Global maritime transport and logistics: Recent developments and implications for Asian container ports

Dong-Wook Song*

ABSTRACT

Globalisation and transport revolution, logistics integration and the consequent expansion of port area and hinterland in the maritime industry have redefined the functional role of ports in global logistics and supply chains and have generated a new pattern of freight distribution. The rapidly increasing world trade in the last decade has brought about a new round of port (especially, container port) development and caused the restructuring of the world port network as well as more intensive inter-and intra-port competition. This phenomenon again requires a new approach towards port development and related planning. This paper aims at, in a holistic way, providing an overview of the recent developments in maritime transport and logistics in the global scale and discussing strategic implications for the container port industry in the Asian context.

Key words: global logistics and supply chain, container ports, strategic implications, Asia.

* Reader in Logistics, Logistics Research Centre, Heriot-Watt University, Edinburgh, EH14 4AS, United Kingdom. E-mail : D.Song@hw.ac.uk, Tel. : +44-131-451-8206.

1. Introduction

The role and importance of ports for international, national and local economies are well recognised and established in the literature. It has been viewed that an effective and efficient port raises the productivity of prime production factors, such as labour and capital and profitability of the producing units thereby permitting higher levels of output, income and employment (Walter, 1975). A port was (and still is) regarded as the springboard for economic development of the hinterland. On this basis much of the research and developmental emphasis has been on the ability of ports to carry out their functions of accommodating ships and other modes of transport effectively and efficiently. Contemporary developments in global transportation, logistics and supply chain, however, dictate that the emphasis should be placed on the ability of ports to fulfil a new role in the logistics and supply chain era in the context of integrated global supply chain systems.

Globalisation and transport revolution, logistics integration and the consequent expansion of port area and hinterland in the maritime industry have redefined the functional role of ports in global logistics and supply chains and have generated a new pattern of freight distribution. The rapidly increasing world trade in the last decade has brought about a new round of port (especially, container port) development and caused the restructuring of the world port network as well as more intensive inter- and intra-port competition. This phenomenon again requires a new approach towards port development and related planning. In addition, there have been dramatic changes in the mode of world trade and cargo transportation, characterised by the prevalence of business-to-business and integrated supply chains. In the port industry, these changes have been embodied by the increasing demand for value-added logistics services and the integration of various transportation modes such as inter-or multi-modal transport systems.

As a consequence, the business stability and sustainability of the industry is largely subject to how well it adapts to such ever-changing environment. Therefore, the high quality of logistics services and the effective and efficient integration of transport systems offered by a port have become an important issue. The world major ports have already regarded the trend as the key area to support their long-term vision. The trend does inevitably create a new dimension of competition. Bearing these developments in mind, this paper aims at, in a holistic manner, providing an overview of the recent developments in maritime transport and logistics in the global scale and discussing strategic implications for Asian container port industry.

2. Environmental forces for changes

As a starter, it would be useful to have a close look at what forces are pushing forwards the industry both within the sector and outside. These currently and likely influencing factors would be identified as illustrated in Figure 1.

On the *external* side, these include-increasing international trade volume, ever more globalised manufacturing and production sites, logistics and supply chain being even more complicated in order to reflect and accommodate the changes on the demand side, transport networks being greatly multi-faceted and other matters such as information communication and technology.

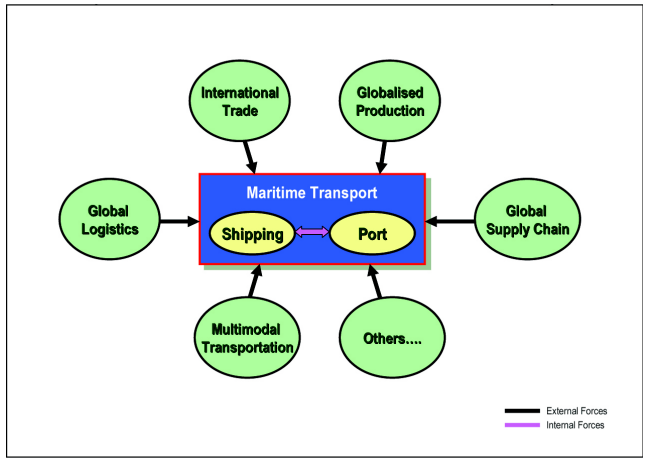


Figure 1. External and internal forces for changes

2.1 External factors

Almost all the external factors are stemmed from the currently ongoing globalisation as vividly described in a recent book by Friedman (2004). Trends derived from the globalisation include offshored production, outsourced businesses activities and/or functions (e.g., business-process-outsourcing), widely fragmented manufacturing settings over the world. These developments create a challenging task for a logistics and supply chain manager to cope with-that is, how to effectively and efficiently co-ordinate the scattered sites and settings over the globe.

In more detailed terms, global logistics and supply chain activities are equally outsourced to tackle the same trend in the manufacturing industry in a form of leanness and agility (Paixao and Marlows, 2003) and via third-party and fourth-party logistics providers (Coyle, Bardi and Langley, 2003). At the same time, they are required to be more

integrated and better operated, which could be feasible thanks to information communication and technology (Song and Panayides, 2008).

The fourth-party logistics providers (4PLs) as a potentially major player in the whole logistics sector in future expand their scope of businesses where shipping companies and port operators become merely sub-sector components. Whether or not the maritime sector establishes a successful linkage with other units under the logistics integrator would be the key point for its future competitiveness. This possible situation is illustrated in Figure 2.

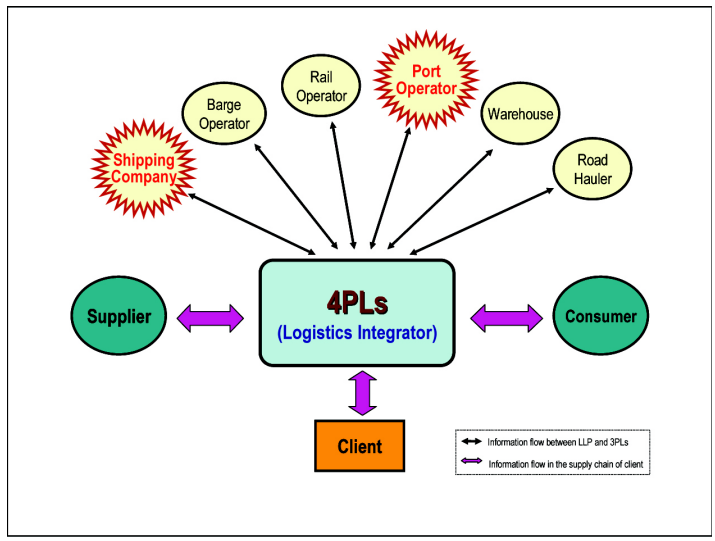


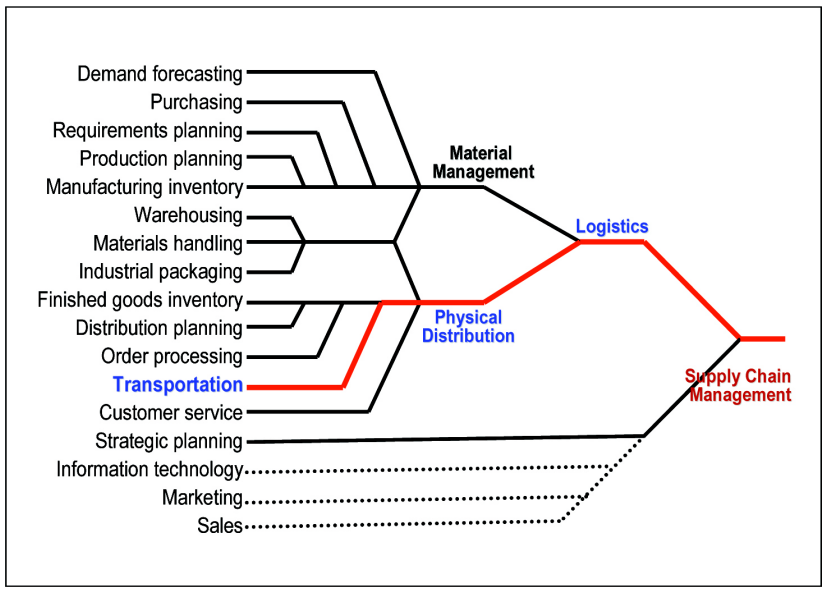
Figure 2. The 4PL as a logistics integrator

2.2 Internal factors

Before turning to internal factors, it would be suggested that maritime transport be examined as just a node of the whole supply chain systems. Figure 3 shows that transportation including maritime branch has evolved from a segmented component in the early stage of development to an element of the bigger and integrated supply chain systems. This development provides an insight into a fact that maritime transport including shipping and ports should be considered within the comprehensive picture of the whole chain on the global scale.

In respect of the *internal* factors in maritime transport, the sub-sectors-shipping and ports-evoke their own direction so as to hold a sort of internal hegemony. Shipping lines are keen to launching an ever bigger vessel-the biggest container ship currently in operation is 12,000 TEUs-to get an operational benefit from scale economies. It is, furthermore, estimated that an 18,000 TEUs vessel could be built from an engineering per-

spective, although its economic feasibility is still in doubt (Cullinane and Khan, 1999). Another effort made by (container) shipping lines is to penetrate into terminal operations in a form of dedicated terminals. APM, Hanjin, Evergreen and COSCO are just a few examples in this list. Finally, strategic alliances or other similar types of consortia become nowadays an industry norm (Song, 2003). All these developments being taken place in the shipping sector allow shipping companies to hold the greater bargaining power against its counterpart port operators.

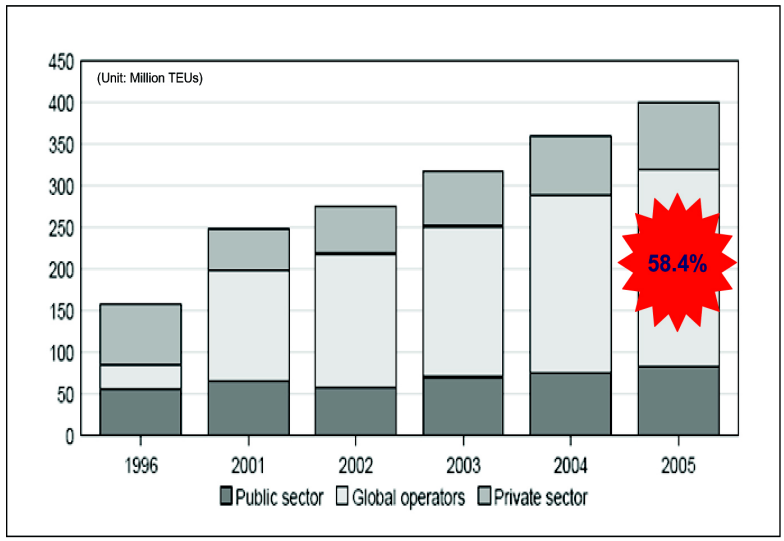


Source : Drawn from David (2004)

Figure 3. The evolution of logistics and supply chain

Responding to the trend and development on shipping, the port industry makes a number of efforts to sustain and obtain relative competitive edge. Their efforts include becoming more price competitive through internal arrangements, improving service quality with customers, expanding service range from the conventional boundaries, dealing effectively with shipping lines and globalising their business management and operations.

The world major players in terminal operations account for approximately 60 percent of the whole market, which is such a remarkable phenomenon that no other industry has the similar pattern. The top 5 operators (i.e. HPH, PSA, APM, DP World and Eurogate) take more than half of the market volume. Should top 10 operators be included, the portion becomes even bigger: a trend that the 20/80 business rule is no longer applicable to this industrial sector. It seems that the bigger takes almost all as indicated in Figure 4.



Source : Drewry Shipping Consultants (2006)

Figure 4. Market shares by global port operators

Table 1 shows terminals being managed and operated by these global operators. HPH and PSA puts their focus on Asia and Europe, while Eurogate, SSA and APM on European and American sides. However, DP World covers all the main continents in the world.

Table 1. Terminals operated by global terminal operators

TOCs	Europe	North America	Asia
HPH	Felixstowe, Rotterdam, Thames port, Harwich		Hong Kong, Shanghai, Yantian, Juizhou, Nanhai, Shantou, Jiangmen, Gaolan, Xiamen, Ningbo
PSA	Antwerp, Zeebrugge, Genoa, Venice, Shines		Singapore, Dalian, Nantong, Fuzhou, Tiacang
Eurogate	Bremen, Hamburg, La Spezia, Giaio Tauro, Lisbon		
SSA		Los Angeles, Log Beach, New Orleans, Oakland, Portland, Seattle	
P&O Ports (DP World)	Antwerp, Southampton, Tilbury, Cagliari	Baltimore, York, Portland, Norfolk, Miami, Gulfport, New Orleans, Lake Charles, Houston, Galveston, Freeport	Shekou, Qingdao
APM	Rotterdam, Bremen, Giaio Tauro, Algeciras, Aarhus	Tacoma, Oakland, Los Angeles, New York, Baltimore, Portsmouth, Charleston, Jacksonville, Port Everglades, Miami, New Orleans, Houston	Shekou, Qingdao

Source : Slack and Fremount (2005, p.120).

Given the discussion thus far, we could see that which side of the maritime transport-shipping or ports-would command or manoeuvre the subset market factors and forces under global logistics and supply chain systems.

Shipping sector seems to have an initiative or leading force while port sector endeavours to catch up with. Slack (1993) pointed out this odd situation of ports as a prawn in global transportation game. It can claimed that shipping plays proactively while port does reactively, as implied in Figure 5.

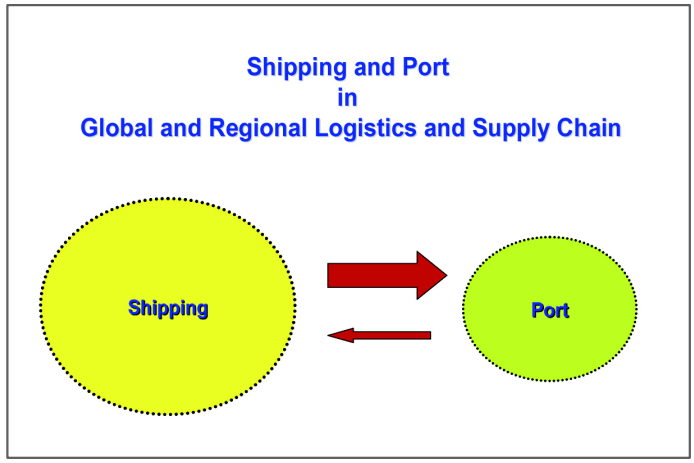


Figure 5. Hegemony between shipping and port

3. Possible strategic options from port operators

Traditionally port authorities played the role of facilitator, focusing on the provision of superstructure and infrastructure for ship operations, loading/unloading, temporary storage and intra-port operations. On this basis the bulk of research in the area has been on the efficiency and performance of seaports and container terminals (e.g. Cullinane, Song and Gray, 2002).

Today's ports play a rather different role as a member of a supply chain. In this role, the port is considered as part of a cluster of organisations in which different logistics and transport operators are involved in bringing value to the final consumers. In order to be successful, such channels need to achieve a higher degree of coordination and cooperation (DeSouza, Beresford and Pettit, 2003). The determination of the parameters that encompass the extent of integration of ports/terminals in global supply chains has, therefore, become of great importance for ports (Song and Panayides, 2008).

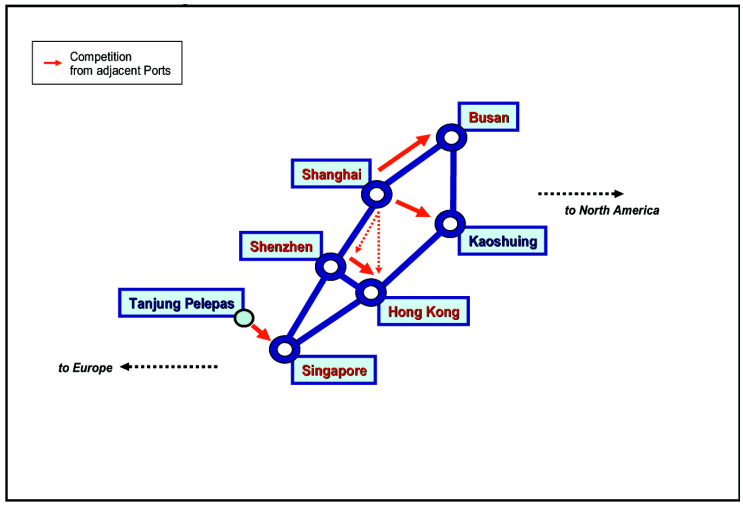
The recognition that ports are increasingly integrated in supply chains is well illus-

trated in the papers by Paixao and Marlow (2003), Marlow and Paixao (2003) and Bichou and Gray (2004). Paixao and Marlow (2003) and Marlow and Paixao (2003) introduce the logistics concepts of 'lean' and 'agile' operations as key factors in the measurement of port performance. It is therefore, implied that port performance depends to a large extent on logistics measures of cost and responsiveness. Bichou and Gray (2004) indicate that adopting a logistics approach to the measurement of port performance is beneficial to port efficiency because it directs port strategy towards relevant value-added logistics activities.

Furthermore, port operators need to gain 'knowledge' being required to respond to the changing business environments such as market-specific knowledge: organised and structured information about the market (Li and Calantone, 1998), or firm-specific knowledge: experience and expertise, essential know-how of organisations and organisational memory about practices or procedures (Bresman, Birkinshaw and Nobel, 1999). Knowledge management has argued that inter-organisational cooperation provides easy access to new knowledge that cannot be internally generated. Such an inter-organisational cooperation includes a number of forms of strategic alliances, joint ventures and social networks. However, as the former two forms limits the inter-organisational cooperation phenomena into dyadic rather than multiple relationships, Lee and Song (2007) show a way that port operators could get and accumulate knowledge-bases in the setting of multiple network relationships among operators. The effectiveness of knowledge acquisition may vary with the conditions of competition among the operators. If operators do not compete with each other to internally maximise their own benefits, they could not make the best possible decision to assess their relative strengths and weaknesses, estimate valuable information for their own requirements, choose appropriate knowledge and even use shared knowledge (Tsai, 2002).

Alliances and integrations among large shipping lines have facilitated the hub and spoke system among ports, which reflects another feature of port operators' network locally and regionally. As ports are facing increased levels of competition on an inter-regional basis regardless of extended hinterlands and even long-distance, the accessibility to large inland transport networks also has become an important strategic consideration.

As far as Asian ports are concerned, there exists a variety of efforts made by individual ports in the capacity of port authority and public, private or hybrid ownership forms of terminal operators having strong supports from local, regional and even central governments. The goal for which they are heading is to be a regional hub port with the wider coverage of immediate or even a bit remote hinterland.



Source : Updated from Song (2003)

Figure 6. Asian container port network

Figure 6 shows the latest status of competition among main regional ports. Apart from intra-port competition, the inter-port competition as highlighted in Figure 6 seems getting only severe in recent years. Shanghai becomes a major threat to all the surrounding ports especially, ports of Busan and Kaohsiung. Hong Kong and Singapore are interesting facing the similar fate-the competition from their adjacent Shenzhen and Tanjung Pelepas ports. However, their responsive approaches to this challenges look different-Hong Kong gears more on a co-operative way, while Singapore on a competitive manner. Kaohsiung and Busan have made a number of measures to stay in the league table, but their future looks not much brighter than expected.

4. Concluding remarks

This paper attempts to holistically view maritime transport as a subset of global logistics and supply chains. Its analysis is mainly descriptive rather than analytical in nature. However, the paper could suggest at least a few implications to be kept in mind for terminal operators, port management and authorities in making a strategic direction and development. These are: i) Maritime transport is subject to international trade and logistics chains, ii) Maritime business is therefore to be planned, managed and operated according to the changing pattern in international trade and logistics, iii) Larger and fewer players hold the ever-stronger market power. The rule of games is changed, iv) New and adoptable strategies are to continually be developed and implemented to remain competitive and sustainable, v) Successful integration into global supply chains is the key to their future businesses.

References

Bichou, K. and R. Gray, 2004. A logistics and supply chain management approach to port performance measurement, *Maritime Policy and Management* 31(1), pp.47-67.

Bresman, H., J. Birkinshaw and R. Nobel, 1999. Knowledge transfer in international acquisitions, *Journal of International Business Studies* 30(3), pp.439-462.

Coyle, J., E. Bardi and C. Langley, 2003. *The Management of Business Logistics: A Supply Chain Perspective* (7th ed.), South-Western, Ohio.

Cullinane, K. and M. Khanna, 1999. Economies of scale in large container ships. *Journal of Transport Economics and Policy* 33, pp.185-208.

Cullinane, K. and D.-W. Song and R. Gray, 2002. A stochastic frontier model of the efficiency of major container terminals in asia: assessing the influence of administrative and ownership structures, *Transportation Research A: Policy and Practice* 36(8), pp.743-762.

David, P. 2004. *International Logistics: The Management of International Trade Operations*, Atomic, New York.

De Souza, G., A. Beresford and S. Pettit, 2003. Liner shipping companies and terminal operators: internationalization or globalization?, *Maritime Economics and Logistics* 5, pp.393-412.

Drewry Shipping Consultants, 2006. *Annual Review of Global Terminal Operator*s, London.

Friedman, T. 2004. *The World is Flat: A Brief History of the Twenty-First Century*, Farrar Straus Giroux, New York.

Lee, E.-S. and D.-W. Song, 2007. Towards co-opetition in global logistics and supply chain: a conceptual framework for port operators, *Proceedings of the Logistics Research Network Annual Conference*, Hull, UK, pp.218-223.

Li, T. and R. Calantone, 1998. The impact of market knowledge competence on new product advantage: conceptualization and empirical examination, *Journal of Marketing* 62(1), pp.13-29.

Marlow, P. and A. Paixao, 2003. Measuring lean ports performance, *International Journal of Transport Management* 1, pp.189-202.

Paixao, A. and P. Marlow, 2003. Fourth generation ports: a question of agility?, *International Journal of Physical Distribution and Logistics Management* 33(4), pp.355-376.

Slack, B. 1993. Prawn in the game: ports in a global transportation system, *Growth and Change* 24, pp.579-588.

Slack, B. and A. Fremont, 2005. Transformation of Port Terminal Operations: From the Local to the Global, *Transport Reviews* 25(1), pp.117-130.

Song, D.-W. 2003. Port Co-opetition in Concept and Practice, *Maritime Policy and Management* 30(1), pp.29-44.

Song, D.-W. and P. Panayides, 2008. Global supply chain and port/terminal: integration and competitiveness, *Maritime Policy and Management* 35(1) (forthcoming).

Tsai, W. 2002. Social structure of "coopetition" within a multiunit organization: coordination, competition and intraorganizational knowledge sharing, *Organization Science* 13(2), pp.179-190.

Walter, A. 1975. Marginal Cost Pricing in Ports, *The Logistics and Transportation Review* 11, pp.297-308.