FRAMEWORK FOR COLLABORATION AMONG PORTSTAKEHOLDERS: LITERATURE REVIEW AND CASE STUDY

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ABSTRACT

Port is the main link in the distribution and transportation systems, and as an interface between sea transportation and other transportation modes. Competitive position of the port is not only determined by internal forces, but also influenced by the performance of the supply chain network. Port performance is affected by the strategy adopted by each of the stakeholders. Each stakeholder in each entity has a different purpose, interests, policies, management and ownership and there may be collaboration as well as competition and rivalry among them. Port does not only play an integral component of the transportation system, but also as a major sub-system of the global production system, an important node in the supply chain and a key component in determining the competitiveness of a country's economy. Therefore, collaboration between stakeholders of the port became an important and strategic issue to be discussed. Collaboration can determine the efficiency and effectiveness of operations of each entity, and may improve the overall performance of port operations, which in turn can improve the competitiveness of the port. In the supply chain literature, collaboration has been a topic much disccused, but collaboration involving port stakeholders only received very little attention. This paper presents a framework for collaboration between port stakeholders based on existing literature, and presents a case study of collaboration among them.We investigate current conditions, opportunities, barriers and challenges in the implementation of collaborative strategies. The application of windows slotssystem, berth guaranty, and a dedicated terminal in the port operations and how these could improve resource utilization are among collaborative issues that are discussed.

Keywords: port collaboration, horizontal collaboration, vertical collaboration, resource sharing, case study.

1. INTRODUCTION

Ports and terminals are widelyrecognized by researchers and practitioners as one of the important components in the supplychainactivities(Tongzon et al. 2009).Ports are required to adapt to the needs and demands of the global supplychain. To meetthesedemands, ports shoulddevelop and implement collaborative strategies(Woo et al. 2013). Integration and collaboration are needed in particular to overcome the limitations of production capacity as a result of the limitedresources of the port (Donk et al. 2008). Donk et al., (2008)refer to Van Donk and Van der Vaart (2004) point outthat the resource sharing will trigger companies to collaborate. The main activities of the collaboration is to shareresources and capabilitiesthatmake the playersworktogether to createmutuallybeneficialresults(Bahinipati & Deshmukh 2012).

Ability to provide services to the shipping linesis partly determinedby the superstuctures and infrastructure owned by the port. These services are facilitatedwithwindows slots, defined as a schedule of arrival and ship service. Services performed by the port isaffected by uncertainty, especially the uncertainty of arrival of the vessels. The mostcommon causes aredelayeddeparturefrom the previous port, the technical condition of the vessel damage and disruption, and the weatherfactors. Wang and Meng, (2012) dividesship disruption in twocategories ofuncertainty, namelyuncertaintyatsea and in port. Uncertainty in the seaincludesbadweathersuch as rain, snow, wind, tornadoes, storm, and tides. Uncertainty in ports is represented by various things such as lack of experiencein navigating the vessel master, berthplanning system, fluctuation of the crane handling and efficiency, and variation in the number of containers handledateachweek.

As statedabove, port is naturally complex due to many entities that interact and influence each other while each of them could have different characteristics and interests(Bichou & Gray 2005). There have been little discussion in theliteraturethataddressesthe integration or collaboration in the port supplychain. More specifically, only a few discusses horizontal collaboration between terminal operators in the port. The purpose of thispaperis to explore the opportunities, challenges and barriers in horizontal collaboration between terminal operators in the port. This researchisexploratoryin nature. Data wascollectedthrough semi-structured interview involving the operational and planning manager ata major container terminal in Indonesia.

The next section ofthispaperwillpresenttheoreticaloverviewrelated to supplychain collaboration, port characteristics, and horizontal collaboration. This will be followed by a case study, related to windows and berthing slots contract, and berthingsystems. The fifth section discussesresults, in particular the obstacles to collaboration, opportunities and challenges in implementing the strategy of horizontal collaboration. The final part of thispaperis the conclusions and suggestions for furtherresearch.

2. SUPPLY CHAIN COLLABORATION AND PORT CHARACTERISTICS

Collaborative supplychainisdefined as two or more companiesworkingtogether to plan and implementsupplychainoperations to createcompetitiveadvantage and achievehigher profits thanwhenworkingalone(Simatupang & Sridharan, 2005). Collaboration in the supplychain network isdonewith the aim to reduce transaction costs, increaseresources sharing, learning, and knowledge sharing (Cousins & Menguc, 2013). Woo et al., (2013)definesstrategy in the port supplychainintegration as a strategyundertaken to integrate the variousfunctions and organizations in the supplychain to become an integral part of the supplychain. Song & Panayides, (2008)defines the terminal supplychainintegration as the extent to which port establishessystems and processes and perform the relevant function to become an integral part of the supplychain. Port is an integral part of the supplychain, sothat in addition to the internal efficiency and performance, port shouldalsofacilitate the efficiency and performance associatedwith the supplychain.

Container terminal is a place for the loading and unloading of container ships and akey point of sea transport network (Hsu 2013). Woo et al., (2013)suggestedthat one of the five components in the port supplychainintegrationis a long-termrelationship. Tongzon et al., (2009)discussesthat the success of the collaboration isdetermined by how the orientation of whichisowned by the port and terminal operatorscollaborate. The success of the terminal operator to realize the collaboration is important in orderto improvecustomer service and hence creates excellence and competitiveness(Tongzon et al., 2009).

One of the main challengesis the complexity of port operations due to the many parties involved and the complex nature of business processes(Cullinane et al. 2006). Coordination isnecessary to avoid operating withhighcosts, improve service, and avoidsuboptimal use of resources. Port is an important part of the cluster of logistics and transport operatorswith the ultimate goal of bringing value to the end customer(Song & Panayides 2008).Bichou & Gray, (2005)proposeda supply chain approach for developing porttaxonomy

Song & Panayides, (2008) mention that the container terminal is a central actor in the supplychain. Each terminal ismanaged by different terminal operatorcompany. Therefore, the ability to integratestakeholders in the port becomesinteresting to discuss. The purpose of integration of the port is to createsynergy or collaboration to convertinterestamongplayers in the port community in ensuring the reliabilityand sustainabilityof the service level of goods and services (Carbone Valentina & Marcella 2003).

The main activities of the collaboration is to shareresources and capabilitiesthatmake the playersworktogether to createmutuallybeneficialresults(Bahinipati & Deshmukh 2012 ; Lin et al. 2013). Tongzon et al., (2009)suggestedthat the port couldbenefit by doing the relationshipwithstakeholders. Assetshare has been proven to increase profits and enhanceits service level. Hoshino, (2010)discusses the need for a balancebetweencompetition and cooperationamong ports. In cases whereseveral ports in Japanissteadilydeclining due to not being able to compete, a collaboration between the container terminal isneeded to improve the ability to compete and createcompetativeadvantage. Hoshino, (2010)foundthatsome ports starteddoing sales and promotion of cooperation, simplification of procedures, cooperation in repositioning to maintain the availability of empty containers, evenitis possible to cooperate in financial and investmentequipment(Hoshino 2010).

Severalstudieswerealsoperformed to determine the correlationbetween collaboration withsupplychain performance. Lorentz, (2008) examine the export-import collaboration activitiescarried out amongcompaniesacrossRussia and Finlandborders, and concludedthat the cross-border collaboration has a positive correlation to performance. Pramatari & Papakiriakopoulos, (2010)developed a performance measurementindicator system to measure the performance of companiesthat do a collaboration. The results show that collaboration canimprove the performance of the company.Hsu, (2013)alsoconducted a study of container terminal operations in the customer perspective. Yeo et al., (2011)identifiedsevenfactorsthat affect the performance of the container terminal port service, hinterland condition, availability, convenience, logisticscost, the regional center and connectivity.

The integration of ports and terminalswithin the framework of the supplychain has been discussedat least by Song & Panayides,(2008)andWoo,(2013). Horizontal collaboration isdone to improveoperationsat the port which is expected to bring improvements on the service levelof ports and terminals, whichwillultimatelyimprove the performance of the supplychain. Someauthorssee the port as an entity in the supplychain. Withthisview port is onlyseen as one node, however whenseen in more depth, the port consists of a couple of entities, where one anotherhas mutual influence (Heaver 2010). Cullinane et al., (2006)saythat the main challenge facing the port isthat

port naturally has complexoperations as a consequence of the many parties involved (export-import) and the complex interactions thatoccurbetween the port operations.

3. HORIZONTAL COLLABORATION

In some of the literature mentioned there are two types of collaboration, vertical and horizontal.Vertical collaboration occurs when a company seeks to establish partnerships and forming relationships with some of the parties in the supply chain at different levels. The goal is to avoid unnecessary logistics costs. Strategic cooperation can improve response to customers by identifying ways to reduce or eliminate excessive costs, to improve the quality and reliability as well as increasing the speed and flexibility (Tongzon et al. 2009).

Traditional approaches typically use vertical collaboration strategy through acquisition or merger. Consequently, the organization is not lean, the obstacles are not able to respond quickly in a very complex market, on the other hand the company has limited efforts to expand and find it difficult to create a competative advantage (Du 2007). To respond to this, companies must invest in large numbers, and when the economy grows unstable or fluctuating, it will be difficult for companies to make large investments in order to avoid the risks that arise in the long term. The company began to make the transition from vertical strategy to horizontal strategy.

Horizontal collaboration refers to joint activities of the company at the same level to reduce costs,improve service, and improve performance (Lozano et al. 2013). Horizontal collaboration isa business agreement between two or more companies at the same level in the supply chain or supply chain network so it is easier in working and cooperating to achieve the same goal(Reniers et al., 2010; Cousins et al., 2008). This can be achieved by taking appropriate action, utilizing and sharing resources such as machines, technology and labor(Bahinipati et al. 2009). Horizontal collaboration can potentially lower prices, reduce supply risks, reduce administrative costs. On the other handit is useful as a group of network members to communicate and interact with each other. With this model, the company can not only enhance the core competence, but also helps companies that collaborate to avoid large investments and high risk(Bahinipati et al. 2009).

Collaboration must be mutually beneficial forthe partners, although the benefits received are not to be divided equally, but based on the contributions made. Thing that needs attention is that the benefit received by the partner must be greater than the benefits received when done alone. Benefits received are not always in the form of financial and in a range of short-term, but may be non-financial and long-term. Collaboration should include the willingness to bear risk (risk sharing). Horizontal collaboration can reduce logistics costs (Yilmaz& Savasaneril, 2012; Lozano et al. 2013). Mason et al., (2005) suggests there are two important reasons why transportation is a strategic business function, namely (1) the cost of transporting a large proportion of the cost of production, (2) there is a strong correlation between customer service levels and performance of transportation. However, the integration and collaboration may notworksmoothly. Defee & Stank, (2005) suggested several factors that affect the success of the collaboration, including the existence of dominance and power, the level of competition in the industry, the maturity of the company, and the nature of the product.

Lorentz, (2008) stated that there is a component that allows the type of collaborative relationship, namely involvement in planning, controlling joint operations, communications, risk and reward sharing, trust and commitment, the nature and the scope of the contract, and investment. In the context of port terminals in addition to having to pay attention to these factors, other factors should also be considered such as geographical location, customs service, and administration.

4. FRAMEWORK

Figure 1 shows the horizontal collaboration framework, consists of four components, drivers, challenges, opportunities, and performance. The components were obtained based on the literature review and case studies. Capacity constraints and uncertainty encourages companies to collaborate. Collaboration is influenced by the opportunities and challenges, and barriers. With capacity constraints and uncertainty, horizontal collaboration is expected to improve overall supply chain performance. Horizontal collaboration by means of joint planning and operation, and asset sharing can improve operations capability. Operations capability can improve asset utilization and flexibility of operation. Service levels can be improvedby increasing asset utilization,while improving operating flexibility can have positive impacts onthe throughput. These will ultimately increase profits.

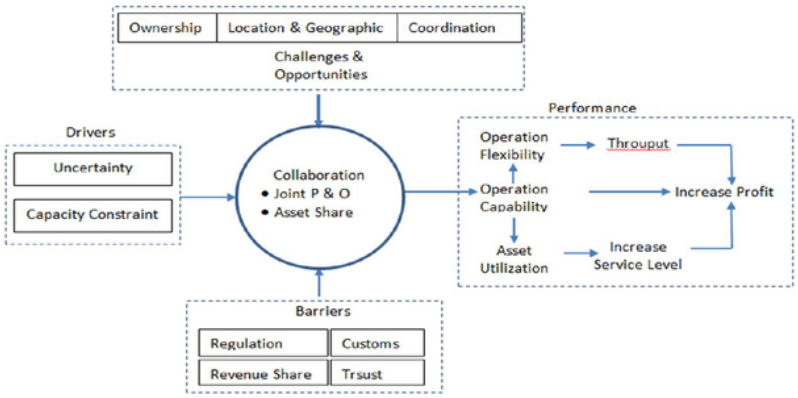

Figure 1. Horizontal Collaboration Framework

4.1. Drivers

There are two factors that drivecollaboration, that is, capacity constraints and uncertainty. These two factors are interrelated to one another. Capacity constraints may be represented by the capabilities of infrastructure and superstructure such as length, width, and depth of the berth, container cranes, RTG, truck and container yard. Uncertainty may be divided into three groups, namely the ships arrival uncertainty, service uncertainty of the vessel, and cargo handling uncertainty in the terminal. Each component is described below.

- *Capacity constraint*. There are three possibilities for the capacity constraints that encourage collaboration, namely the lack of capacity, excess of capacity, and investment constraints (Wu et al. 2014). Excess capacity led to the existing facility being underutilized. The decision to increase the capacity is constrained by the limited availability ofinvestment funds, regulatory constraints, and constraints due to technical problems. Available resources should be utilized appropriately and improvements of utilization can be achieved throughhorizontal collaboration (Bahinipati et al. 2009).
- Uncertainty. Uncertainty is divided into three categories, namely the ship arrival uncertainty, service uncertainty of the vessel in port and cargo handling uncertainty.
  - Vessel arrival uncertainty. Vessel uncertainty in the sea, including bad weather such as rain, snow, wind, tornadoes, storm, and tides (Wang and Meng, 2012).
  - Vessel service uncertainty. Uncertainty in ports due to such factors as lack of experience in navigating the vessel master, berth planning systems, fluctuation crane handling and efficiency, and variation in the number of containers handled ineach week.

- Cargo service. Uncertainty due to the allocation and productivity of equipment, congestion in the terminal and container yard.

4.2. Opportunities and Challenges.

Opportunity and challenges are factors that support the occurrence of horizontal collaboration.

- *Ownership.* The success of the collaboration is determined by how each party see the value of collaboration while each party is an independent business entity (e.g., port and terminal operator). Important variables are related to the effect on the initiation of the collaboration of different entities and their willingness to collaborate (Ankersmit et al. 2014). Still few are discussing the influence of ownership on the success of a collaboration, but it can be said that the orientation of the owner will determine the success of the collaboration.
- *Geographic location.* Based on the survey results, in particular the joint operation of horizontal collaboration and asset sharing between terminals, may not be done if the terminal does not support location. Ideally to support collaboration, the berth should be at the same location (connected).

4.3. Barriers

To realize the collaboration, there are several challenges that must be faced, namely:

- *Trust.* Trust refers to the belief of an organization in the ability of other organizations. Anti-trust is distrust in the ability of the other party, which may be a barrier to collaboration (Bahinipati & Deshmukh, 2012; Ramiers et al., 2010).
- *Coordination.* The success of collaboration is largely determined by the coordination between the parties, which is costly and takes a long time to realize(Lozano et al. 2013), but it can be useful to improve the trust (Wu et al. 2014).
- *Revenue Sharing.*One of the barriers in the collaboration is to determine the division of revenue or profit (Lozano et al. 2013). Collaboration must bemutuallybeneficialbetween the partners, although the benefitsreceived are not to bedividedequally, but based on the contributions made. Benefitsreceived are not always in the form of financial.
- Regulation. Associated with the applicable laws and regulations, particularly those governing the management of ports and terminals. The discussion on the regulation has not been done, but it is necessary to include this factor as one of the factors that can hinder collaboration.
- Customs. Based on interviews with managers of the terminal, customs can be one of inhibiting collaboration.

4.4. Collaboration Process

- *Joint Planning and Operation*. Joint planning is a strategic component in the collaboration (Thakkar 2012) which can be used to improve the performance of the two different systems (Kim & Cavusgil 2009). Joint planning and operation is also based on trust and equity, there is a shift in responsibility for the entire party (Braziotis & Tannock 2011). Joint planning and operation can improve the performance particularly in the long-term financial performance (Zhao et al. 2013). Horizontal collaboration can be done by means of capacity sharing, joint planning, and handling service (Ankersmit et al. 2014).
- *Asset Share*. One way that can be taken to achieve a competitive advantage in the collaboration is through resource sharing (Mena et al. 2009). Mena et al., (2009) assert that collaboration means working together to utilize the resources necessary to achieve effective operation in

accordance with the strategy and objectives of the parties involved. It takes trust, expertise, and good ability to integrate its resources. The success of the company in assets sharing depends on the ability of the company to make projections of customer demand changes. Resources sharing in the context of horizontal collaboration in the container terminal can reduce costs, particularly the cost of transportation (Ankersmit et al. 2014), and improving performance (Reniers et al. 2010).

4.5.Performance

Horizontal collaboration could provide benefits such as lower price, reduced supply risk, reduced administration costs (Wilhelm 2011), cost savings; (Wu et al. 2014), better access to market, pooling or swapping of technologies and production volumes, access to specialized competences, lower risk of R & D, enjoying the larger economies of scale, benefiting from economies of scope, etc. Horizontal collaboration could help companies to focus on improving productivity and profit (Reniers et al. 2010).

Lozano et al., (2013) suggested that the benefit of horizontal collaboration is the result of a resume of some authors. Here are some of the benefits that can be obtained from collaboration:

1) Financial opportunities: a potential for cost reduction providesa strong incentive to partner. Closer collaboration may lead tocost reductions in different areas like transportation, inventory,handling or development;
2) Service level enabled through collaboration: integrating activitiesin the supply chain through partnerships can often lead toservice improvements for customers, e.g. in the form ofshorter lead times, increased delivery frequency and moretimely and accurate information;
3) Market position: collaboration can enhance companies'competitive position or market power, provide entry into newmarkets and access to technology and innovation to stimulateproduct development;
4) Return on collaboration investments: return on investments isoften a strong driver for partnerships. By achieving profitstability or growth in the collaborative agreement, a relationshipis strengthened, often leading to long-term commitments,reduced variability in sales, and joint use of assets.

5. CASE STUDIES: JICT and Koja Container Terminal

Case studies conducted on two container terminals are located at TanjungPriok Port.Port of TanjungPriok has five container terminals, namely the Regional Harbour Container Terminal (or known as berth009), berth 300, Terminal 3, Koja Container Terminal, and Jakarta International Container Terminal (JITC). To discuss horizontal collaboration strategies in particular sharing resouces and joint operation, only two terminals are discussed in the case studies, the TPK Koja and JITC. There are three reasons for choosing these two terminals. First, both are the biggest terminals in TanjungPriok Port. Second, both are in the same location and the same side. This is a main prerequisite for joint operation. Third, both terminals are owned by the same company. Infrastructureand equipment owned by the both terminals are showed in Table 1.

Tabel 1. Infrastructureand Equipment

Description	TPK Koja	JICT 1	JICT 2
Berth			
Length	650 m	1640 m	510 m
Width	40 m	26,5-34,9 m	16 m
Draught	-14 m	-11 s.d -14 m	-8,6 m
Container Yard			
Area	25,72 Ha	45,50 Ha	9,24 Ha
Capacity		39.884 TEUs	7056 TEUs
Ground Slot			
Export	7696 TEUs	1027 TEUs	104 TEUs
Import	7560 TEUs	693 TEUs	200 TEUs
Reefer	310 plug	564 plug	78 plug
Equipment			
Quay Crane Container	7 bh	16 bh	3 bh
Rubber Tyred Gantry Crane	25 bh	63 bh	11 bh
Head Truck	48 bh	128 bh	13 bh
Chasis	60 bh	128 bh	21 bh

(Source: IPC 2, Annual Report 2013)

Determination of Production Capacity with Windows Slot

One of the activity that is important here is to determinethe number of vessels that could be serviced by the slot windows system. Determination of windows slots is done by considering the infrastructure and equipment owned terminals, such as length, width and depth of the berth, the number and capacity of container cranes, number and capacity of RTG, extensive container yard, and the number of trucks. The length and depth of the berth determine the number of vessels that can be served.

Berthing Contract

Based on availability and the capacity, the terminal offers windows and the availability of facilities owned (such as container cranes, RTG, container yard, and the number of trucks) to the shipping company. Instead, the shipping company delivering ship schedules and data services to the needs of the terminal. The data presented include technical data and projected volume of cargo ships. If both parties agree then in the next process, particularly on berthing contract signing, which includes berthing schedule, the estimated capacity (week/month/year), and duration of contract will be decided. With berthing contract, both shipping line and port/terminal have agreed to respect the use of windows slots. The windows contract can be composed of multiple services. Only vessels registered in the berthing contract are eligible for services.

Open Stack

Open stack is a policy provided by the terminal to export container stacking. Closing time period is given by the terminal to take container imports. JITC and Koja Container Terminal deploy an open stack policy consecutive H-4 and H-5 of ship arrivals (ETA) and the closing time of H + 4 and H+5 of the ship's departure time (ETD). Early stack can be done with very special considerations, and subject to progressive tariff. If the container is not taken after the deadline passes, then the container will be moved to a temporary store (overbrengen) and progressive tariff is imposed. Shipping line (or consigne) will be charged progressively.

Berthing Policy and Uncertainty

By the agreement through berthing contract, the operator terminal or shipping lines should committ to fulfill the agreements. Berthing agreement in contract usually consists of two things, namely unloading volume and berthing time. In regard to berthing, it is crucial to make berthing accuracy in accordance with a predetermined schedule. Incompatibility of ship arrival schedule to make berthing can affect the overall schedule, particularly for the ship concerned and also the possibility of another vessel will be disrupted. Shipping company has to update the position of the vessel to the port and in particular to the operator terminal. Furthermore, the shipping lines and terminal addreswill determinedetermine the estimated time of arrival (ETA) of the vessel and the estimated time of departure time (ETD).

The cause of delayedship can be affected by many factors, but the most common oneis the delay from the departure of the ship from the earlier port , the technical damage of the vessel, and weather factors. Wang and Meng, (2012) divide ship disruption in two categories of uncertainty, namely uncertainty at sea and uncertainty in port. Uncertainty in the sea may include such factors as bad weather such as rain, snow, wind, tornadoes, storm, and tides. Uncertainty in ports maybe due to lack of experience in navigating the vessel master, berth planning system, fluctuation crane handling and efficiency, and variation in the number of containers handled at each week.

JICT and Koja Container Terminal impose a tolerance policy with time delay but still included in windows slots. There are at least two considerations, the first was the estimated time required to perform loading and unloading. The second consideration is vessels that are potentially affected by the delay and hence may have to be reallocated / moved to a differentberthing time. Illustration in Figure 2 exhibits four different situations. The left part represent the first ship while the right part is for the second ship. In (a), both ships arrive at their given time window. In (b), the first ship arrives late and occupies berth until the ETA of the second ship, but causing no service delay for the 2nd ship. In (c), the first ship is late and the departure time enters the windows slot of the second ship, but given the second ship is also arriving late, no delay in its service. In (d), the arrival of the second ship is earlier than the departure of the first ship and hence, it has to wait until the berth is available.

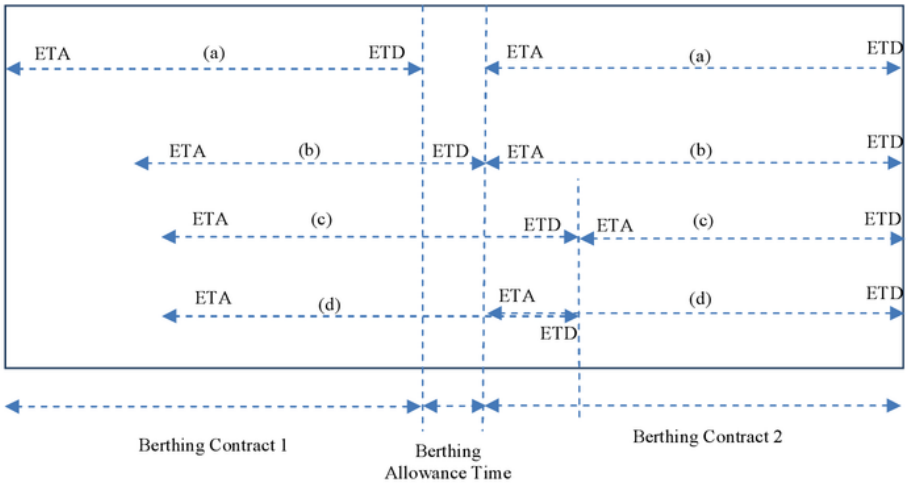

Figure 2. Berthing System

If the ships can not be served, then the ships will wait at the pool to get permission for bething. In such conditions, ships must bear the cost of operations while waiting in the pool. In some cases ships usually consider looking for alternatives to make berthing at other terminals. If the ships decides to berthing at other terminals, ships could only do the loading, because the container to be loaded has been prepared in advance to do a stacking where the ships has a windows slots. The consequence is that the shipping lines must bear the cost twice as much, that is to berthing at another terminal and back to the terminal where the container is stacked.

Another condition that occurs when ships do not come in accordance with windows is to use the remaining time in the windows for berthing. Usually ships into account and decide the number of containers that must be unloading and the number of containers that can be loaded. For this condition usually ships containers should prioritize in prior of loading and utilizing the remaining time to be fully utilized to load the container. Obviously here there will be no whole container can be loaded. Decisions must be taken to minimize the accumulation of delays in the next port, the risk is the entire container can not be loaded. Shipping lines will consider the overall of the cost of waiting for the costs that must be paid, including costs complain of container that can not be transported.

6. DISCUSSION

Uncertainty is a factor that can not be controlled, both by shipping lines or by port authority. In general, higher level of uncertainty should be coped with better flexibility. However, flexibility in terms of capacity is not an easy matter in port. Most ports ahve a fixed capacity while demand for serving ships is highly uncertain. While increasing flexibility by adding capacity is costly, an opportunity to work with lower level of capacity but with better service level my be achieved through collaboration among port operators. Under demand uncertainty, collaboration in terms of resource sharing as discussed earlier in this paper can potentially improve service level as well as resource utilization.The discussion on various aspects of collaboration between port terminal operations has been in the literature for some time.Ankersmit et al. (2014) sugest that capacity constraints and higher uncertainty encourages the terminal operators to increase their capacity orto collaborate.Heaver, (2010) revealed that there is a strong desire among existing firms in the supply chain network to collaborate in order to improve the reliability either individually or as a whole supply chain. Resources or assets share could be used together in order to create a mutually beneficial outcome (Bahinipati et al. 2009); (Bahinipati & Deshmukh 2012). Horizontal collaboration can be done by way of capacity sharing, joint planning, handling service(Ankersmit et al. 2014).

Some authors argue that horizontal collaboration can reduce costs(Lozano et al., 2013; Wu et al., 2014; Reniers et al., 2010;Juan et al., 2014). But there has been no empirical studythat investigate how collaboration can reduce costs (in terms of horizontal collaboration in port). Horizontal collaboration emphasis on asset utilization (Bahinipati et al. 2009; Ankersmit et al. 2014) that have an impact on increasing service levels. Service level will have an impact on the berthing time. Berthing time would have contributed to the shortening of the dwelling time and delivery time, as well as fuel consumption.

Tabel 2. Existing condition, barriers, opportunities and challenges of horizontal Collaboration

Factors	Existing Condition	Opportunities	Barriers	Challenges
Uncertainty	High uncertainty of the ship arrival causes the ship does not dock on shedulle.	Berthing Flexibility (Docking flexibility)	Assignment of equipment Revenue allocation	Distance fromstacking area
Berthing contract	Separate based on internal capacity.	Joint capacity	Administrative and Legal contract	heterogeneous and contract flexibility
Berthing system	Separate is causes asset unutilized (idle) or queuing (over capacity) due to berthing uncertainty	Joint Operation Rearrangement windows slot	Schedulle uncertainty Revenue sharing	Berthing Flexibility due to uncertainty
Layout &Geografis	Berth is connected. Availability & Feasibility Infrastructure movement.	Joint planning and operation	Administrative and Legal contract Revenue sharing	Proportional sharing dan win-win solution.
Infrastructure and Superstructure Utilization	Asset unutilized (idle) or queuing (over capacity) due to berthing uncertainty	Joint planning and operation	Revenue sharing and coordination	Revenue sharing
Ownership	The same owner (IPC2 & HPI), operational separately	The same owner	Legal administrative	Owner Orientation

Barriers such as trust (Bahinipati & Deshmukh, 2012; Reniers et al., 2010), coordination (Lozano et al. 2013); (Wu et al. 2014), and revenue sharing (Lozano et al. 2013) in the context of collaboration between JITC and Koja Container Terminal can be easily overcome as there is noownership issue, that is, the two are owned by the same party. For different terminals, ownership issue will remain a barrier. These barriers maybe reduced if there is a strong motivation, encouragement and orientation of thesecompaniestocollaborate. Reniers et al., (2010) stated that the collaboration-oriented company has the capability and willingness to collaborate. Another obstacle that needs attention is the existence of different regulations that govern the ownership of the operator terminal. There are constraintspertainingthe administrative requirements related to customs. Table 2 show a resume of the current conditions, barriers, challenges and opportunities in implementing horizontal collaboration.

7. CONCLUSION

In this study we have developed a framework of horizontal collaboration among port terminal operators. As arrival of vessels in port is highly uncertain, horizontal collaboration is believed to improve both service level and facility utilization. We also presented the results of a field research in a large port in Indonesia to obtain insights on how the horizontal collaboration works, the opportunities, and the challenges. Our preliminary results suggest that the success of horizontal collaboration is determined not only by the willingness of the port operators to collaborate, but also the setting of the port infrastructure. Sharing resources for loading and unloading, for example, would be possible if the two or more collaborating parties manage facilities which are physically adjacent so that vessels could have an easy alternative for berthing. This study will be extended to include more in depth case analysis to map the current state of horizontal collaboration. Adding other ports as a case would also be an important extension from this study. In addition, we aim to also do some modelling work to evaluate different collaboration mechanism and its impact on business performance of the collaborating parties.

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