) (Van der Lugt et al., 2013).

This 'strategic management thinking' tendency is notable from studies illustrated in Table 2.3.

Table 2.3 Port strategic management

Study	Research objective	Findings
Focus on port strategies		
Lugt, Dooms, & Parola (2013)	Defines port authorities as an organization that needs strategic thinking	Port authorities are value sharing organizations with strategic intent
Cepolina & Ghiara (2013)	Demonstrates the strategic role of ICT in port and logistic systems' development	Every link of the supply chain has to demonstrate the highest efficiency
Song, Cheon, & Pire (2015)	Examine the motivations for ports to opt for coopetition	Ports are aimed at achieving a beneficial situation; Coopetition is not key factor
Focus on port stakeholder supply chain strategies		
Jacobs & Hall, (2007)	Defining port supply chain strategies from territorial embeddedness perspective	Three strategies identified-insertion, integration and dominance
Mangan, Lalwani, & Fynes (2009)	Traditional and emerging roles of ports in the SCM practice from strategy context	Identification of the various roles for ports within the four supply chain designs
Pettit & Beresford (2009)	Examination of ports role within the supply chain	Understanding of ports position in supply chains leads to clear focus
Zhang, Lam, & Huang (2014)	Port strategy from supply chain perspective	It is crucial for the port to reinforce its fundamental capabilities in agility
Robinson (2015)	Principles of cooperation in the wider context of business strategy	Cooperation strategies will cause the responsiveness of the regulators

Song, Cheon, & Pire (2015) approaches port strategy from coopetition aspect, claiming that coopetition is developing and progressing strategy for ports. This strategy assists with proper response to the extremely dynamic market environment and by embracing this strategy, ports will compete and cooperate to accomplish common goals (Song et al., 2015).

This study investigates reasons for ports to choose coopetition strategy, claiming that it is advantageous for all ports to consider appliance of coopetition strategy in way of developing network of logistics activities and services (Song et al., 2015).

Evolution of port strategies has led to the focus on port stakeholder strategic management from global supply chain strategies perspective. Jacobs & Hall (2007) approaches this matter by dividing supply chain strategies in three categories – insertion, integration and dominance. As described by Jacobs & Hall (2007), initially, port stakeholders insert themselves in supply chain networks, because it provides access to vital assets and resources as knowledge, technology, expertise, capital and markets. Next, Jacobs & Hall (2007) notes that when port stakeholders are inserted in supply chains, they are integrating their activities within the supply chains to decrease costs and increase efficiency of their services. Subsequently, port stakeholders operating within supply chain network reaches for dominance to sustain control over their owned rare capabilities and potentials or exploiting economies of scale (Jacobs & Hall, 2007).

However, Jacobs & Hall (2007) approach towards supply chain strategies within port sector is methodologically different than the foundation for research on supply chain strategy - focal work of Marshall L. Fisher (1997) - where he propositioned two supply chain strategies - physical efficiency and market responsiveness. This approach can be linked with other supply chain strategy perspective, which distinguishes strategies between lean, leagile and agile supply chains (Christopher, Peck, & Towill, 2006).

When it comes applying this theory to the port sector, Mangan, Lalwani, & Fynes (2007) aims to categorize the role of ports from different supply chain management practices and strategic perspectives (lean and agile philosophies) by pointing out that it is imperative that ports strengthen the activities and tactics relevant to their nature and environment (see Appendix A). Mangan et al. (2007) notes that ports with enhancing their corresponding

supply chains by making them more efficient and effective, also add value to their own environment in terms of profit and further investment in development.

Pettit & Beresford (2009) follows this research with more detailed investigation of port development patterns towards logistics hubs, and advising that it is advantageous for ports to have a distinct understanding about their position and fit within various supply chains because it allows more accurately to focus and support their capabilities in terms of facilities and needed activities. Following Mangan et al. (2007) conceptualization of ports, Pettit & Beresford (2009) extends this approach by categorizing ports' strategies with focus on the range of ports' activities (see Appendix A).

When approaching this strategy concept from supply chain management perspective within port sector, Pettit & Beresford (2009) and Mangan et al. (2007) emphasis that "*which supply chain strategy is chosen will depend on the predictability of demand for products, the lead time for replenishment of stocks and the logistics philosophy adopted i.e. lean and agile or 'base and surge'"* (p.265). Pettit & Beresford (2009) explains that "*lean systems are designed to cope with predictable base demand while agile capability is designed to suit periodic surges such as seasonal demand peaks, end of week stockpiling and other high demand events such as product promotions" (p.263)*.

Zhang et al. (2014) also applies lean and agile philosophy, insisting that adequate port strategy has to incorporate supply chain focus. The analysis of Hong Kong's free port's case was conducted, arguing that this port's strategic fit is for the high-value and time-sensitive shipments, and due to that - port should apply agile strategy to facilitate corresponding responsive supply chains (Zhang et al., 2014). Practicing agile strategy would support port's main capabilities in agility and improving the efficiency of port's operations (Zhang et al., 2014).

However, the latest literature (Robinson, 2015) suggests different approach - cooperation strategies. Cooperation is rare and not easy to accomplish because supply chains and 'process of cooperating' are highly complicated matters due to antitrust legislation and competition policy (Robinson, 2015). Robinson (2015) discusses that it is necessary to reconsider the cooperation principles within the wider framework of the competitive behaviours of companies and their business strategies.

2.4 Port performance assessment in era of supply chain management

The previous discussions about the various changes within port environment have put a lot of focus on port performance and its measurement. However, it is important to note that this study does not intent to develop port performance measurement tool, but identify different port stakeholders supply chain strategies and analyse their perceptions towards supply chain strategies' effect on port performance.

The serious curiosity about the port performance measurement started decade ago, when Marlow & Paixao (2003) noted the changes in port environment and advised to employ qualitative measures, which would provide information about the quality of offered services. Characterizing ports as agile institutions, Marlow & Paixao (2003) emphasis the need for internal and external measures in order to make the port environment more transparent, and by that stimulating higher integration of entire supply chain's logistics elements. Applying concepts of 'leanness' and 'agility' in a port environment, suggested qualitative measures are multimodal process, interface performance measurement, transport modes performance measurement and infrastructure performance measurement (Marlow & Paixao, 2003).

Bichou & Gray (2004) and Bichou (2007) approaches port performance by conceptualizing port performance from logistics and supply chain management perspectives arguing that physical, economic and financial indicators, and factor productivity are not

providing sufficient measurement spectrum. Bichou & Gray (2004) and Bichou (2007) notes that most of the port performance literature is overlooking processes of the port operating system and disregards other actors within the port's supply chain network. Results showed that ports in general are aware of their logistics capabilities' potential, however, there is absence of an understanding of supply chain management concepts and which practices to apply for identification and assessment of performance (Bichou & Gray, 2004; Bichou, 2007).

Following studies apply the same general idea towards port performance measurement. Beresford, Woo, & Pettit (2011) argues that ports as a significant link in supply chain have other activities, which can be measured as performance of other supply chain actors, leanness, agility and time compression. Beresford et al. (2011) determines that logistics operations positively contribute to port performance. De Langen & Sharypova (2013) notes that regardless of increasing amount of port performance measures, there are no clear standards, suggesting that increasing attention for port performance indicators and that port authorities will be increasingly pressured to report port performance indicators that allow comparison between ports, as one such indicator naming intermodal connectivity.

Low, Lam, Tang, & Lan (2013) is focusing on port performance improvement as part of seaborne cargo supply chain by giving insights for providers and consumers of the port services, claiming that previous research mostly focused on provider's perspectives. Furthermore, Talley, Ng, & Marsillac (2014) approaches port performance from a port service chain model claiming that the conventional port measurements focuses on sea access but not on land-side connections and port performance has not been assessed from the perspective of the individual services and land-side efficiency. Due to this limitation, the distinctive methodology is adopted by employing the port service chain concept for the evaluation of the port's performance from separate services perspective (Talley, Ng, & Marsillac, 2014).

The latest literature (Langenus & Dooms, 2015) approaches port performance by developing framework based on mapped academic literature about the performance measurement and management of the meso-level. Langenus & Dooms (2015) pinpoints that implementing a multidimensional data management instrument provides the port and port-related stakeholders with information of their performance and value creation from effectiveness and efficiency spectrum, which supports managerial value of conducting analyses and strategy formulation.

However, port performance literature does not exactly explain the connection with suggested new parameters in relation to port performance - efficiency and responsiveness accordingly (Beskovnik & Twrdy, 2011). Due to that, it might be beneficial to consider Supply Chain Decision-Making Framework (Chopra & Meindl, 2010), which introduces the notions for strategic fit. First, it is advised to have comprehensive understanding about the customer and supply chain uncertainty and its capabilities (Chopra & Meindl, 2010). This leads towards of achieving strategic fit and by that defining performance of the supply chain in terms or efficiency and responsiveness (Chopra & Meindl, 2010) (see Figure 2.1).

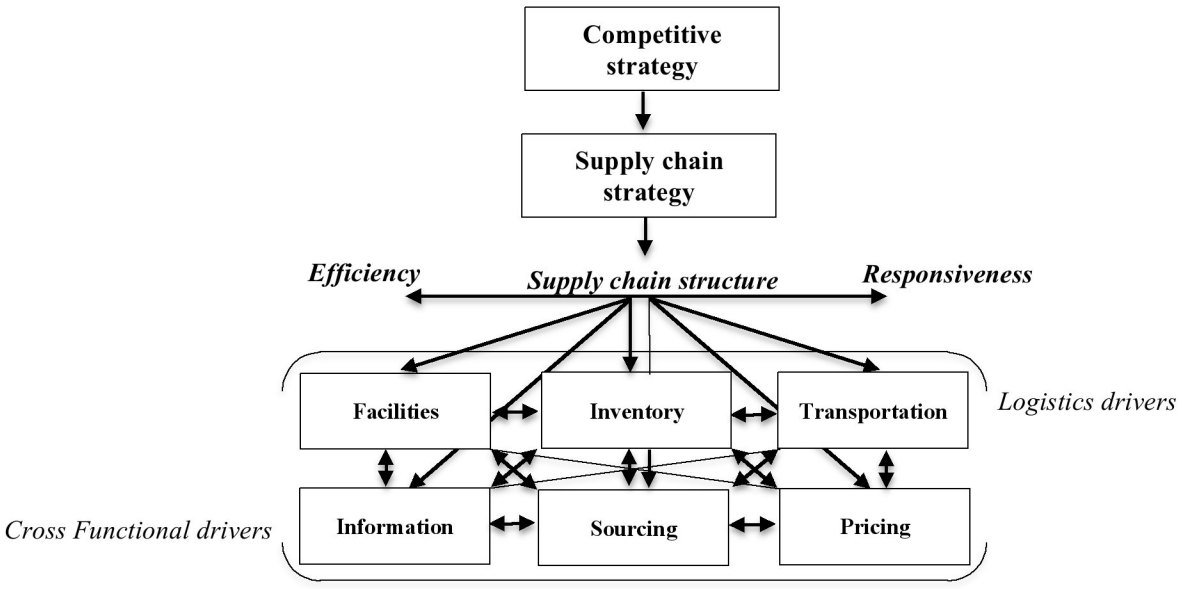


Figure 2.1 Supply chain decision-making framework
(Adapted from Chopra & Meindl, 2007, p. 47).

It can be noted that port research literature have focused on developing new port performance measurement tools, stimulated by the changes in the port environment (see Table 2.4). However, despite of the development of various conceptual models that emphasizes the recognition of soft values' measurement, there still has not been developed mutual port performance measurement system, due to ports' imposed organizational dissimilarities.

Table 2.4 Port performance assessment concepts

Studies	Research objective	Findings
Marlow & Paixao Casaca (2003)	Development of lean port performance indicators	Lean port measurement indicators bring visibility within the port environment
Bichou (2007)	Conceptualizing port performance from supply chain management approach	There is a interest, but lack of awareness about supply chain management concepts
Beresford, Woo, & Pettit (2011)	Develop and adapt new measures of the current role of ports as logistics centres	Logistics activities positively contribute to port performance
Low, Lam, Tang, & Lan (2013)	Improvement of port performance as part of a seaborne cargo supply chain	Hong Kong and Rotterdam are the most efficient port systems
De Langen & Sharypova (2013)	Development of port performance indicator: intermodal connectivity	Port performance indicators are increasing but standards are lacking
Talley, Ng, & Marsillac (2014)	Evaluation of port performance by using port service chain concept	Port is effective when operating objective of port service is optimized
Langenus & Dooms (2015)	Port performance measurement from the meso-level	Multidimensional data management tool

2.5 Research model

It is obvious that various aspects have to be considered for identification of appropriate supply chain strategy for particular port stakeholder. Trent (2007) notes that effective strategy consists of both assessment of objectives and constraints, quoting Richard Vancil of Harward University that,

> *The strategy of an organization, or of a submit of a larger organization, is a conceptualization, expressed or implied by the organization's leaders, of long-term objectives or purposes of the organization, the broad constraints and policies that currently restrict the scope of the organization's activities, and the current set of plans and near-term goals that have been adopted in the expectation of contributing to the achievement of the organization's objectives* (p.108).

Due to that, research model was developed based on various supply chain management dimensions considered in literature review (see Figure 2.2).

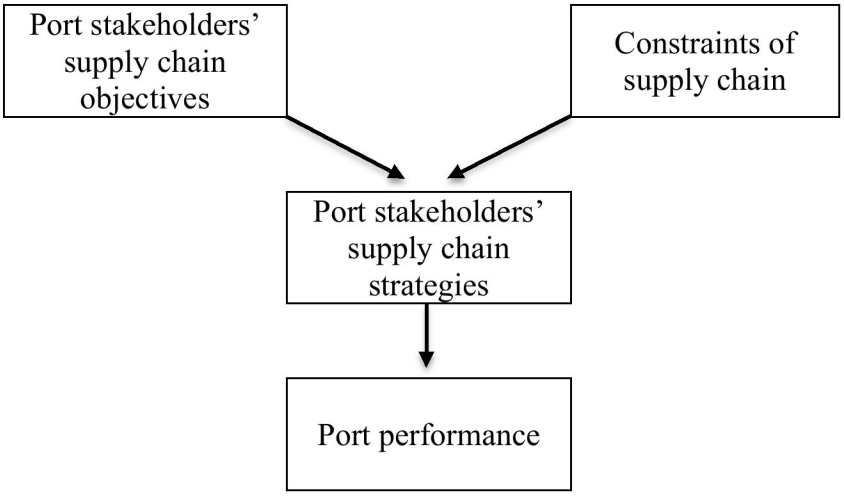


Figure 2.2 The research model

The theoretical framework is structured following rationale:

1) Identification of the objectives of supply chain management from various port stakeholders' perspectives. Identification of supply chain management objectives is essential for composing appropriate assistance and facilitation of port sector functions and their corresponding supply chains and to fulfil demands of the customers;

2) Identification of constraints of supply chain management within particular port sector. Identification of main constraints of port stakeholders' supply chains is essential for the recognition of the any element that might hinder the efficiency or responsiveness within supply chain in the particular environment;

3) Identification of the supply chain strategies of port stakeholders;

4) Identification of port stakeholders' perceptions on port performance from supply chain strategy perspective. This will allow identifying efficiency and responsiveness perceptions of port stakeholders.

3. Research methodology

This chapter describes the applied research methodology in order to answer the research question of this thesis. The first section introduces with research strategy and design. The second part proceeds by illustrating the data collection process. Then it follows with third part - the explanation of undertaken data analysis. This chapter concludes with overview of reliability, validity, and ethical considerations.

3.1 Research strategy, design and conceptual framework

Ports' dynamic, complex and unique environments provide prosperous and interesting research content for the strategic management. Therefore, after practical considerations the research strategy of this thesis is designed in qualitative approach based on semi-structured interviews. The qualitative research strategy is identified as the most suitable research strategy for this study because it supports comprehensive understanding by benefitting of abundance and holism of data (Miles, Huberban, & Saldana, 2014). This research strategy will answer research question of this thesis by getting more comprehensive understanding of port stakeholders' supply chain strategies and how these strategies are influencing port performance.

Decision about which research design to apply, same as research strategy, has to be based on investigated research question. Research design for this thesis is constructed in multiple-case study design. This design supports comparison to identify distinctive elements of the different port stakeholders' strategies within the Oslo Fjord port sector (Bryman & Bell, 2015). Thus, multiple-case study design is recognized as the accurate design for this study. Disparate the previous empirical literature, this thesis examines port authorities', port operators' and port users' perspectives involved in short-sea and container operation services.

Conceptual framework was developed based on theoretical framework. It provides rationale for the data analysis and identifies key variables and assumed relations amongst them (Miles et al., 2014) (see Table 3.1).

Table 3.1 The conceptual framework of my study

Phases	**The reference model**	**The derived model**	**The model's research focus**
Phase 1: Identification of supply chain management objectives	• *Measures of port integration in supply chains* (Song & Panayides, 2008; Panayides & Song, 2009)	*Mapping supply chain management objectives*	Similarities and differences between port stakeholders' supply chain management objectives
Phase 2: Identification of supply chain constraints	• *Analysis of conflicting interests in ports* (De Langen, 2007; Parola & Maugeri, 2013)	*Constraints' analysis*	Recognition of the factors that hinders the efficiency and responsiveness of supply chain
Phase 3: Identification of supply chain strategy	• *Role of ports in varying supply chain strategies (*Mangan, Lalwani, & Fynes, 2007*;* Pettit & Beresford, 2009)	*Identification of Lean, Leagile, Agile supply chain strategies*	Identifying supply chain strategies of port stakeholders
Phase 4: Effect on port performance	• *Supply Chain Decision-Making Framework* (Chopra & Meindl, 2010)	*Analysis of trade-offs between efficiency and responsiveness*	Supply chain strategies' effect on port performance

3.2 Data collection

My research methods included primary data collection through interviews with three port stakeholders' groups operating in Oslo Fjord region. Interviews are triangulated with an in-depth secondary literature review and analysis of strategic reports and documentation available on companies', ports' and government's home pages. Additionally, also observation was present, due to the fact that I visited specific ports' environments and some interview participants gave a tour around their port/terminal area.

3.2.1 Semi-structured interviews

The study employed semi-structured interview approach. This method was used as exploratory tool as it intends to gain consistent understanding of Oslo Fjord port sector stakeholders in order to identify their supply chain strategies and perceptions towards port

performance. The research interview as instrument for data collection is commonly used in qualitative research and is generally suggested to be an appropriate method for an exploratory study to obtain existing insights (Bryman & Bell, 2015).

Semi-structured interviews are distinguished by the fact that there is list of questions, which are categorized in themes (Bryman & Bell, 2015). Actual interview process is flexible and questions are scheduled based on the interviewer practice (Bryman & Bell, 2015). Additionally, interview process is very dependent how interviewees understand the concept on the investigated question and their will to provide data about it and contribute to knowledge creation (Bryman & Bell, 2015).

Furthermore, interviewer can add and ask follow up and probing questions as interview proceeds. Interview guide for this study was developed on the basis of valid indicators and constructs drawn from reviewed literature. These elements constitute port stakeholders' supply chain strategies and perceptions towards their impact on port performance (Appendix B). Interviews focused on three research questions:

1) What are the objectives and constraints of different port stakeholders' supply chain management systems?
2) What are the strategies that different port stakeholders are applying to their corresponding supply chain networks?
3) What are port stakeholders' perceptions on their supply chain strategies' impact on overall port performance?

The interview guide was pilot tested with two colleagues. The testing out of the interview helps to identify the areas that need possible improvements (Bryman & Bell, 2015). From the pilot test, it was found that some of the terms were not clear and also that some questions were repeating the same idea. Accordingly, questions were revised. The interviews were recorded by note-taking and tape-recording. To prepare data for analysis, interviews were

transcribed manually, which was highly time consuming process.

3.2.2 Sampling for the interviews

The decision on which port stakeholders to involve in this study was determined by the characteristics of this specific research. This study explores interaction between three groups of port stakeholders - port authorities, port operators and port users. The rationale for sampling approach was that these are the three main stakeholder groups in port sector, which have the highest interaction regarding facilitation of corresponding supply chains.

The goal of this research at very beginning indicated particular port stakeholder groups that should be investigated for this study. Therefore, sample was established at the outset of research and purposive sampling was applied as a fixed sampling strategy (Bryman & Bell, 2015). However, as interviewing process proceeded and interviewees showed high interested in this study and will to contribute more to it, other contact details were shared, which would also let to apply snowball sampling. But due to the restrictions of the study as costs and time spent on traveling for the interview meetings, this sampling method was not applied.

Once sample was defined, I established contact with the chosen port stakeholders. Requests for the invitation to the interview was send via e-mails. Most of the participants for the study were found already in October/November, 2015. In invitation and prior the actual interview, it was assured that the actual names of persons, organizations and companies would not be revealed in the study. For this reason, analysis on data is not specifying any names and titles.

Research sample includes six interviews (two port authorities, two port operators, two port users) in 5 different ports over the period of one month (16.02.2016-15.03.2016) (see Table 3.2). Oslo Fjord consists of 7 ports and total 5 different ports have been visited.

Interviewed port users cover all ports within Oslo Fjord region. Overall sample includes a majority of ports in Oslo Fjord.

Table 3.2 The participants interviewed in this study

Participant	***Port stakeholder***	***Interview date***	***Interview***
Participant 1 - Terminal manager	Port operator	16.02.2016	Face to face
Participant 2 - Port Captain - Assist. of the port director	Port authority	17.02.2016	Face to face
Participant 3 - General manager	Port user	19.02.2016	Face to face
Participant 4 - Country manager	Port user	23.02.2016	Face to face
Participant 5 - Port captain - Assist. of the port director	Port authority	08.03.2016	Face to face
Participant 6 - Port operations manager	Port operator	15.03.2016	Face to face
	Port user		

3.3 Data analysis

In contrast with quantitative data analysis, there has not been developed common practice on how to conduct qualitative data analysis (Bryman & Bell, 2015). For this study the qualitative data is derived from interviews in form of notable amount vaguely structured textual material, which cannot be straight away analysed (Bryman & Bell, 2015). Qualitative data analysis often is labelled as 'attractive nuisance', due to *"attractiveness of its richness but the difficulty of finding analytic paths through that richness"* (Bryman & Bell, 2015, p.579). To guard this thesis from 'analytic interruptus' (Bryman & Bell, 2015), the data analysis is based on Miles, Huberban and Saldana (2014) approach towards qualitative data analysis within three continuously interrelated aspects – data condensation, data display and conclusion drawing and verification (see Figure 3.1).

Data condensation is a *"process of selecting, focusing, simplifying, abstracting, and/or transforming the data that appear in the full corpus of written-up field notes, interview transcripts, documents, and other empirical materials",* which continues till the end of qualitative research, by that making data stronger (Miles et al., 2014, p.12). Interviews were tape recorded and, afterwards, manually and precisely transcribed.

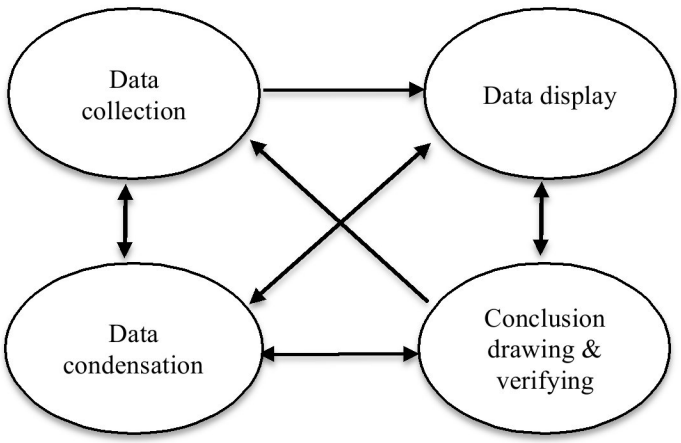


Figure 3.1 The key components of data analysis
(Adapted from Miles, Huberban, & Saldana, 2014, p.14).

Data collection process continues with *"writing summaries, coding, developing themes, generating categories, and writing up analytic memos"* (Miles et al., 2014, p.12). Subsequently, the interviews were coded electronically by using NVivo software. Computer-assisted data analysis was used to limit number of possible deficiencies that may obstruct the researcher during analysis process (Bergin, 2011). Particularly, NVivo software was used with purpose to store, code, organize data, and write analytic memos to assist analyzing process of the data. Sotiriadou, Brouwers, & Le (2014) characterizes NVivo software as effective tool for semi-structured interviews, which is suitable for interpretive approach. Interviews are coded according to the main aspects from the interview guide, and this identified main attitudes, insights, and experiences among interviewees within each port stakeholders' group. Since this study is designed as multiple-case study, comparisons were especially relevant for understanding the differences between port stakeholder groups in terms of their perceptions towards supply chain strategies and port performance.

Data condensation is vital part of analysis and assist conclusion drawing and verification, because thematizing of contents focuses and organizes data (Miles et al., 2014). Research resulted in a lot of data, which was outcome of highly interested and supportive participants. Data condensation revealed that interviewees have a decent understanding about the today's

ports' environment, operational matters and their goals towards facilitation of corresponding supply chains. However, interviewees could not specifically formulate their supply chain strategy. Due to that comprehensive examination of the data was conducted. Coding process revealed a range of interconnected and recurring codes and categories related to the supply chain management. Coding process generated main themes (see Appendix C), which were used for in-depth analysis in order to reveal specific supply chain strategies for each port stakeholder group.

This study highly focuses on data display – organized and dense assembly of information, because it improves understanding of the data and is a must for robust qualitative analysis (Miles et al., 2014). In order to display data for this study many types of tools are used – maps, tables, figures, etc. All these instruments intend to *"assemble organized information into an immediately accessible, compact form so that the analyst can see what is happening and either draw justified conclusions or move on to the next step of analysis that the display suggests may be useful"* (Miles et al., 2014, p.13). However, effective data display would not be possible without following the theoretical and conceptual framework of this study and NVivo software tool, which supported easy allocation of needed data material. These elements highly assisted to create and maintain the structure of this study, aiming for better representation of conclusions.

The general tendencies of this study were noted at the beginning stages of the study, because *"researcher interprets what things mean by noting patterns, explanations, causal flows, and propositions"* (Miles et al., 2014, p.13).

3.4 Reliability, validity and ethical considerations

Reliability and validity are vital elements when it comes to creating and assessing the quality of quantitative research. There have been various discussions about the relevance of

reliability and validity in qualitative research, particularly, regarding reliability in qualitative research (Bryman & Bell, 2015). Stenbacka (2001) points out that reliability concerns measurements and due to that is irrelevant matter in qualitative research, but Patton (2002) notes that reliability is a result of the validity of the research. For this thesis validity and reliability was created and assured by involving a variety of port stakeholders and implementing a structured approach based on conceptual framework.

Validity is distinguished between internal and external validity. Internal validity assess *"whether or not there is a good match between researchers' observations and the theoretical ideas they developed"* (Bryman & Bell, 2015, p.400). Internal validity is strength of the qualitative research if accurate data in used to answer specific research question (Bryman & Bell, 2015). To ensure the internal validity, the interview questions were developed based on thoroughly review of the port research literature. External validity assesses the level to which results can be generalized across social settings, which maybe difficult for the qualitative research due to the frequently used research design - case study and limited size samples (Bryman & Bell, 2015). This thesis can be generalized to the similar port sector setting and findings may be applicable to other ports as they all consists of investigated port stakeholder groups, which have similar interests as port stakeholders within the Oslo Fjord port sector. Therefore, this study is striving to provide clear conceptual framework with accurate explanation of used methodology and results. Triangulation is one of the principal methods to establish and evaluate validity of the qualitative research and assure the findings - meaning the use of various qualitative methods or data sources to identify if similar results are achieved (Bhattacherjee, 2012; Bryman & Bell, 2015).

Reliability is concerned whether the results of a study are repeatable and there are two types of reliability (Bryman & Bell, 2015). External reliability assesses the level to which research can be replicated (Bryman & Bell, 2015). However, there is a difficulty in qualitative

research *"to 'freeze' a social setting and the circumstances of an initial study to make it replicable in the sense in which the terms is usually employed"* (Bryman & Bell, 2015, p.400). It is possible to replicate this study, and it is very possible to get the same results within the same case, however, if the case, involved stakeholders, point in time and questions are changed, the results may vary. Maritime industry as such is very dynamic and time-sensitive and impacted by various external factors. The main factor is "the shipping cycles" (Stopford, 2009). But internal reliability assesses *"whether or no, when there is more than one observer, members of the research team agree about what they see and hear"* (Bryman & Bell, 2015, p.400). To approach the internal reliability, the interview questions were wisely designed and structured to ensure a rich collection of data. Additionally, the answers of the respondents were similar within the same port stakeholder group. Also similar patterns noted within all three stakeholders' groups, which ensure the reliability and consistency of the data.

This study was conducted according to the academic standards and practice. All interview participants were familiarized with informed consent (Bryman & Bell, 2015). Informed consent assured that interviewees are aware of necessity of their participation, how data will be used and analysed, and accessibility level of the findings. Additionally, it was assured that it is interviewees' choice on what kind of information to share and which questions to answer. However, I did observe that all participants felt very comfortable and research topic was very relevant for them. Interview participants were willing to share their opinions in order to contribute to this matter. Therefore, all questions were answered.

4. Data analysis and results

This chapter provides findings from the interview study supported with in-depth analysis of the collected data. Findings are presented in following rationale: objectives of supply chain management from various Oslo Fjord port stakeholders' perspectives; constraints of supply

chain management within Oslo Fjord port sector; supply chain strategies of Oslo Fjord port stakeholders; Oslo Fjord port performance from supply chain strategy perspective.

4.1 Supply chain objectives of Oslo Fjord port stakeholders

This section reviews findings regarding objectives of supply chain management within Oslo Fjord port sector. Supply chain management objectives are essential for the facilitation of the corresponding supply chains. The objectives of supply chain management have been identified based on the insight of various Oslo Fjord port stakeholders groups.

4.1.1 Objectives of the supply chain from port authorities' perspective

Port authorities have the main role of coordinating the assistance and facilitation of the corresponding supply chains. Interviews highlighted that traditional role of port authorities have changed towards 'business like' performance and revealed that the interviewees strongly agrees with the inevitability of this tendency by confirming that they are constantly aiming towards this change in port environment,

> *Now the port authority is much more active, thinking business cases together with customer because if its not working for them, the cargo is also then disappearing. It's important for the ports to be active […] they [port authorities] have to change the mind from being only port authority looking on own quays and cranes. We have to lift us from our shelves a little bit, and it is important that we are thinking about the market and the customers.*

Port authorities as significant part of corresponding supply chains execute role as efficient distributor of products across supply chains. The interviewees pointed out that their objective towards the facilitation of corresponding supply chains is particularly based on effective handling and distribution of the cargo (see Figure 4.1). However, due to today's

highly competitive market, this objective only can be achieved if operational and cost efficiency and compliance with the environment and socio-economic matters is supporting it. From the interviews it was possible to note that operational and cost efficiency is sustained by elements and activities as proper maritime and hinterland interface (preferably intermodality as part of it), constant port development and expansion, variation of value-added services within port area and customer/stakeholder relationship management. It is not impossible to prioritize previously mentioned elements, because they support each other and are interdependent.

Interviewees emphasized that proper maritime and hinterland access combined with proper port infrastructure and superstructure, highly contributes to the effective cargo handling and distribution, by that bringing more cargo volumes and higher profits, which are further invested in port development and expansion by enlarging port area, building new quays and enlarging the fairway for better navigational access and bigger vessels. Port authorities confirm that they have very close contact with their customers, and they are working closely regarding operational matters and new projects. The close cooperation assures port authorities that they are aiming the right direction regarding port development. Additionally, Oslo Fjord port stakeholders use communication as tool to eliminate and reduce bottlenecks and foster efficiency by setting up common business goals and working together on it.

Interviews indicated that no less import factor is socio-economic responsibility. Interview participants explained that they are trying to limit frame conditions impact on the future operations, by ensuring possible port development opportunities, stable employment and good working conditions. Additionally, port authorities are in constant communication with the society and municipality to ensure that they are aware of port operations and how they can benefit from it.

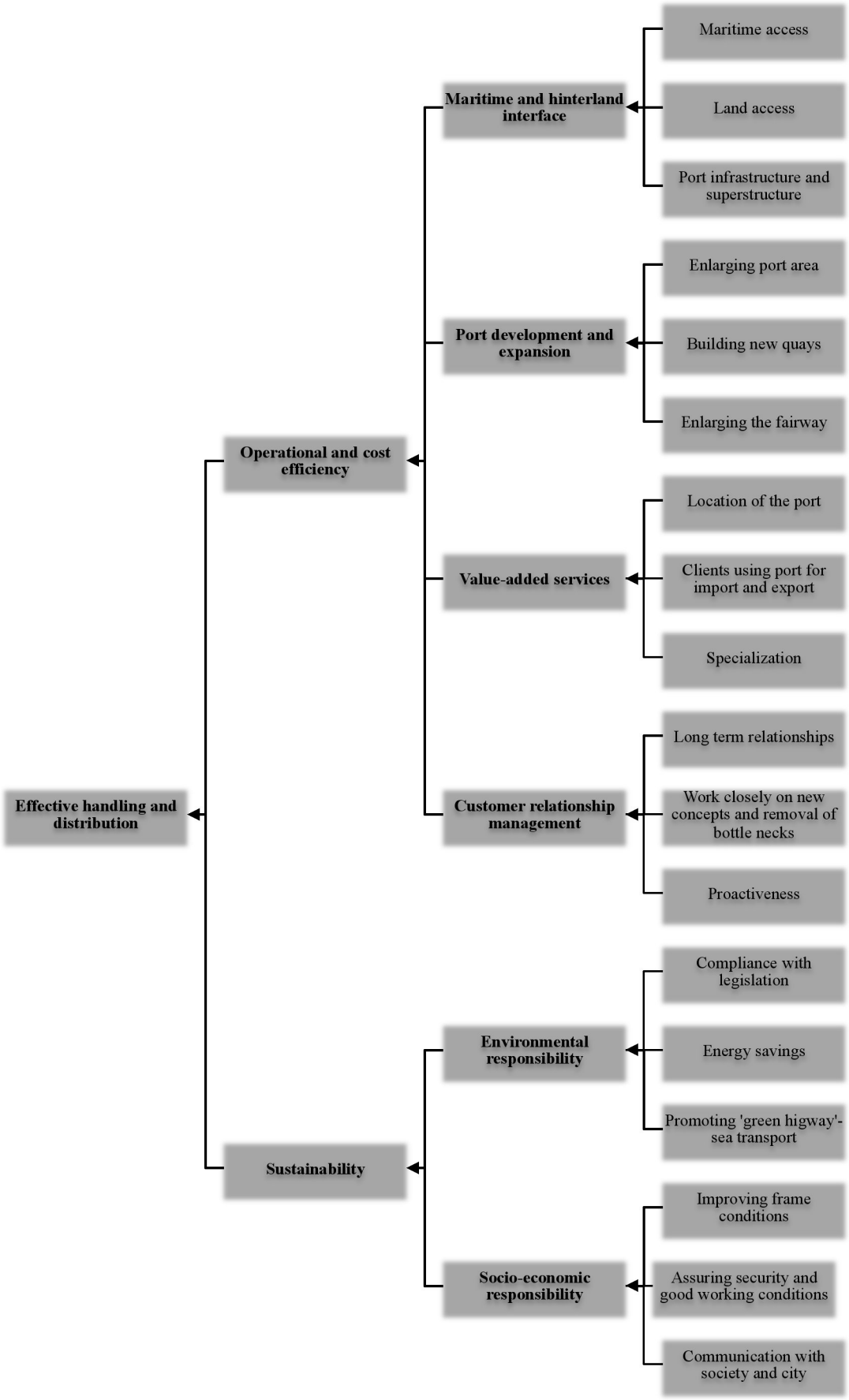


Figure 4.1 Key supply chain management objectives of port authorities

4.1.2 Objectives of the supply chain from port operators' perspective

As previously mentioned - port authorities have the main role of coordinating the assistance and facilitation of the corresponding supply chains and port operators can be seen as direct mechanisms for it (see Figure 4.2). Sample port operators have similar objectives towards supply chain as port authorities. However, their positioning in supply chain is as an direct link between customers from both sides – land and sea. Due to that their objective regarding facilitation of corresponding supply chains is by putting emphasis on customers and local market. Interview participants explained that it is very important for the Norwegian customers to be near to the port, because this leads to shorter transport chain and reduces the costs. Port operators seek to comply within pro-activeness to satisfy clients and they see themselves as the ones who hold the customers for the port.

Interview findings confirm, that customer/stakeholder relationship management plays vital part when being a port operator. In previous section it was discussed that port authorities have a close collaboration with their customers. Port operators also notes this as highly important element,

> *This is day to day operation, we are communicating daily about operation aspects and we also have very close contact with managerial parties in the port – how can we develop together, we have interesting case, what we could do [...]. And we have the same goal, we want that port performs and we want us to perform. And of course, we want that port include us, if they get request that we should be able to answer. What kind of options or opportunities port sees that they can use us as a tool to develop? We both want volumes and so its really good working together and we do that basically from day to day basis both - operationally and managerially. They have to make money by our operations and we of course […] putting those […] down along the supply chain.*

For the port operators, specifically important element is space availability for further development. Ports and port operators who are positioned advantageously within the geographical area have high potential of smooth development, but ports and terminals with limited space face issues as restrictions for automatization, continuous pressure from society, etc. Due to the fact that port operators have interactions with their customers and related stakeholders from the both sides within the port area – sea and land – sometimes it may create issue and someway limit their operational potential. As one interviewee expressed the sensitivity about this situation when various customer/stakeholder demands are not matching and by that creating a pressure towards their operations. In this case port operator have to be creative to make it work for both parties, interviews reveal.

Interviews pointed out that operational and cost efficiency is vital for port operators. But port operators' approach it from customer perspective in order to deliver economy and timely service to the customer. Also, interviews with port operators show that equipment is important factor as export industry is constantly checking do they have enough empty equipment for overbookings. Port operators sees this as a strategic decision for shipping lines by having empty containers in terminals, because those shipping lines will have an advantage over the ones, which does not have, when the cargo appears. To comply with that the information is shared actively between the parties.

However, in case if ports within the Oslo Fjord would introduce automatic gate system, existing information sharing practices may not be seen as effective as it should be. As one interviewee explains that due to the fact that Oslo Fjord includes many container ports, container could be picked up in Larvik, drove to Oslo and loaded there, and left in Fredrikstad. Shipping lines decides that and port operators see that information about the container picked up in Larvik would be in Larvik, and automatic gate principle would not work.

Additionally, sustainability is seen as necessity. Supported by environmental and socio-economic responsibility, interviews revealed the importance of environmental goals – as zero emissions, damages and emissions that can harm the environment and promotion of 'green highway'. Also, important fact for port operators is safe working conditions for the employees – no deaths, no severe injuries and increase of the sick leave compered to country's average.

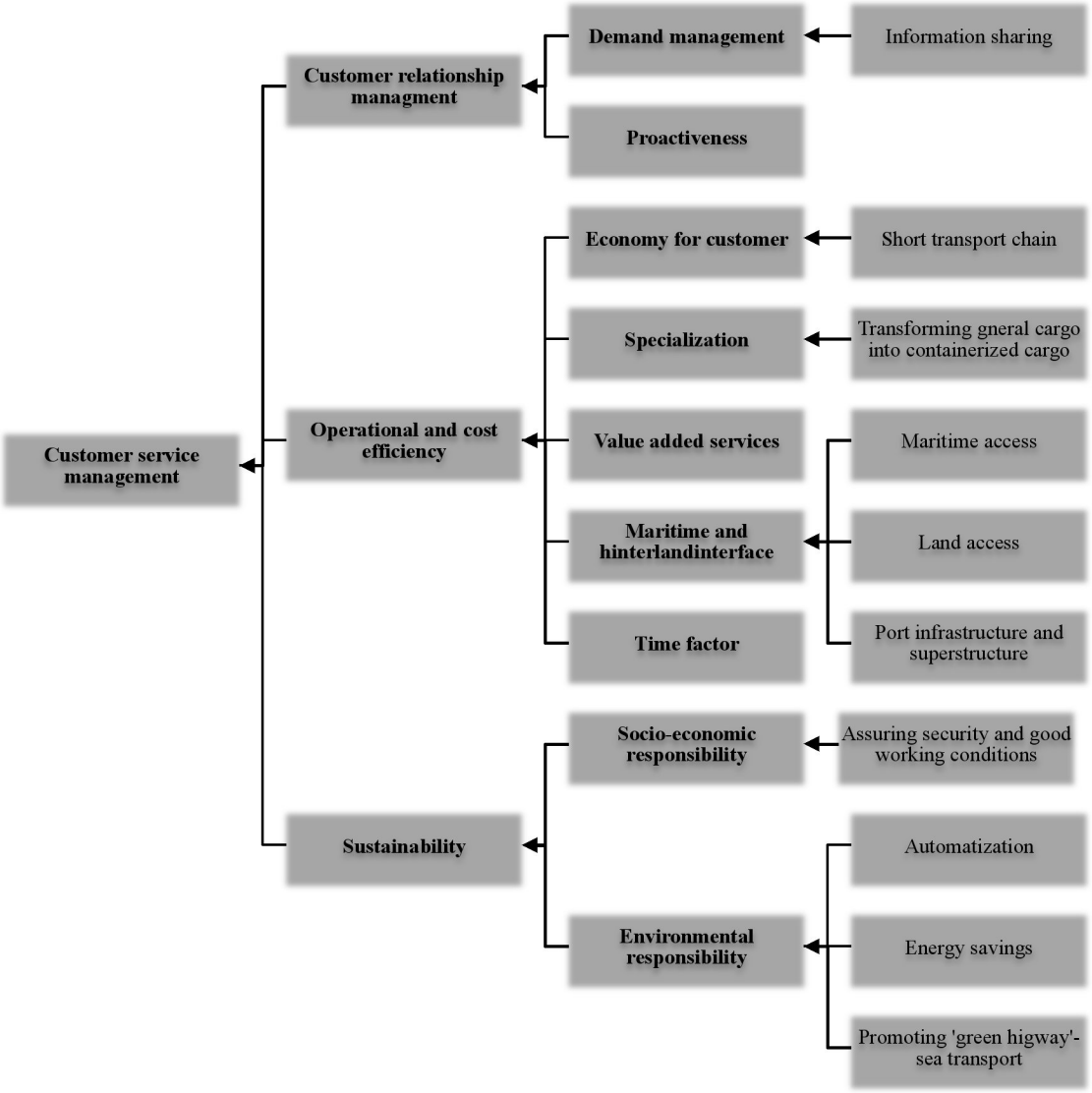


Figure 4.2 Key supply chain management objectives of port operators

4.1.3 Objectives of the supply chain from port users' perspective

Participants of the port users show more different opinion regarding supply chain

management as port authorities and port operators (see Figure 4.3). Port users approach towards their supply chain is more flexible and dynamic, probably, because their business is highly marginal, as interviews reveal. Port users include variety of different and distinctive companies, but this sample includes – shipping line, freight forwarder and logistics service provider. Each company has different business goals, structure and services offering logistics competence. When reviewing the port users operational processes always customer is in mind – to help him not to restrain. For the investigated port users in this study, main objectives are the time factor and increase of the productivity, inland infrastructure and multimodal solutions, and reducing cost and environmental impact.

Customer service management and the close relationships with customers is high importance for port users. This fact emphasis the necessity for smooth communication and cooperation, as interviewee pointed out that, *"I ask my customers what are their needs and then I try to adjust to the needs they have. Or, I can tell my customers also – you need to do this, so I can perform better – plan better."*

When it comes to the operational and cost efficiency, supported by interview findings, the time factor is recognized as an important element because this is where the port users can reduce the costs, improve the efficiency, and gain flexibility and reliability. All port user's group interview' participants confirmed that the competition is fierce in this segment, so companies are searching for the ways where to gain their competitive advantages and reduce costs. Interview participant who represented a shipping line offering feeder and short sea shipping services, as the main objective of their supply chain stated the time factor,

> *Our earnings are when we are sailing, not when we are in the port. Port is just something we need to get the containers on board. We are not paid then. We are getting paid from moving container from A to B. So it is important for us to get vessels in and out of the port in the most efficient and fastest way.*

Port user - company offering multimodal logistics solutions, as the main objectives notes port and inland infrastructure and the proper communication with port operators with the aim to increase the cargo volumes. Port and inland infrastructure is necessity of to fulfil their business goal and satisfy the customer with door-to-door services. But the proper communication is needed to stimulate the cargo volume increase, which benefits both parties. The aim of the customer focus is customer value creation.

Due to the current economic situation is it necessity to eliminate non-value stops across the all supply chain network and the operational and cost efficiency is highly acknowledged by all port stakeholder groups. Port users are especially demanding in this concern, because the competition in their business field is characterized as extremely fierce and their customers will not pay more for their services. Interviewees of the port users' group emphasis that, *"Its important to get vessels in and out of the port in the most efficient and fastest way. We need to get efficiency because efficiency creates more flexibility"*. This has resulted in pressure towards port operators to improve their operational efficiency to satisfy port users as their clients.

However, one major similarity connects all of the various port user types, which is - using environment awareness as an advantage to compete with road transport. Interviews confirmed that they approach their operations from suitability aspect arguing that,

> *Competing for the same container customers wont get us anywhere, just get the prices down. So we need to compete with something that is not in containers yet. That is road transport. So its environmental goal for us to change transport mode.*

Supported by interview findings and the analysis of the secondary data, limitation of the port operation caused by environmental awareness are played of as a smart tool and used for creating competitive advantage and opportunity for growth by promoting short-sea shipping (National Transport Plan 2014-2023, 2013).

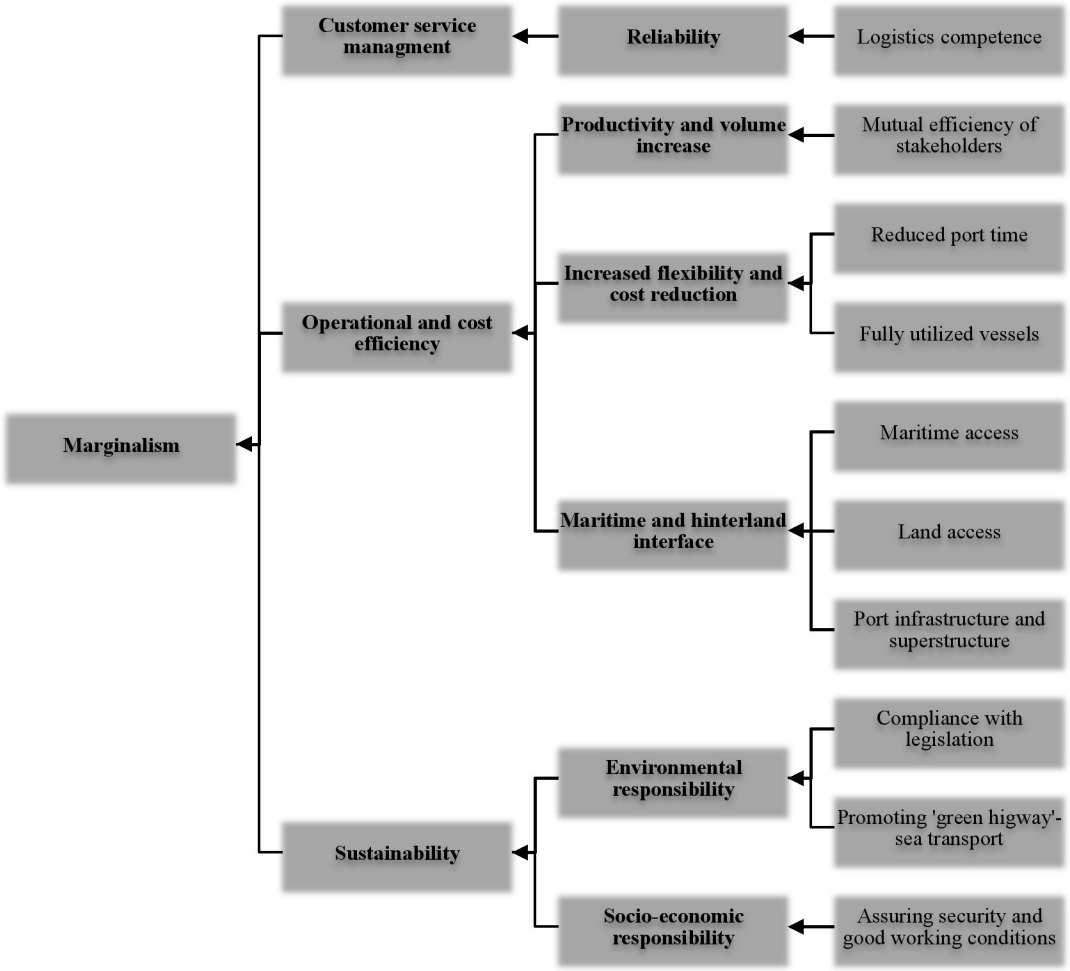


Figure 4.3 Key supply chain management objectives of port users

4.2 General supply chain constraints of Oslo Fjord port stakeholders

From the analysis of interviews and secondary data, it can be seen that the identified constraints within Oslo Fjord sector impact various port stakeholders' supply chain capabilities and performance (see Table 4.1). However, all three parties are exposed to those constraints relatively equally.

Interviews revealed that the majority of port stakeholders are dealing with infrastructural constraints, which are highly important for proper cargo handling and distribution. Some investigated parties noted that Norwegian ports are not well enough designed and have poorly structured port and inland infrastructure. This limits the intermodality for ports and

multimodal services provided by the port users. Additionally, various participants noted the importance of fairway accessibility due increasing vessel size and navigational limitations.

Interviewees also accentuated some operational related issues. As the most serious can be noted 'stevedoring monopoly' within the Oslo Fjord. So-called uniazied and organized dockers have 'stevedoring monopoly' which is causing operational efficiency problems for ports and its operators. One of the investigated ports, which just got rid of 'stevedoring monopoly', admitted that, "*They could destroy anything if they wanted by just saying we haven't been warned about the vessel coming early enough, so we wont come until 10 o'clock instead of 7 o'clock"*.

Additionally, interviewees explain, that this factor also increases the costs, but if it is not present, costs can be reduced due to the fact that their service is done only on demand. But representative of port, which still is forced to use dockers, are stating that they are very important part of port and very important port stakeholder group by having advantage in stevedoring service. This factor may cause delays, which could be one of the explanations why there are some discrepancies between shipping lines' and terminal operators' mutual understanding, and increasing the need for stakeholder management.

Oslo Fjord also has some specific characters, which impose some issues. The amount of the ports within the Oslo Fjord is high. The fact that Norwegian ports are based on feeder operations increases the price for the feeder lines. But from positive side, this allows port stakeholders to fulfil short sea transport and door-to-door service principle. Additionally, the high amount of ports, limits data availability in case ports would want to introduce automatic gate systems for their terminals. On other note, as a threat some stakeholders see possible government support for the railway connection with Sweden. Some interviewees see it as a significant danger in terms of cannibalization of the Norwegian ports and expresses incomprehension why government would support such matter.

Table 4.1 Identification of supply chain constraints in the Oslo Fjord region

Issues	Possible outcomes
Infrastructural constrains	
• Accessibility to the inland roads and railway	Limited intermodality and distribution spectrum
• Accessibility of port infrastructure	Limited intermodality and distribution spectrum
• Inadequacies of inland infrastructure network	Limited distribution; Heavy transport in city centres
• Capacity within the port; maritime interface	Development, expansion limitations
• Accessibility of fairway; maritime access	Reduced port competitiveness
Operational constraints	
• Stevedoring monopoly	Port and terminal operation disruptions
• Lack of mutual understand between stakeholders	Reduced efficiency and productivity
• Multi-layered network	Need for high level stakeholder management
• Data availability	Information does not leave the port
Region specific constraints	
• High amount of ports in Oslo Fjord	More calls per port – adding costs to shipping lines
• Support of road/railway connection with Sweden	Cannibalization of Norwegian ports
Market/Economic constraints	
• Increase in road transport freight	Decrease in sea transport freight
• Import/export imbalance between ports	Positioning of empty containers
Bureaucratic constraints	
• Frame conditions; Industry requirements	Limitation of development/operational possibilities
• Legislative framework	Limitation of development/operational possibilities
• Increase of safety and security matters	Increasing complexity of operations
Sustainability imposed constraints	
• Increase in environmental legislation	Increase in environmental responsibility
• Need for more environmental friendly equipment	More energy efficient systems; Automatization
• Location of the port; Urban pressure/development	Limitation of development/operational possibilities

The other serious issues are related to the market situation in this region. Competition of road transport freight, particularly, trailers coming in from Europe, is imposing threats for all investigated parties. If port sector and sea transport cannot offer lower costs and additional benefits for sea transport, then road transport will continue to be a threat and sea transport freight volumes within Oslo Fjord may decrease. Ports and other port related companies are promoting short sea shipping and competing with road transport systems severely. The main

trumps when port sector stakeholders are trying to gain new clients are price, environment and promise that this transportation way will not be more complicated than road.

Additional problem towards supply chain are seen port stakeholders approach towards export/import imbalance between the ports. This issue results in empty container problem, where it is necessary to establish some system how to manage empty containers – collaborations between the ports, etc. The empty container problem causes doubts for some interviewees about true sea transport environmental friendliness, because a lot of shipping lines are transporting huge amounts of the empty containers and the green transport may not end up as green as supposed due to useless transportation of "expensive air", advices interview participant representing port users' group.

Bureaucratic aspects also impose some constraints. Particularly, ports are affected by "frame conditions" – requirements from municipalities, for example, requirements for building height, etc. Ports see this as very hard task to work with municipalities to convince them to change rules so port can continue to develop and people can have a stable future employment. Sustainability as such is a necessity for the port-related companies, however, it causes some constraints. Ports, as the rest of maritime industry, is effected by international and regional regulations, which asks for the involved parties to invest the money on particular matters, for example, environmental friendliness. Additionally, not all ports within Oslo Fjord have very advantageous location and due to that many ports are experiencing the high pressure form the society, as the result - ports are loosing their areas and operational spectrum.

4.3 Supply chain strategies of Oslo Fjord port stakeholders

Ports are significant part of the supply chain network, but as various interviewees pointed out, they do not control all supply chain. However, this fact does not mean that they do not

have a supply chain strategy nor that it is not needed for port or port stakeholders, because *"supply chain strategy determines how supply chain should perform with the respect to efficiency and responsiveness"* (Chopra & Meindl, 2010, p.61). Based on prior examination of port stakeholders' supply chain related objectives and constraints, the main characteristics that define port stakeholders supply chain strategies are identified (see Figure 4.4).

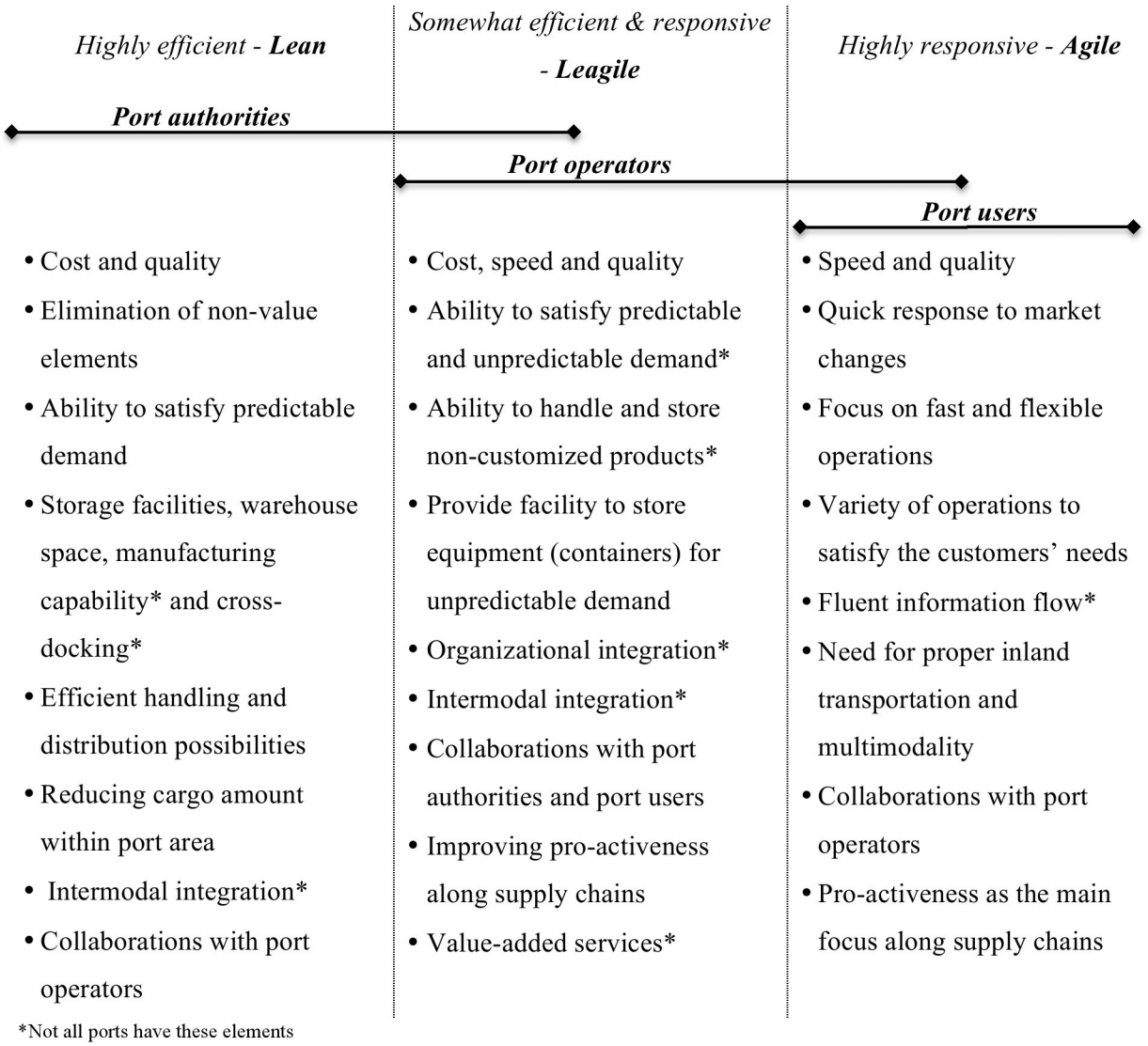


Figure 4.4 Variety of supply chain strategies of the Oslo Fjord port stakeholders

Port authorities show more holistic approach towards facilitation of corresponding supply chain networks. It is due to ports' overall role to facilitate trade and afterwards act as distributor of goods. This port's function comes with wide spectrum of operations and needed

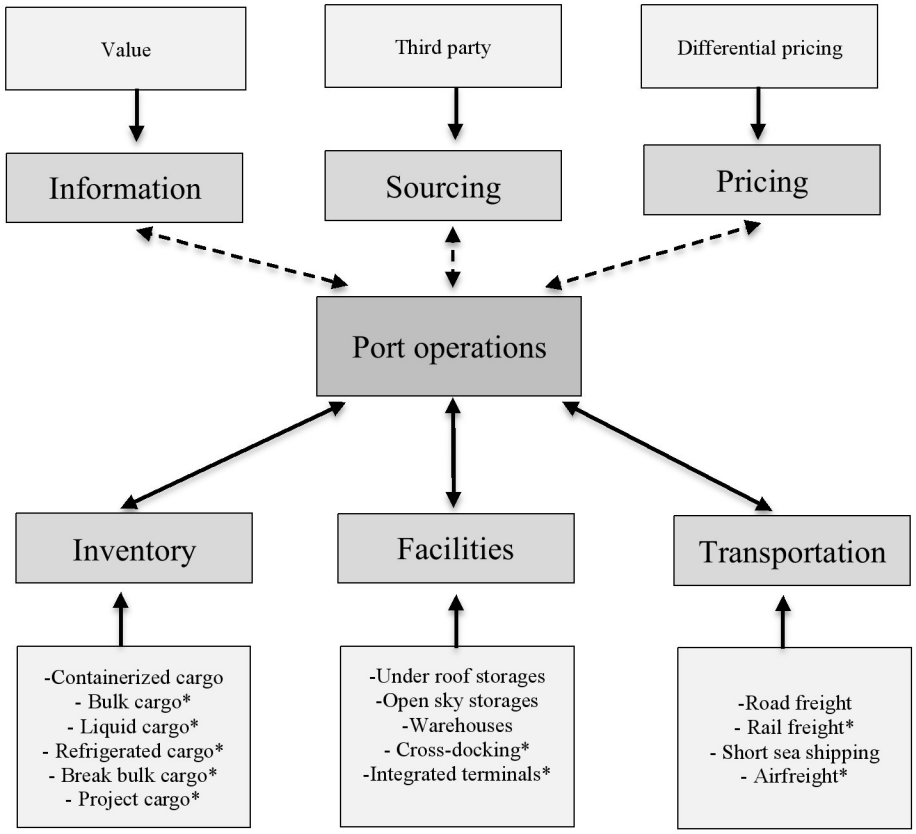
activities, which asks for continuous investments in port development. To be able to cope with this matter, port authorities within Oslo Fjord focus on effective and efficient operations, reduction of wastes and elimination of non-value elements, which leads to lean supply chain strategy. Additionally, limited amount of ports also are able to provide the quick response to the demand, intermodality, variety of value-added services, which lead towards leagile supply chain strategy. Since the ports within Oslo Fjord are so different, the supply chain strategies may vary from lean to leagile. But it can be noted that due to the serious constraints as limited intermodality, limited inland infrastructure, limited maritime interface or location restrictions, none of the ports within Oslo Fjord are able provide fully agile services.

Port operators' operations are located within port area and are highly effected by the port's characteristics. Due to that their supply chain strategies tends to be the same as port authorities, however, they aim to increase responsiveness to satisfy port users, for example, shipping lines. Port operators' main focus is customer and all their activities are based on that. This can be identified due to characteristics as being efficient and responsive, for example, port following lead strategy tries to eliminate all wastes and reduce inventories, but terminal as such, still allows shipping lines to store some of their empty container within terminal (for port user – shipping line – this means agility, because they are trying to stay responsive regardless of costs – costs for empty container storage within port area). Port operators are link between port authorities and port users, so they feel pressure from both sides regarding efficient and responsive operations. However, terminal operators must perform a range of different operations in order to satisfy the increasing variety of customers' needs.

But *port users* approach their supply chain at individual/business level due to the marginality of their business. They are tending towards agile strategy for responsive supply chain. Investigated port users within Oslo Fjord focus on flexibility, reliability, time factor, which are the main elements of agile supply chain strategy.

4.3.1 Port supply chain decision-making effect on port performance

To better understand port system supply chain network and supply chain strategies, it is necessary to recognize and understand logistics and cross-functional drivers operating in port. These drivers give better understanding how supply chain performance could be improved or is affected by trade-offs between efficiency and responsiveness (Chopra & Meindl, 2010). Based on previous analysis, the port supply chain decision-making model was created (see Figure 4.5).



*Not all ports have these elements

Figure 4.5 Port supply chain decision-making model

When considering **logistics drivers** for the ports and its operators involved in this study, it is seen that ports have more efficient characteristics. Due to the fact that port is location as such, creates limitations in flexibility and capacity. Port and terminal facilities are dedicated for particular purposes, and as some interviews revealed that they are restructuring port in order to use the available port space wisely, for example, remove the less valuable cargoes as

stones to warehouses or storage places outside the port area. This also shows the tendency to reduce inventory (cargoes) within the port. Additionally, port focuses on product-focused facilities. This is confirmed by the fact that ports support companies who establish themselves within port area for both – import and export.

Also very important factor here is access to the transportation modes and its speed. Limited access to various transport modes and time-sensitivity, limits responsiveness. Even though ports try to improve their operational responsiveness, some port users complain about the speed of serving their ships and limited access to all transport modes. Port operators aim to satisfy customer requests, which very often invites for responsive operations, but however, port terminals are within port area and their flexibility depend on ports characteristics.

When considering **cross-functional drivers** for the ports and operators involved in this study, it is seen that port authorities approach information from value perspective, opposite to the port users, which imposes the danger of information complexity by pressurizing ports for more active information sharing. Information can increase the efficiency and responsiveness for the ports, but to find the balance, proper evaluation of minimum information needed for achieving the established objectives is necessity. Also, ports faces some obstacles concerning information sharing, due to the fact that there is high number of ports in Oslo Fjord, causing some information sharing problems when ports are collaborating regarding container positioning.

Port is third party service provider, accordingly, all services are outsourced by third party service providers, which benefits ports users with more satisfying tariff systems. Ports have fixed pricing for its services, however, since port establish close relationships with its clients, there may be some differentiation pricing involved in some cases due to the long-term contracts. Port operators approach is similar to the port authorities, however, they usually do not outsource, as they are the third party service providers. Port operators see value in

information sharing, but however they face the pressure for port users for whom information trade off is complexity.

5. Discussion

This chapter conducts discussion reflecting the findings with consistency of academic literature. The goal of the thesis was ambitious - to identify supply chain strategies of three different port stakeholder groups – port authorities, port operators and port users, and understand their perceptions towards supply chain strategies effect on the port performance. Discussion therefore deals with those two phenomena – supply chain strategy and port performance.

5.1 The choice of supply chain strategies within the Oslo Fjord port sector

The empirical results have identified supply chain strategies of the investigated port stakeholders' sample - port authorities tend to apply lean or leagile supply chain strategy, port operators - leagile supply chain strategy, but port users employ agile supply chain strategy (see Figure 5.1).

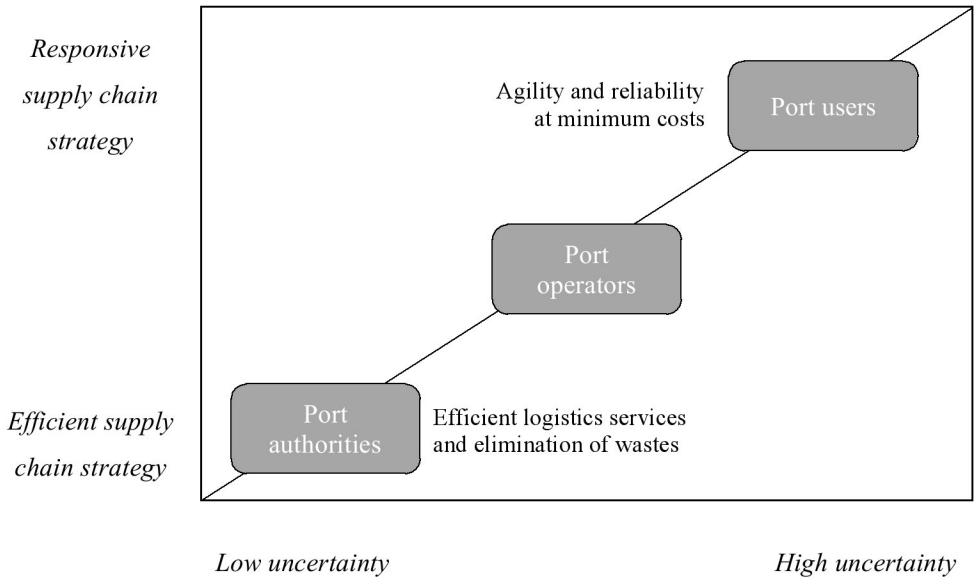


Figure 5.1 Propositions of supply chain strategy versus uncertainty

The results shows that investigated port stakeholder groups due to various reasons have different strategic approach towards their corresponding supply chain networks. This particular supply chain strategies' arrangement for investigated port stakeholders is very rational, because the identified supply chain objectives and constraints revealed many details, which define applied strategy for their corresponding supply chains.

As explained by Pettit & Beresford (2009) and Zhang et al. (2014) port's choice of supply chain strategy is affected by factors as land capacity, ports' geographical location, infrastructural and superstructures' elements, and characteristics of the cargo flows. Additionally, some conventional ports benefit from advantageous location and surplus land area, which provides capacity for diverse operations and facilities for various types of cargoes (Pettit & Beresford, 2009). Ports within the Oslo Fjord region understand their strategic capabilities and facilitated cargos flows, and due to that are very realistic of their future development possibilities and choice of appropriate supply chain strategies.

Interviews confirmed that Oslo Fjord port stakeholders' groups are focusing on supply chain integration aspects, which sets direction for their supply chain strategies. Identified supply chain management objectives – proper maritime and hinterland interface, value-added services, customer and stakeholder relationship management, etc., (see sections 4.1.1, 4.1.2, 4.1.3) have very close fit with the integration measurements provided by Song & Panayides (2008) and Panayides & Song (2009). They have identified elements as supply chain integration practices, information and communication systems, relationships with shipping lines and inland transport operators, value added services, inter-connectivity with inland modes of transport, multimodal systems and operations. All these elements constitute to the port integration into supply chains. This means that port stakeholders within the Oslo Fjord are integrating into their corresponding supply chains. This can be seen as positive aspect, because research (Song & Panayides, 2008) has confirmed that strategically adopted

integration practices have positive contribution to the port performance.

However, Tongzon et al. (2009) argues that the port sector may not be as supply chain oriented as literature proposes, noting the necessity for high level of information sharing and trust, which is difficult to achieve in the port sector environment. Additionally, integration into supply chains imposes the issue of how to divide the gains and costs incurred during this process, because harmonization of operations entails giving up on some stakeholder's autonomy (Tongzon et al., 2009). However, there can be seen positive side in this aspect - port stakeholders operate in close collaboration and inter-organizational relationships are the most significant strategic assets, because these relations create access to other stakeholders' resources in the network, which benefits to the added value creation (Zhang et al., 2014). In this study, various inter-organizational relationships can be recognized – relations between port authorities and port operators and between port operators and port users. Lastly Tongzon et al. (2009) points out that ports and its stakeholders must have significant control or influence on the entire supply chain in order to gain benefits from the integration and the embeddedness within supply chain network.

Furthermore, this thesis revealed supply chain related constraints within the Oslo Fjord, such as infrastructural, operational, market, region specific, bureaucratic and sustainability imposed constraints, which to some extend direct their supply chain strategy, as previously explained by Pettit & Beresford (2009). Most of the constraints are originated from the multiplicity of stakeholders involved in port operation, which creates port's complex role in transport networks and local areas (Parola & Maugeri, 2013). These factors hinder efficiency and responsiveness for the supply chain. De Langen (2007) as the main conflicting areas for the ports where constraints may appear sees environmental protection versus port development, urban development versus port development, labour conditions versus port development, resident interests versus port development, overall economic development

versus port development. Ports within the Oslo Fjord region encounter all of De Langen's (2007) identified constraints and additional ones due to their specific region and market characteristics.

When all previous is discussed, it can be seen that stakeholder management is highly important for the port sector, also for this case - Oslo Fjord port sector. As literature (Verhoeven, 2010) advises, increasing interactions between market players, government and municipalities are pressurizing port authorities to manage a large number of matters, which limits their capabilities of responding proactively to market dynamics and local community requests. This fact is one of the reasons why ports within this case have lean or leagile supply chain strategies, because their stakeholder landscape is limiting their pro-activeness by reducing their capabilities for agile supply chain strategies.

The industry requirement regarding 'Port-Supply chain management' philosophy emphases that *"ports should add value to shipper by aligning their own business activities with shippers' supply chain management strategies and requirements"* (Herz & Flamig, 2014, p.376), indicating that ports and terminals no longer can only aim to advance their internal efficiencies and performance, but also have to focus on external performance by assisting the efficiency and performance of their corresponding supply chains (Tongzon et al., 2009). This verifies previously discussed multi-pressure complications, which port authorities are experiencing due to the complexity of the port's environment. The ports' dynamic business environments have put strong pressure on the conventional role of public port authorities by demanding greater 'business like' performance (Verhoeven, 2010; Lugt et al., 2013), which asks for the agility for its offered services (Beskovnik & Twrdy, 2011).

However, the Norwegian port sector is specific and ports are limited towards providing agile services and applying agile supply chain strategies. But couple of ports who are able to provide more agile services, are proactively improving their leagile supply chain strategies –

investing in infrastructure, exploding port areas, building closer relationships with customers are other involved stakeholders. But, regardless of the fact that ports within this case may not provide fully agile services, sample shows that ports within the Oslo Fjord region definitely can approach their corresponding supply chain with efficiency by improving service quality, limiting non-value elements and offering best price for the customers for their cargo flows.

As previously discussed, it is understandable that due various reasons there are inconsistencies between various stakeholders and their supply chains. Literature (Herz & Flaming, 2014) argues that,

> *Shippers increasingly act globally, which poses new challenges to their SCs such as increased complexity, security issues, risks of major disruptions and the like but also creates new business opportunities such as access to new markets, cost advantages etc.; SC and transport services in this context often need to be agile and reliable and, at the same time, offered at minimum costs* (p.383).

But ports in contrast are,

> *Critical nodes in global SCs represent places where international transport chains merge and split and, for the most part, a large variety of logistics services is offered and pursued; For shippers, the seaport system with its actors and services can thus represent a potential threat as well as an opportunity with regard to their SC operations* (Herz & Flaming, 2014, p.383).

Ports are vital elements in cargo flow decision-making in many shippers' supply chain strategies, and it is essential to have a proper mutual understanding between shippers' supply chain requirements and services provided by port actors, advises Herz & Flaming (2014). However, Pettit & Beresford (2009) and Mangan et al. (2007) arguments are not solely stating that today agility is a must for the ports. They advise that ports' strategic fit for their corresponding supply chain networks will be different in any case, and some ports even can

have several strategy types simultaneously (large European ports such as Rotterdam), but smaller ports (northern European ports) may only be able to fulfil one strategy type (Pettit & Beresford, 2009; Mangan et al., 2007).

Additionally, interview findings pointed out that port operators are highly affected by port users' requirements, and since port operators' focus is customers, they are operating to satisfy customer needs. Pettit & Beresford (2009) notes that requests and demands from the shipping companies, which are exploiting port facilities, is one of the key factors that influence the supply chain strategy. Moreover, port operations may be already included in supply chains' concepts of manufacturing and production (Pettit & Beresford, 2009). Interviews showed a similar pattern, revealing the importance of close collaboration with customers when developing appropriate superstructures (terminals) for the efficient facilitation of new supply chain networks.

5.1.1 Port stakeholders' supply chain strategies impact on the port performance

Ports' performance is strongly affected by various port stakeholders' supply chain strategies due to the strategic interdependencies and connections among them (Song & Parola, 2015). Research (Song & Panayides, 2008; Beresford et al., 2011) has confirmed that logistics operations and strategically adopted integration practices have positive contribution to the port performance. A lot of literature in the last decade has been focusing on developing port performance measurement tools from qualitative standpoint (Marlow & Paixao, 2003; Bichou & Gray, 2004; Bichou, 2007; De Langen & Sharypova, 2013). The industry has realized the need for lean and agile measures by emphasizing that this will improve transparency of port's environment and enhance better integration of all supply chain logistics elements (Marlow & Paixao, 2003).

However, regardless of the development of various qualitative measurement tools, the latest literature (Talley, Ng, & Marsillac, 2014; Langenus & Dooms, 2015) confirms that ports are not implementing any qualitative measurement tools to assess its relevance for their environment. The results for this study confirm the same - all interview participants agreed that this is an adequate question and it would be useful to view port performance from this perspective. However, this is not the reality within the Oslo Fjord port sector. All parties acknowledge the importance of factors as intermodality, customer relationships, information sharing, etc., but mostly rely on their customers for their own performance measurements and the control of business activities. This has a close fit with the principle of 'strategically interdependent' port stakeholders (Song & Parola, 2015). Port stakeholders acknowledge the power of each other and realize that their business would not exist if other parties would not be involved.

This can be explained by the fact that port's environment is highly complex that port stakeholders are just a part of the supply chain and does not have control over it (Tongzon et al., 2009). Literature (De Langen & Sharypova, 2013; Talley et al., 2014) suggests that the reason for not applying qualitative measurement tools are due to the fact that ports are very dissimilar and this constitutes serious limitations on potential measurement activities.

Interviewees from port authorities noted that the port performance as such would be a useful factor to know for the port operators who would like to establish themselves within port area. This is consistent with De Langen & Sharypova (2013) arguments that port authorities will be increasingly pressured to report port performance indicators, which supports comparison between ports. De Langen & Sharypova (2013) also notes that for port operators qualitative port performance indicators may result in greater pressure from port users, port authorities and other stakeholders, requesting to report the efficiency and sustainability of operations. But for port users, such measures would enable improved

decision-making in terms of efficiency and sustainability for their transport operations (De Langen & Sharypova, 2013).

Even though port authorities and port operators are not directly measuring qualitative performance factors, there could be drawn some linkages between supply chain strategies and its impact on the port performance (see Figure 5.2). The findings of this study regarding port stakeholders' perceptions towards supply chain strategy in connection with port performance show similar patterns as De Langen & Sharypova (2013) arguments. Port users' perceptions on how their supply chain strategy effects port performance is based on improvement of their efficiency and potential how to reach their customers via multi-modal solutions. This has caused pressure towards port operators because port users' business is extremely marginal and shipping lines pressure port operators for reduced port time for their vessels.

Port users emphasises that they have valid points, which would benefit to overall port performance, for example, time factor (see section 4.1.3). In this case, ports would be able to reduce their expenses required for fulfilling services, while shipping lines would gain flexibility and operate their schedules faster, still paying for port's service the same amount. This confirms the importance of strategically interdependent stakeholders and their effect on each other's performance.

However, since port authorities approach their supply chain strategy from the holistic perspective, they see close alliance with their supply chain objectives and port performance in terms of maintenance port's infrastructure and port development. This is supported by Song & Panayides (2008) and Panayides & Song (2009) arguments, by emphasizing importance of elements as transport mode integration and multi modal systems.

But port operators' main focus is the customer, which have a close alliance with Song & Panayides (2008) and Panayides & Song (2009) parameters as value added services, relationships with customers, and information and communication systems for data sharing.

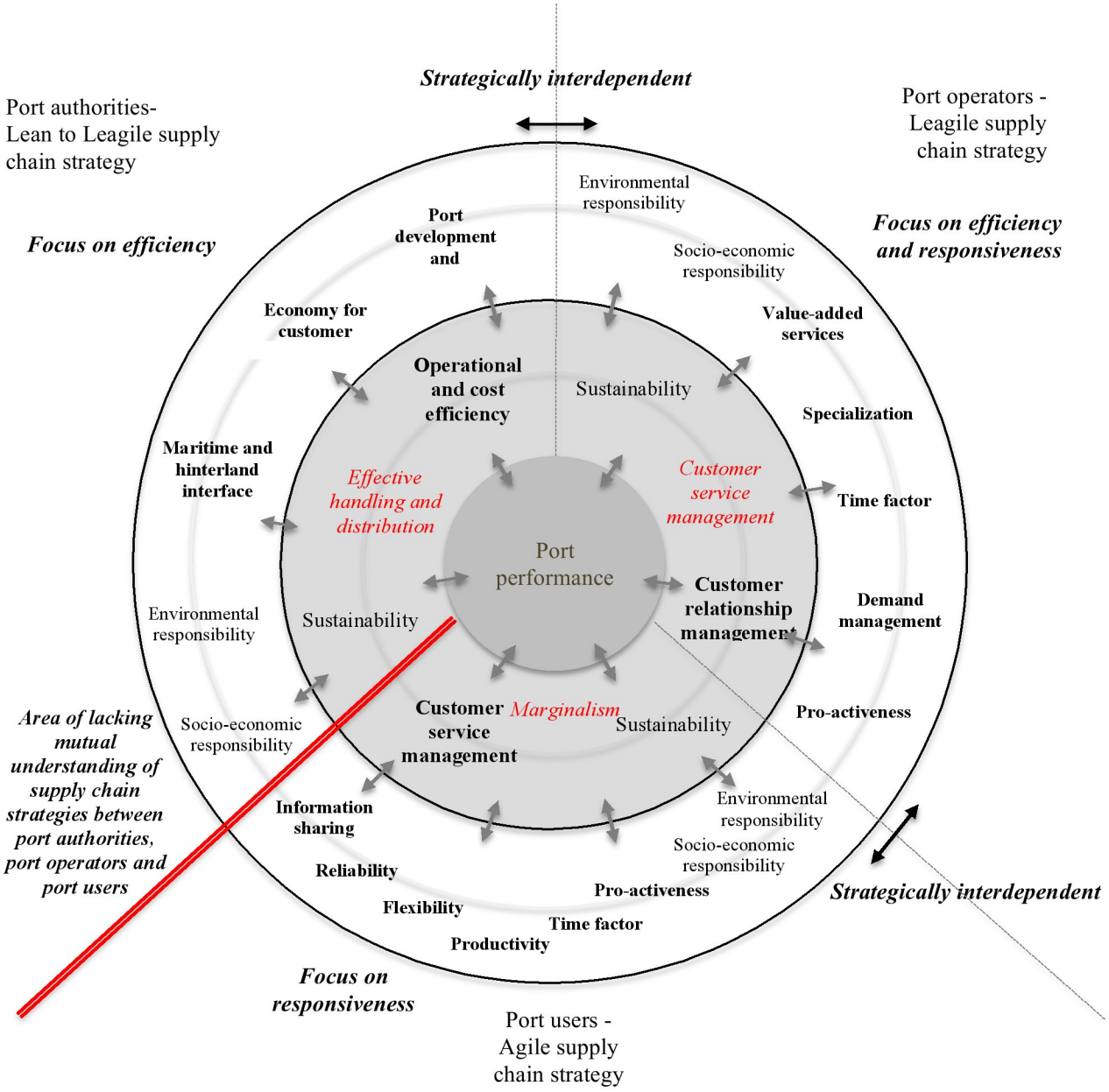


Figure 5.2 Port performance elements from supply chain strategies' perspective

Additionally, all parties acknowledge the significance of sustainability within their supply chain networks and the potential within to maintain their business operations and subsequently improve port performance. However, as discussed prior, ports have to deal with the wide spectrum of involved stakeholders, which are limiting their capabilities of responding proactively to demands and requests from their customers.

5.2 Limitations and recommendation for future research

Every port and port-related company within the Oslo Fjord is very unique. This may lead to different results depending of the differences between various ports and port-related companies. Furthermore, not all port stakeholder groups were investigated, meaning that not all supply chain actors' relations and interdependencies were acknowledged.

Therefore, this study invites for more detailed empirical research on supply chain strategies of various port stakeholders from the entire port's supply chain network perspective. Additionally, it would be useful to investigate the Norwegian Western Coast ports and port-related stakeholders and afterwards to compare it with the Oslo Fjord port sector.

6. Conclusion

This paper contributes to the empirical literature of Oslo Fjord port stakeholders' supply chain strategies in connection with the port performance. This matter has been under-investigated and might improve port stakeholders' understanding of supply chain strategies and provide with new insights on the port performance.

By applying qualitative approach based on semi-structured interviews and multiple-case study design of the Oslo Fjord port sector, this thesis has shown a variety of port stakeholders' supply chain strategies and the fundamental elements of it. The sample indicated that port authorities focus on efficient operations and aim to apply lean or leagile supply chain strategy; Port operators provide balance between efficiency and responsiveness leading towards leagile supply chain strategy; But port users serve responsiveness for their corresponding supply chain networks by employing an agile approach towards their supply chain strategy.

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Appendix A

Role of ports in varying supply chain strategies

Supply and demand characteristics	Pipeline strategy	Ports role	Ports distribution facility	Strategy type
Short lead time and predictable demand	Lean, continuous replenishment	Import: provision of relatively cheap warehouse space close to point of import, e.g. vendor managed inventory (VMI)— supplier import freight through the port and replenishes direct to the customer from warehouse at the port	Districenter; ICD	A1
		Export: VMI managed at the port for short sea traffic	Distripark; ABP Connect	A2
Short lead time and unpredictable demand	Agile, quick response	Import: provision of warehouse space and cross docking facilities to allow rapid import, sorting and distribution of varying product lines	Distripark	B1
		Export: Short lead time and unpredictability of demand may lead suppliers to choose to store goods at the port rather than the factory	Districenter	B2
Long lead time and predictable demand	Lean, planning and execution	Import: Cost effective storage facilities. Long lead time requires varying ship arrivals and requirement for ship berthage space	Traditional port warehousing	C1
		Export: Port may provide facility to store export goods to cope with seasonality and varying ship departure times	Traditional port warehousing	C2
Long lead time and unpredictable demand	Leagile production, logistics postponement	Import: Provision of warehousing, manufacturing capability to allow manufacturing postponement/kitting/pick and pack	Districenter; ABP Connect	D1
		Export: capability to handle and store non-customized product	ICD	D2

(Adapted from Pettit & Beresford, 2009, p.264; Mangan, Lalwani, & Fynes, 2007, p.590).

Appendix B

Interview Guide

Area of research - focus on port environment, strategic position in supply chain and relationships with other port stakeholders:

1. What is your opinion on port development tendencies and what kind of changes you have noticed in port industry environment?
2. In your opinion, what factors have the most impact of port development? How do you think port business environment will continue to develop?
3. Can you describe how your company (port) is positioned in port's supply chain system? What kind of connections do you have with to local or global supply chains?
4. What is your relationship with different stakeholders in the port?
5. How important is their role in your supply chain?
6. How does your company (port) is maintaining these supply chain relationships with its members?
7. How do you share information concerning market situation and economic forecasts with other supply chain actors in order to improve your company's (ports') performance?
8. Are you aware of other supply chain actors' business goals and do they coherent with yours (port authorities)?

Area of research - focus to the supply chain management and supply chain strategy:

9. How do you as port actor insert and integrate yourself in supply chains?
10. How are you managing your supply chain resources and activities to increase value added services and subsequently - customer value?
11. What do you as a port actor want to achieve with respect to supply chain?

12. How do you think, what factors condition the supply chain strategy for your company (port)?
13. How do you think supply chain should operate in order to compete?
14. Does your supply chain strategy is intended to support a cost efficient supply chain or your supply chain strategy is intended to achieve and sustain flexibility and adaptability in order cope with dynamic port environment and changing customer needs?
15. What is your business strategy and how it is connected to supply chain strategy?
16. Is there any strategic challenges' your company (port) face in current operating environment?
17. Do you feel pressure from different stakeholders for more sustainable supply chain – for example, that ports/terminals/shipping lines have to become more flexible, consider environmental concerns and socio-economic?
18. Can you please describe how in your opinion port activities impact environmental and socio-economic matters of the region port is located?

Area of research - focus on supply chain performance and port performance

19. Are you measuring your business performance? How?
20. Do you measure supply chain performance? What are the parameters used to measure your company's (port's) supply chain performance?
21. What you think are the difficulties faced in measuring your company's (port's) performance?
22. Do you compare the supply chain options available for cargoes flows that will flow through your company (port) compared to alternative routes?
23. Do you have a management process that reviews and assess your operations and seeks for the opportunities to improve company's performance (port's performance) and operational efficiency?

24. Are you aware and interested in overall port performance?
25. Do you communicate with other port stakeholders about the overall port performance improvements?
26. How do you think, which factors the mostly impact port performance?
27. What you think are the difficulties faced in measuring port performance?

End of the interview

28. How important is this factor – supply chain strategy - for your business? How do you think, are your business and port is benefiting from port stakeholders' supply chain strategies? Do you have some examples?
29. Do you take part in some projects especially created for supply chain improvement – infrastructure development etc.?
30. Before we end the interview, can give me advice what important aspect I have missed when investigating this question?
31. In case if I have some additional questions, is its possible to contact you?

Thank you for your answers and your contribution to knowledge creation!

Appendix C

Main statements - most relevant themes and categories - of the thesis

	Participant Nr. 1	Participant Nr. 2	Participant Nr. 3	Participant Nr. 4	Participant Nr. 5	Participant Nr. 6
Effective handing & distribution	■	■			■	■
Operational and cost efficiency	■	■	■	■	■	■
Maritime and hinterland interface	■	■	■	■	■	■
Value-added services	■	■			■	
Port development and expansion	■	■			■	
Customer relationship management	■	■		■	■	■
Customer service management	■					■
Sustainability	■	■	■	■	■	■
Environmental responsibility	■	■	■	■	■	■
Socio-economic responsibility	■	■	■	■	■	■
Demand management	■					■
Pro-activeness	■	■		■		
Economy for customer	■	■	■	■	■	■
Specialization		■	■	■		■
Time factor	■	■		■		
Marginal business			■	■		■
Reliability			■	■		■
Productivity		■		■		
Cargo volume increase	■	■	■		■	■
Flexibility			■	■		
Cost reduction	■			■		■
Infrastructural constraints	■	■	■	■	■	■
Operational constraints	■	■	■	■	■	■
Market imposed constraints	■	■	■	■	■	■
Region specific constraints	■	■	■	■	■	■
Bureaucratic constraints	■	■			■	
Sustainability imposed constraints	■	■	■	■	■	■
Efficiency	■	■		■	■	
Responsiveness			■	■		■
Port performance	■	■		■	■	■