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**A Conceptual Model of  
Supply Chain Collaboration  
across the Sea Port  
Logistics Network: Role of  
Competitive environment  
and Port Performance**

# **A Conceptual Model of Supply Chain Collaboration across the Sea Port Logistics Network: Role of Competitive Environment and Port Performance**

## **Abstract**

In academia as in practice, seaports are increasingly viewed as elements in supply chains. Supply Chain Collaboration (SCC) is now inevitable for smooth cargo movements in supply chains, in light of the complexities of seaport logistics. Although SCC reinforces effective Supply Chain Management (SCM), it is not developed adequately both from academic and practical perspective. This paper aims to develop a conceptual model for evaluation of the relationships between SCC, Competitive Environment (CE) and Port Performance (PP) from the standpoint of the seaport logistics network.

Key words: seaport, supply chain collaboration, competitive environment, supply chain management, port performance

## **1. Introduction**

A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain includes not only the manufacturer and suppliers, but also transporters, warehouses, retailers, and even customers themselves. A supply

chain is dynamic and involves the constant flow of information, product, and funds between different stages [1]. Logistics is the management of the flow of goods between the point of origin and the point of consumption in order to meet some requirements, for example, of customers or corporations [2]. Supply chain is therefore a more broadened conception [2] and logistics is an integral part of a supply chain. In academia as in practice, seaports are increasingly viewed as elements in supply chains [3]. Seaport logistics (Maritime logistics) is defined as a concept that applies the principles of logistics and supply chain management (SCM) to maritime transport and this includes ports [4]. Maritime logistics is redefined in the wake of globalisation, increased international trade and shorter life cycles of products and technologies. For instance, developments in logistics and SCM have led to global outsourcing, which has roused relocation of production facilities to low cost economies. Global outsourcing in turn has resulted in increased movements of cargo and innovative distribution strategies in multinational companies. In academia as in practice, seaports are increasingly viewed as elements in supply chains. It is argued that seaports should add value to shippers by aligning their own business activities with shippers' SCM strategies [5]. Ascencio et al, 2014 [6] observe a port logistics chain (PLC) embracing all the global logistics chains that operate through a seaport, including different stakeholders involved in the international trade processes, such as the importers and exporters, the Port Authority, the terminal operators, customs, customs agents, transport companies (ground and maritime), freight forwarders, and empty container parks. They accordingly, propose a collaborative logistics framework for a port logistics chain based on the principles of SCM that rely on stakeholders' integration and collaboration. Supply Chain Collaboration (SCC) is now inevitable for smooth cargo movements in supply chains, in light of the complexities of maritime logistics.

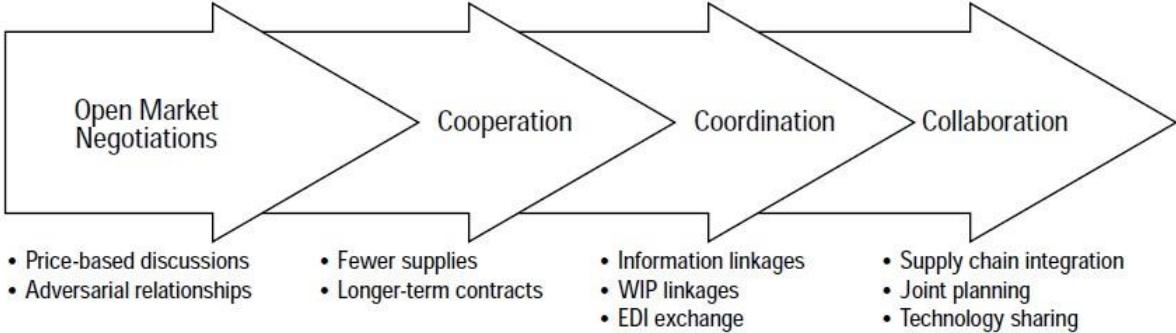
## **2. Theory and concepts**

### **2.1 SCC-Theoretical perspective**

SCC is defined as *“two or more independent firms jointly working to align their supply chain processes so as to create value to end customers and stakeholders with greater success than acting alone”* [7]. Although SCC reinforces effective SCM, it is not

developed adequately both from academic and practical perspective. This assumes significance in light of the fact that the terms integration and collaboration are interchangeably used to describe supply chain relationships because they are comprised of similar concepts [8]. Based on a comprehensive literature review, Natour et al, 2011 [9] propose a classification of supply chain integration and SCC that distinguishes the relationship-oriented “collaboration” from structural configuration-oriented “integration”. The typology of three kinds of different partnerships, elaborating each characteristic as shown in Table 1 and Figure 1 shows that SCC encompasses supply chain integration [10], [11].

Figure 1: The key transition from open-market negotiations to collaboration



Source: Spekman *et al.* (1998, p. 57)

Table 1: Characteristics of partnership types

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Partnership type	Activities	Time horizon	Scope of activities
Cooperation	Fewer suppliers Longer-term contracts	Short-term	Single functional area
Coordination	Information linkages WIP linkages EDI exchange	Long-term	Multiple functional areas
Collaboration	Supply chain integration Joint planning Technology sharing	Long-term with no fixed date	Firms see each other as extensions of their own firm

Source: Harrison and Van Hoek (2005, p. 254)

An increasing percentage of the value creation takes place outside the boundaries of the individual firm [12]. The underlying motivation behind SCC is that the complexity of product, technology, and marketing processes needs collaboration for optimizing cost and value addition [13]. There is a need therefore to draw on several behavioural and organizational theories and frameworks in combination to understand SCC. This thesis is based on the application of socio-economic theories of Transaction Cost Analysis (TCA), Principal-Agent Theory (PAT), Resource Based View (RBV) and Network Theory (NT) to seaport logistics.

#### TCA

TCA is a useful instrument to decide whether a transaction should be performed in the marketplace or in-house. A company may reduce its total transaction costs by cooperating with external partners [13].

SCC may assist firms to reduce the cost of opportunism and monitoring based on mutual trust and integration for mutual interest through the partnership [14].

#### PAT

The theory attempts to conceptualise and explain the relationship between the two parties identified as ‘principal’ and ‘agent’, as applied to the delegation of authority (control and decision making) within organisational contexts. It can therefore be a useful analytical lens for studying relational aspects of supply chain management [9]. Based on the separation of ownership and control of economic activities between the agent and the principal, various agency problems may arise, such as asymmetric information between the principal and the agent, conflicting objectives, differences in risk aversion, outcome uncertainty, behaviour based on self-interest, and bounded rationality [13]. An effective means of addressing the issue of goal conflict in a supply network is promoting collaboration between agents [15], [16]. In effect, the theory attempts to address the problem of (lack of) “goal congruence” between the principal and the agent resulting from the potential opportunistic, self-seeking behaviour of the agent which is presumed to be in conflict with the “utility maximisation”-oriented interests of the principal [17].

#### RBV

The RBV deals with competitive advantages related to the firm’s possession of heterogeneous resources (financial, physical, human, technological, organizational, and reputational) and capabilities (combination of two or more resources) [18].

Collaboration between firms encourages them to concentrate on their core activities, so they can develop specific skills and economies of scale as well as learning effects so as to increase their positions [19]. SCC is viewed as one of the initiatives of RBV that encourages supply chain partners to exchange knowledge and share information for enhancing their supply chains [20].

NT

The network theory (NT) contributes profoundly to an understanding of the dynamics of inter organizational relations by emphasizing the importance of “personal chemistry” between the parties, the build-up of trust through positive long-term cooperative relations and the mutual adaptation of routines and systems through exchange processes [13]. Links between firms in a network develop through two separate, but closely linked, types of interaction: exchange processes (information, goods and services), and social and adaptation processes (personal, technical, legal, logistics, and administrative elements) (Johanson and Mattsson, 1987) [21]. In SCM, NT has primarily been applied to map activities, actors, and resources in a supply chain. The focus has been on developing long-term, trust based relationships between the supply chain members [13].

Several benefits of SCC have been found such as lower total cost, revenue enhancements, operational flexibility, demand planning, inventory visibility, new knowledge and skills, reduced inventory, more efficient use of human resources, reduced cycle times, sharing risks, improved technology capabilities, stronger focus on core competencies, increased sales and returns, enhanced customer services, enhanced customer responsiveness, and improved service performance to deal with high demand uncertainty [22]. SCC also entails barriers and risks such as uncertainty around the optimum number of partners, duration of partnership and the investment in collaboration are regarded as obstacles of healthy collaboration [20]. Major barriers to SCC are categorised into organisational and operational dimension [20]. A deficiency of internal integration as an organisational barrier may be a demanding obstacle to utilise demand and forecast information as an operational barrier [23] . Undertaking supply chain partnering is difficult because it entails radical changes, considerable workloads, and they recognised six underlying obstacles in supply chain partnering: (1) underestimating the scale of change which partnering involves; (2) underestimating the

changing environments surrounding partnering; (3) priority conflicts; (4) over-dependence on relations; (5) inadequate definition of cost, benefit and value-adding models; (6) insufficient focus on the long-term relations [24]. Inappropriate information sharing, inconsistent metrics and turf conflicts are also predominant barriers to SCC [25]. Although the chief motivation in SCC is to obtain a win-win situation, there is often a huge discrepancy between the potential and the practice. Indeed, the influence of SCC on outcomes may be determined by the exercise of power in asymmetric relationships as a critical obstacle. Power refers to the ability to influence decision-making and actions of the other party [26]. Additionally, the lack of common goals, which is defined as the belief in benefits of SCC and risk or benefit sharing among supply chain partners, may result in opportunistic behaviours and weaken trust [27], [28]. Collaboration is frequently hampered by interfunctional and inter-organisational conflicts [29].

There is hardly any research regarding antecedents or precursors to collaboration in the supply chain. As per Simatupang and Sridharan, 2002 [30] intensive competition in the market place has forced companies to collaborate in the supply chain and respond more quickly to customer needs. Sahay, 2003 argues that collaboration can provide the competitive edge as global markets grow increasingly efficient and competition takes place between entire supply chains [31]. Natour et al, 2011 [9] state that supply chain collaboration is necessitated by the intensely competitive business environment. Based on a comprehensive literature review and empirical analysis as shown in Table 2, Ralston, 2014 [32] identified competitive environment as one of the antecedents to SCC. As per Hyland, 2015, [33] intense competition requires more integrative and collaborative efforts in supply chains. Fawcett et al, 2012 have sought to enrich the theory of collaboration by building on insights from the literature and via inductive, interview-driven research. One of their research findings is that companies have sought to cultivate collaboration capabilities to respond to intensifying competition and rising customer expectations [28].

Table 2: Antecedents to SCC

Authors	Year	Antecedents
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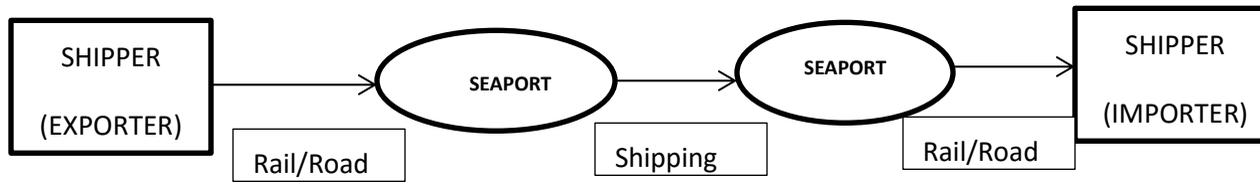
Frankel, Whipple, and Goldsby	2002	willingness to innovate and change, understanding the other's business, common goals and objectives, appropriate measures and incentives, and information sharing
Simatupang and Sridharan	2005	common collaborative performance system, information sharing, decision synchronization, incentive alignment, and integrated supply chain processes
Fawcett, Magnan, and McCarter	2008	management commitment, supply chain mapping and role definition, information sharing and system integration, people management and development, supply chain performance measurement, relationship management and trust building, and rationalization and simplification
Chen, Tien, Ellinger, and Daugherty	2010	top management team championship, 3PL customer service expertise
Hartmann and DeGrahl	2011	supply chain partner insight and communication
Zacharia, Nix, and Lusch	2011	absorptive capacity and collaborative process competence
Fawcett, Fawcett, Watson, and Magnan	2012	competitive environment
Richey, Adams, and Dalela	2012	technological complementarity and flexibility

Source: Ralston (2014, p. 29)

## 2.2 SCC in the seaport logistics context and proposed Interim conceptual research model

In this paper, ‘supply chain’ means ‘supply chain of goods and materials’ passing through seaports rather than ‘supply chain of services seaports provide’, and ‘seaport’ is considered as one of the members of the wider (ultimate) supply chains. This is illustrated by Figure 2.

Figure 2: Seaports in a Supply Chain



SCC philosophy within the port is still in its infancy. Nonetheless, a substantial body of maritime literature has examined the importance, roles and examples of collaboration amongst the organizations. Given the wide adoption of SCM into the maritime logistics context, diverse maritime researchers have interchangeably used various terms such as maritime supply chain, port supply chains, maritime port logistics chain, port-oriented landside supply chain and terminal supply chains. Lam, 2011 [34] used the term *maritime supply chain* by defining it as the connected series of activities in regard to shipping services which are concerned with planning, coordinating and controlling containerised cargoes from the point of origin to the point of destination. She considered maritime supply chain as customer-supplier vertical linked relationships between shipping lines, ports and shippers. Paixão and Marlow, 2005 [35] put forward the term *multimodal logistics supply chains* to identify service attributes of

short shipping operations within multimodal transport chains. Lee *et al.*,2003 [36] proposed the term *port supply chain* by decomposing a supply chain into a simple linear chain, comprising supply chain members, information and cargo flow, and logistics regarding export and import operations. Bichou and Gray,2005b [37] and Bichou,2007 [38] pinpointed *port supply chains* including a multitude of maritime logistics organisations such as shippers, freight forwarders, port authorities, third-party logistics providers, shipping lines and terminal operators.

Logistics involves complicated activities in which a firm optimises the flow of the product for cost reduction, whilst SCM is a wider concept than logistics in which various organisations in networks collaborate with each other. A supply chain approach considers maritime transportation as an integrated part of supply chain management in which separate organisations develop networks from production to sales, including managing purchase, product and inventory, so ports can be recognised as an important logistics centre not a sub-directory of sea transport.

In terms of the port supply chain, it is difficult to grasp the concept of the supply chain due to the complexity and variety of entities engaged in maritime logistics. Table 4 indicates the different characteristics between a manufacturing supply chain and port supply chain. The port supply chain is different from the manufacturer supply chain in service characteristics, logistics characteristics, strategic and operational policies [36].

Table 4: Comparison between manufacturing and port supply chain

	Manufacturing SC	Port SC
Objective in business entity	Same objective (low conflict) -Supplier: inventory -Manufacturer: inventory	Different objective -Shipper: punctuality and reliability -Shipping line: turnaround time
	-Distributor: inventory	-Port: resource management, inventory, q loading/unloading
Value-added business process	Manufacturing and assembly	Logistics (including load/unload)
Objective in business process	Lower inventory cost	Lower port time
Initiative in business process	Manufacturer	Ship and port
Business entity	Supplier, manufacturer, assembler, distributor	Supplier, shipping lines, terminal operator

management company, inland transport company, freight forwarder, third logistics provider, port authority, shipper, consignor/distributor

Source: Lee et al (2003, p.245)

Traditionally, ports tended to concentrate only on the seaside linkage e.g. container cargo loading/unloading, nautical approaches and acquisition of cranes rather than value-added services. As Martin and Thomas, 2001 [39] discussed, despite heavy interdependence between members in the port, there has been a lack of coordination and communication in a traditional break-bulk port community in the past. Today, ports are regarded as the catalysts for economic growth of the hinterland, but due to the development of door-to-door services arising from supply chain practice, ports have progressed toward a new role of integrated global supply chain systems [40]. Due to a changing environment, shipping liners, container terminal operators and inland transport companies have horizontally and vertically integrated their operation and services [41]. The availability of an intermodal transport system is also a growing issue as an important way of ensuring seamless cargo movements [42].

To achieve an efficient movement of cargoes, two types of geographical approach should be satisfied, including both seaside and landside. Due to door-to-door systems ports are integrating all roles in maritime, intermodal/multimodal and inland logistics for unified cargo flows [43]. The maritime transport cargoes, which are a derived demand from the trade between countries, now seem to be an integrated demand originating from the need for lowering costs, increasing reliability and adding value for shippers from the origin of manufacture to the destination of consumption [44]. In addition, shippers demand optimised transportation chains to integrate different types of transport modes toward seamless distribution [43]. This integration amongst port supply chain members may contribute to higher performance for the whole transport chain [45]. A large body of literature has attempted to adopt SCM into maritime logistics contexts for the last decade. Panayides and Song, 2008 [40] advocated that an integrated port in the context of supply chains featured unified communication, removal of wastage, cost cutting, interconnectivity, value-

added services and customer satisfaction in port operations. They conceptualised four constructs: (1) information and communication systems; (2) value-added services; (3) multimodal systems and operations; and (4) supply chain integration practices to measure seaport terminal supply chain integration (TESCI) through synthesis of ports and supply chain literature. Their empirical study firstly revealed that the development of constructs related to port integration activities with other Seaport logistics organizations such as shipping liners leads to a rise in the degree of TESCOI, so it contributed to enlightening an abstract concept of TESCOI. They concluded that TESCOI practices positively influence port performance, but there is a limitation in this finding because it only covers terminal operators' stances [40]. Bichou and Gray,2004 [46] pointed out that little research on ports addressed the aspects of logistics and SCM related to organisational networks, although ports play an important role in integrating all kinds of logistics channels as a distribution systems. The research related to SCM encourages either partnerships or integration, whereas port studies typically focus on conflict with one another or institutional fragmentation. It might be overwhelming for channel members to coordinate and integrate in the port. Organisational coordination is, however, necessary for them. This study regarded ports as not only a facilitator for value-added logistics where integral transport activities are processed, but also a sub-system of the production and supply chains. Ports even can be seen as networking sites amongst channel members in the supply chains. They discovered three different kinds of channels: *the trade channel*, *the logistics channel* and *the supply chain channel*, and pointed out that those channel interactions positively influence the degree of port integration and port performance. This empirical study showed that respondents emphasise the need for partnership or collaboration with other logistics channel members and the lack of information sharing. Further, the respondents in the port community tend to show a lack of full understanding of SCM concepts [46]. Robinson,2002 [47] articulated that recently a port is considered not only as a place in which third party logistics service providers create, share and compete over value with one another within supply chains, but also as an intervener in a set of different organisations' supply chains. This results in a fact that competitive advantage of the port is more focusing on the level to which it is embedded in supply chains, which provide shippers with greater value for customers, not traditional efficiency or geographical location. To sum up, value creation of a port is aligned with value creation of shippers. However, this study barely examined what kinds of capabilities of a port are necessary to satisfy customers as a facilitator of successful global supply chain players.

Panayides, 2006 [44] explained that due to the emergence of SCM it is important that other channel members collaborate in the transport industry. In addition, the deployment of mega-carriers has caused operational bottlenecks and synchronisation disputes between transport chains, which encourage them to cooperate [48]. Ferrari and Benacchio, 2002 [49] asserted that *“Cooperation between different players in the transport chain is to be positively considered because it allows the concentration of each player in its own business implementing the efficiency of the logistical service and a more rational infrastructure policy exploiting economies of scale and reducing sunk costs”*. Notteboom and Rodrigue, 2005 [48] suggested that port managers should consider collaborating with other organisations such as shipping lines, shippers, railway companies, and inland transport companies to enhance supply chain practice within a port. According to UNESCAP, 2005 [50], all organisations in the port network can be beneficial by cooperation between shipping lines and container terminal operators or port authorities. Collaborative relationships between the port and shipping line enable the shipping line to be satisfied, leading to the higher degree of loyalty to the port, which contributes to the ability to solve their problems. Port tariff bargains or loyalty rebates are an example of implied cooperation between terminal operators and shipping lines [50]. Paixão and Marlow, 2003 [35] stated that as two side directional logistics nodes, ports need high coordination since their function is highly complex. The level of coordination in these port supply chain actors from seaside to landside affects the efficiency and effectiveness of ports [51]. For hinterland connection as an important factor of port success, De Langen, 2004 [52] pointed out that coordination amongst Seaport logistics organizations such as container terminal operators, port authority and freight forwarder is a prerequisite. The superiority of connection to hinterland depended on whether they efficiently coordinate or not [52]. However, there has been little attention on coordination to improve hinterland transport so far. According to Van Der Horst and De Langen [53], there are a number of reasons identified why coordination and cooperation of hinterland connection amongst Seaport logistics organizations are difficult as below, which gives a rise to the free-rider problem.

- *The unequal distribution of the costs and benefits of coordination;*
  
- *The lack of resources or willingness to invest on the part of at least one firm in the transport chain;*

- *Strategic considerations;*
- *The lack of a dominant firm;*
- *Risk-averse behaviour and a short-term focus of firms in hinterland chains*

Soppé *et al.* 2009 [54] empirically identified partnerships between shipping lines and terminal operators. Although competition between shipping lines and terminal operators was intense for preoccupying the control of the port phase over the last few years, they are gradually transforming their attitude to each other with some forms of cooperation: contract, joint venture, partially owned subsidiary and wholly owned subsidiary. This empirical research found that some forms of strategic alliances between shipping lines have a propensity to establish either partnerships or networks with particular global terminal operators. Cooperation between channel members leads to significant benefits such as channel efficiency, goal achievement and higher degrees of satisfaction [55]. Nowadays terminal operators in search of integrating both horizontally and vertically are cautious about probable channel conflicts since their customers (cargoes) are likely to be footloose [43]. The others also attempt to focus on horizontal and vertical integration so as to strengthen their market positions and reduce uncertainty, transactions and transport costs because they can control and integrate within the logistics chains as an appropriate weapon in the era of global logistics [42]. According to Notteboom, 2002 [56], notwithstanding the prevalence of integration in the port industry, from the terminal operator's perspective it does not necessarily suggest that they should initiate integrated transport companies. Cooperation with related organisations in transport chains would be sufficient to facilitate the terminal function in terms of total logistics networks. Similarly, Panayides, 2006 [44] wondered whether long-term partnership activities between Seaport logistics organizations would be as effective as integration or not, and suggested that this topic could be a future research direction in maritime industry. To become a fourth generation port, a port should possess aspects of agility, leanness, flexibility, JIT and virtual partnerships between Seaport logistics organizations in both horizontal and vertical ways [35]. The higher the degree of collaboration, the

larger the advantages they will gain in promoting reciprocal interdependencies [57]. For instance, a shipping line based in a foreign country and a container terminal operator launch a joint venture for mutual interest [50]. According to Musso *et al.* 2000 [58], an important role of information flows across transport networks is that they should be managed effectively whilst maritime logistics companies have to cooperate in horizontal and vertical ways in order to dominate a higher market positioning. Therefore, to generate mutual benefits and a high degree of engagement of the port in supply chains, collaborative spirit and mutual trust are essential [57].

From traditional views by many researchers, maritime transport and logistics have been looked at as independent subdisciplines, so they are investigated respectively without overlapped areas [44]. Essentially, all organisations related to the maritime industry aim to satisfy the same targets, which are shippers' needs in providing services with reliability and punctuality. Shipping lines are likely to offer homogeneous services and transportation in general. A relationship between ports and shipping lines can be regarded as a vertical relationship because ports are in charge of the provision of their facilities such as berths, container yards, and gantry cranes and so on with shipping lines as its main customers. In a narrow perspective, the shipping lines are only one customer of the port. However, in a broader view, ports consider both shipping lines and other parties such as shippers, freight forwarders, inland transport companies, ship management companies and third-party logistics providers as their customers while shipping lines view shippers as their customers and regard themselves as customers of the ports. Ports have strived to satisfy the needs for both shipping lines and shippers by providing incentives in order for customers to retain a loyalty to them while shipping lines are struggling to keep their eye on shippers' demands. It may be inferred that the interests of related organisations overlap. This point of overlap might be a catalyst promoting SCC between MLOs in satisfying customers' demand in order to achieve collaborative advantage.

Franc and Horst, 2010 [59] explain why and how shipping lines (SLs) and terminal operating companies (TOCs) integrate into hinterland services. They conclude that Transaction Cost Economics helps to understand that both SLs and TOCs aim at enlarging their scopes in order to deal with uncertainty. As per Henesey and Persson, 2006 [60] the choice of governance systems in the transaction costs approach seeks to understand how economic efficiencies can be created in a transport corridor comprising of terminal, freight forwarder, inland transportation providers, governmental legal authorities, shipper and ship line. Horst and Lugt,

2011 [61] apply Transaction Cost Economics (TCE) to clarify coordination in port-related transport chains. They conclude that the types of interdependence of the companies involved (related to the specific coordination problems: lack of investments in the inland transport network, insufficient or suboptimal operational coordination in the hinterland transport chain, and underutilization of assets) is relevant in addition to the specific characteristics of the transaction according to TCE. They also find that to gain a better understanding of coordination in hinterland chains, further specification of TCE attributes is necessary. They finally conclude that it is important to explore the characteristics of the coordination arrangements chosen, including the transport modes involved, the functions of the actors involved, the function of the initiator, the power relationship of the initiator to other actors involved, and the use of Information and Communication Technology (ICT). Based on country-level analysis, Cho, 2014 [62] studies empirically the internal capabilities and external environments of logistics costs and traffic volumes in individual container ports by applying TCE. His study hypothesized thirteen relationships among determinants (port infrastructure, service, accessibility, maritime uncertainty, labour market uncertainty, and institutional uncertainty) and effects of logistics costs and container volumes in container ports.

Zheng and Negenborn, 2014 [63] focus on two port regulation modes: centralization and decentralization and use principal-agent theory to establish the model for the centralization mode and determine the optimal tariffs, port capacities and port efficiency levels. The use of principal-agent theory for the centralization mode is due to the existence of information asymmetry between the central government and the port operator. They elaborate on the problem that arises where the two parties have different interests and asymmetric information (the agent having more information); such that the principal cannot directly ensure that the agent is always acting in his best interests, particularly when activities that are useful to the principal are costly to the agent. In the centralization regulation mode, the central government is considered as the principal, due to his power to design the regulation system and lack of port cost information. The port operator is treated as the agent for her information advantage. The objective of the central government is to maximize the total social welfare, while the port operator wants to maximize her profit. The conflicting objectives and asymmetric information between them make the application of the principal-agent theory to the centralization regulation mode suitable. Furthermore considering two kinds of principal-agent problems: adverse selection and moral hazards, they base the centralization regulation on the former because the asymmetric information variables are exogenous.

Gordon et al, 2015 [64] discuss the resources, including operations and information technology that have contributed to the competitive position of the Port of Singapore. They analyse the case using the Resource-based View of strategy and argue that a combination of resources including supportive government policies, ample investment, and well thought out operations and information technology along with location and a natural deep harbour helped create a sustainable advantage for the Port. Seaports provide a rich, though unexplored, field to understand the interactive nature of innovation given the multiple and strong interdependencies among port operators and firms of the regional economic system [65]. Modern businesses in the maritime transport industry are interfacing with a dynamic, increasingly complex, information-driven world. Information and knowledge are increasingly the intangible assets on which business sustainability and growth are founded [66].

Several researchers have highlighted the importance of competitive environment from the point of view of seaport logistics.

For instance as per Tongzon et al, 2007 [67] the present era of globalization and regional competition has witnessed the increasing influence of the global operations of the shipping lines on port development and the declining monopoly of ports, which in turn warrants the need for an identification of the port selection criteria from the perspective of the shipping lines.

Heaver, 1995 [68] argue that the competitive environment favours considerable local autonomy and that the port management, in addition to possible direct responsibility for terminal management, needs to focus on activities with economies of scale or scope. Tongzon et al, 2005 [69] investigate the effects of factors such as private sector participation in the port industry and the adaptability to the customers demand can improve port operation efficiency, which will in turn increase port competitiveness.

Slack, 1993 [70] examines the plight of public monopoly ports in a highly competitive environment and discusses several policy options. Zhang, et al, 2013 [71] study port strategy from a supply chain perspective considering the case of Hong Kong port which used to be the world's busiest container port, but is now in danger of losing its hub status due to rising competition from neighbouring lower-cost rivals. Competitive Environment (CE) is therefore identified as the appropriate antecedent to SCC in the context of seaport logistics.

A port is a complicated reality engaged in a series of supply chains, each of which is an independent unit aiming at its own profits [57]. There are many organizations occupied (or potentially occupied) with logistics and supply chain integration within and around ports, mainly in the role of logistics channel facilitators (ocean carriers, land-based carriers, port operators, forwarders,

port agents, etc.), but also as public institutions such as Customs authorities. Ports are one of the very few networking sites that can bring together various members of the supply chain [46]. This should reflect the performance aspects of ports concerning customers' perspectives and expectations [40], [44], [72].

An interim conceptual research model comprising of supply chain collaboration, competitive environment, and port performance as constructs is accordingly proposed as shown in Figure 3.

Figure 3: Interim conceptual research model



### 3. Summary and conclusions

SCM philosophy forces the seaports to become more integrated into the shippers' supply chain. Practically, they should strive to augment multiple facets of SCC practices for their port supply chain by constantly redefining their collaborative endeavours. The paper discussed in some detail the theoretical perspectives on supply chain collaboration and supply chain collaboration in the context of seaport logistics and proposed the Interim conceptual model. The model comprising of supply chain collaboration, competitive environment, and port performance as the constructs should be empirically verified and validated.

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