Journal of Science, Technology, and Humanities : 2010, Vol. 8, No. 2, pp. 71-79

Review Article

# THE CHANGING ASPECT IN SHIPPING INDUSTRY FOR THE 21st CENTURY

Mana Chaowarat

*Faculty of Logistics, Burapha University, Chon Buri 20130, Thailand.*

## ABSTRACT

The role of shipping industry is very significant for the economic prosperity of maritime countries, especially developing countries. From the early of 1960s until the end of the 20th century, shipping industry has been changed and developed in all aspects, such as management systems and technologies concerned. Once the 21st century arrived, the challenging in quality of performance for shipping industry has been questioned. The role of seaports which providing services for cargo receiving, movement and storage, and delivery in terminal area has been becoming most awareness by customers. The efficient flow of containerized cargo is most significant in maritime supply chain. Hence, this report is analyzed of international articles of surveying in relating to the development and changing in shipping industry that has been adopted by the container terminal operators whose expected for achieving in higher advantages in the age of globalization in the 21st century.

**Keywords:** maritime supply chain, container terminal, shipping industry.



*Corresponding author. E-mail address: chaoma@buu.ac.th

## INTRODUCTION

No marine cargo management system can be operated without considering the seaport, its structure, and its purpose. Seaports have been developed according to the needs of the economic community, as well as the nature of the shipping business, especially on the flow of containerized cargo. Each seaport has been developed according to the trade needs of the region and the type of vessels it is designed to service an accommodation.

Seaport is the interface between land and sea, and is a geographical area where vessels are brought alongside and to load and unload cargo. The area where a seaport is located is a sheltered deep-water area, such as a bay or a river mouth. The seaport structure has slowly changed over the decades, with the original docks and basins have been abandoned in favor of long, riverside terminals with space for several large container vessels, as well as distant jetties and terminals for the purpose of accommodating bulk carriers or tankers, each terminal with its own dedicated equipment purpose-designed for the loading and unloading of such cargoes.

Seaports are the backbone of international trade, providing direct linkages from international to regional or local transport systems and supply chain of trade. The current expansion and rapid growth of global trade have been making pressure on container terminal for higher efficiency of performance within seaports. It has been realizing that seaports are critical nodes in the fundamental trade and international supply chains of freight movement. Port authorities and port managers have shown strong interest in efficient port management and container terminal performance.

Seaports have been facing intense competition with neighboring seaports in globalized shipping industry. They are continually searching for strategies to meet growing demands for higher throughputs and quality services from shipping companies, while reducing costs is the main element. In other word, the 21st century global economy is characterized by globalization of container freight flow which can be described as the increasing universality of consumption. Globalization of international trade of efficient flow of containerized cargo is not possible without the support of and efficient supply chain of container terminal of which implying integrated intermodal transportation network, with the need for high quality management of cargo flows with low inventory costs, more reliable delivery time and distribution.

Nevertheless, it is clear that in the era of the 21st century container terminal of seaports needs to change and adjust its operation and management structures for achieving in high quality of performance for containerized freight move through the terminal. And also the container terminals have to include value added activities into their services that render to the consecutive changing need of seaport customers. Finally, maritime countries should acknowledge that high delivery costs caused by fragmented supply chain, poor logistics service levels and connectivity can prevent container terminal in maritime developing countries from realizing their true potentials and great opportunity.

### Effects of trade flows

Globalization of International trade flows has been contributing a considerable effect to the level of confident of shippers around the globe. The question of how to transport containerized cargo through container terminal with short lead time is quite important for seaport users. According to the World Bank's report interviewing 80 world wide freight forwarders and logistics professionals, economies with the most predictable, efficient transport systems and trade procedures are most likely to take advantages of technological advanced economic liberalization and access to the international markets, while predictability, reliability and quality of services are more important than the exact monetary costs of transportation.

Globalization is impacting on the container freight transportation industry through several inter-dependent developments, of which the demands of the market, competition, and the need to enhance profitability are among the most important. There is a wide acceptance that changes in the market

and in the demands of shippers are forcing the container terminal to adopt logistics services (Browne and Allen, 2001).

In the past, the port of Hong Kong was able to reap the benefit of China's industrialization. Lacking any deepwater port with modern container handling infrastructures, the goods were transshipped at Hong Kong from trucks (in the case of Shenzhen shipments), river barges (in the case of freight from the rest of the Pearl River Delta (PRD)), and coastal shipping (in the case of cargoes from the rest of China). Hong Kong became a massive container transshipment center. In the 1990s, progressed important changes began to take place. China began to upgrade its own port facilities and a trend was set in place for more and more of the traffic from Eastern and Northern China to be shipped directly from local ports, such as Shanghai. The continued economic growth and sheer size of this region, however, was sufficient to maintain Hong Kong's pre-eminence in the world container port league.

However, the significant case of challenging that has incurred in shipping industry has impacted to Hong Kong port. At the beginning of the 21st century, the position of Hong Kong port is being threatened. Over the last five years, new port facilities in Shenzhen have begun operation and have started direct overseas shipments. The annual growth rate of container throughput in Shenzhen was consistently over 50% from 1997 to 2001. In 2001, the growth rate was 127% and the container throughput reached five million TEUs. It is significant that these new terminals are managed and operated by the two most important terminal operators in Hong Kong port: Hutchison's Hong Kong International Terminals and Modern Terminals. Exploiting advantages of lower operating and fixed costs, Yantian and Sheou are emerging as local competitors to the Hong Kong port. They are closer to the markets and do not require goods to undergo the delays experienced at the border crossing points. The involvement of Hong Kong terminal operators in these developments is seen by many as early warning that Hong Kong port must strive to retain its competitive edge. By this reason, it is clearly that the competitive edge cannot be based on cost, since the ports in the PRD will always be cheaper. Hong Kong sees its future based upon the efficiency of its operations and its ability to provide logistics services at a much higher level than is possible across the border. (Cheung et al., 2003)

It is well known that the demand for seaport services is derived demand from trade. With the international trade is being hit relatively hard in an economic downturn. It is also make a negative impact for container terminal operators. It has been recognized that the decision to route containerized cargo through a seaport lies ultimately with the shippers (consignees and consignors). In general, their roles in delivering containerized goods may be defined as follows. The buyer or consignee places an order, defines the terms of sale, and takes delivery of the goods. The buyer is in a position to determine every aspect of the cargo movement. The seller or the consignor is either a trader/ middleman to whom an order is placed and who, in turn, places the order with a factory, or the factory owner with whom an order is placed directly. It is the buyer, as the party which issues the purchase order and makes payment for the goods, who usually has ultimate control over how goods are transported, although responsibility over transport of goods from the factory to the seaport may be delegated to either the vendor or to a consolidator or other logistics intermediary (Tongzon, 2009).

Shippers may be grouped into three types: those who have long-term contracts with shipping lines, those who are using freight forwarders, and those that are independent shippers. The first category of shippers are committed to a particular carrier for a number of years and are, therefore, dependent on the shipping lines' chosen port of call, while the second group of shippers delegate the responsibility for port selection to the freight forwarders. Thus, only the freight forwarders and the independent shippers are engaged in regular port selection. Most of the studies that have identified and examined the factors determining port choice by port users are from the shippers' perspective.

However, the above studies have focused mainly on port users based in North America, Europe, and Australia and may not be applicable universally, particularly to Southeast Asia. Moreover, previous studies have focused mostly on the shippers' port choice behavior, and there is so far very little investigation on the port selection process of freight forwarders. This study contributes to the existing literature by investigating further the seaport decision factors and their relative importance to freight forwarders and whether there is some consistent pattern and mechanism of seaport selection process among freight forwarders in Southeast Asia. Hesse and Rodrigue (2004) and De Langen (2007) have underlined the importance of analyzing the seaport selection processes of forwarders by pointing to the growing maritime supply chain power of third party logistics providers.

**Implications on port development in the 21st century**

The analysis of the drivers of trade emphasis on industrial production is fundamental to maritime transportation and port business. Globally integrated international supply chains have increased the interdependencies between economies and the importance of trade to countries' economies. But in an economic downturn, industrial production and trade is hit especially hard, leading to unprecedented and unexpected reductions of port volumes. This has very significant implications on strategies of port authorities, shipping lines, terminal operators and others actors involved in the sector. These implications, as well as the strategies deployed by these stakeholders in order to face the emerging challenges, have included pricing, revised port as terminal assets, and the re-mobilization of public funds.

Apart from the several and severe pressures on all stakeholders, the crisis provides an opportunity to address a number of existing misallocations that developed over two decades of consistent market and traffic growth. The throughput setback results in a limitation of previously dominant congestion issue. This allows ports and their governing authorities to solve congestion bottlenecks on time. Another group of seaports are seaports on the periphery and smaller terminals that need to enact strategies targeting to attract few, if any, global operators that are present in pure transshipment only, which they develop practices that satisfy operators that are active on a national or regional scale. The new reality provides port governors the contextual background to move away from the concept of all-purpose ports and develop niche markets, like ro-ro markets and short sea shipping routes, as a path to prosperity. Independent forelands have for long been associated with overlapping seaport related hinterlands, leading already to thoughts that seaports in proximity need to prioritize specialization. In order to improve a sustainable performance, seaports may develop two key strategies. The first one is the already emerging cooperation between seaports. Cooperation can lead, inter alia, to specialization in cargo or ship types, and organization and pooling of hinterland transport facilities and improvement in output. The second one is coordination to enhance strategies with other stakeholders in order to solve the several hinterland accessibility problems (e.g., underinvestment in inland transport facilities, peak loads at terminals, underutilization of assets with little cargo exchange, inefficient information and document processing, etc.) and positively influence the environmental conditions that will enable the accommodation of future growth. Strategic collaborations in logistics networks can reduce risks for all organization in the network, and reap the real benefit of collaboration, which is innovation via knowledge integration, in turn produced by effective communication, organizational routines and efficient structures. Port authorities need to assume a key role towards an effective and efficient networking, which is to steer a critical path where they maintain their current sources of competitive advantage while they develop future resilience through innovation opportunities provided by learning from practical coordination with other stakeholders (Haugstetter and Cahoon, 2010). There is also considerable scope for adjustments of port policies on various levels (local, regional, and/or supranational) fixing regulatory problems observed in the recent past. As the

European case was proved to be difficult in fast growing port markets, hence the clarification of the framework governing the involvement of private actors in terminal operations was also proved to be difficult. This led to several sagas, including the withdrawal of the winner in Thessaloniki; a re-bidding for a sixth terminal in Genoa; national court interventions in Izmir; and a European Commission re-examination of concession terms in Piraeus. Additional competition issues had a reference to monopoly rights, or anti-competitive pricing by port authorities, TOCs, or other providers. Along with long pending labor reforms, these represent unresolved regulatory issues that when addressed they will create the framework for accommodation future growth. The rapid trade growth increased local communities' discontent, and along with the expanding seaport infrastructure, they distanced further the seaport from the port-city and increased both environmental problems and societal pressures for industrial responses. The crisis makes planning comparatively easy, and in the short-term seaports might be tempted to go as far as compliance with applicable regulations in order to avoid enforcement actions. In the long-term, however, the need for a social license to operate may again become a necessity. The importance of being pro-active in integrating economic and environmental objectives inexorably motivated already relevant initiatives beyond compliance. With the question being how to achieve this integration, the crisis provides opportunities to conclude on the appropriate themes and content of corporate initiatives and public policies that will achieve green cost-effective solutions without challenging the presence of a level playing operating field.

Port authorities' strategies in a complex environment, such as the recent financial crisis, further complicating their decision-making environment. However, it is also greater with more opportunities for innovation and change. In this environmental uncertainty strategic intent and in conjunction with an institutional framework and strategies to create resilience are central to sustainability. Over recent decades, seaport governance has undergone transformation (De Langen, 2007). In a dynamic environment, it provides a 'matching framework' linking a seaport's operating environment, its strategy and structure relationships to enable innovation-oriented strategies such that the fit between the three elements determines performance. One of main conclusions is that the matching framework provides focus on 'relationships between variables (Baltazar and Brooks, 2007, p. 398) and that this will help determine the alignment between environment, structure and strategy. An alternative view of how the dynamism inherent in networks, growing seaport competition and recent restructuring, and the resultant diverse and complex demand for contemporary seaport products can be analyzed to enable better decision-making. By utilizing an analytical framework of 'Worlds of Production Theory;' the authors provide several possible forms of structure that can be utilized for organizational strategy formulation by decision-makers to suit their specific situation.

Depending on the level of environmental uncertainty the 'Worlds of Production' provide organizational frameworks to classify the nature of the specific seaport product offered. For example both the 'Market World' and the 'Interpersonal World' incorporate networks into their model of production, but the former operates with economies of scale as a key characteristic, with the latter incorporating the economics of variety.

Given the heterogeneity of the seaport industry, it revealed that the specific analysis of a seaport's configuration and its competitive position is necessary prior to the development of organizational strategies. By transforming into 'smart' institutions utilizing a new institutional framework is emerged from the distinction between the administration of the port services production and the production process itself.

Port authorities should make a strategic choice that is congruent with their strategic intent. And also knowing and understanding the significance of strategic intent to this choice process is critical, especially if a new institutional hybrid is necessary, with responsibility for coordinating the

strategic choices to achieve both exploitation of existing competitive advantage and simultaneously collaborate for innovation.

The port authority will be challenged to provide coherence between the market forces at play and the public sector in situation, both of which can lead to market inefficiencies and failures. Developing capabilities in coordination and collaboration, the smart port authority will be able to better control the interdependencies within the hybrid institution, maintain good relationships with the stakeholders and achieve its strategic intent by outlining 'common frameworks of action'.

**Seaport institutional reforms and efficiency**

Conflicting views exist regarding the impact of the private sector's participation on port efficiency. Liu (1995) examines how different types of seaport ownership shape the technical efficiency of seaports. Liu does not find any significant advantage to private or public ownership when the policy environment is competitive. Similarly, Notteboom et al. (2000) value a diversity of ownership and administrative systems in the seaport sectors, and argue that port ownership does not have a significant effect on seaport performance. Various empirical studies support institutional reforms based on private sector participation as an effective policy to achieve higher efficiency in seaport terminals. Specifically, Estache et al. (2002) adopt an analysis of the Malmquist Productivity Index (MPI) for Mexican seaports, and claim that the reform of privatization and decentralization in Mexico has generated large short-term improvements in the average performance of the seaport industry. Examining Spanish seaports, some studies show that Spanish seaport reforms in the 1990s generated significant improvements in productivity mainly through technological progress (Gonzalez and Trujillo, 2009). Barros' study (2003) is also in line with the previously mentioned studies, arguing that the reform implemented in the Portuguese ports achieved substantial impacts on efficiency improvement. Cullinane et al.(2002) assess the relative efficiency of selected Asian container seaports by employing both cross-sectional and panel data versions of stochastic frontier models. They conclude that privatization should have positive impacts regarding improvement inefficiency. Tongzon and Heng (2005) examine similar issues with terminal level data and claim that private sector participation in the seaport industry can improve a port's operational efficiency. Moreover, they contend that privatization has become a necessary strategy to gain a competitive advantage in the current marketplace. Focusing on the US, it is identified that the US public seaport systems suffer from inefficient operation, mainly due to political interference and risk a version. Their view is that private sector participation can broaden capital sources and increase seaport efficiency.

In contrast, some maritime academics points out that because private investors and operators pursue profit maximization, they may abandon facilities and services that offer long-term rewards and a broader social perspective. This is especially true when limited competition exists in a region, and privatization can turn into private monopolies of seaport facilities. Coto-Millan et al. (2000) examine port efficiency of 27 Spanish seaports from 1985 to 1989. They claim that the most efficient Spanish ports are those that adopt a significantly more centralized management system than those that have a greater level of management autonomy. And also argues that an outright sale of seaport land and a transfer of operations and regulation functions to the private sector may possibly be counterproductive. Due to long-term payback and high capital costs in the seaport industry, an almost total dependence on the private sector could result in significantly delayed investments in the crucial operation of facilities and equipment.

For the most recent, comprehensive review of the issues, one should refer to Gonzalez and Trujillo (2009). These previous studies have contributed to a better understanding of the impact of seaport institutional reforms on seaport efficiency. However, it is important to discuss several points relating to the conceptual and methodological aspects of these reforms in order to gain a more complete understanding of the global seaport industry.

Many seaport efficiency-benchmarking studies utilize only the largest 10–30 container seaports together and utilize data for their seaport efficiency evaluations. Moreover, in some cases, sampled seaports can already be regarded as successful seaports. This relatively small and biased scope of sampling, directed by data availability, makes it difficult to clearly examine the issues; the primary issues include whether the efficiency gap between successful seaports and unsuccessful seaports is explained by the difference of seaport ownership and institutional structure, and whether private sector participation and transformations of seaport institutions have allowed inefficient seaports to become more efficient. Secondly, the variable capturing seaport ownership does not always coherently signal what it is that seaports actually do in their management and investment for seaport assets. Portions of previous studies have dichotomized seaport institutions into either public or private ownership.

However, seaports are complex institutional systems involving multiple levels of governments and private sectors. Using a dichotomized variable to explain seaport ownership between public and private sectors is not sufficient to realistically reflect complex organizational aspects needed to carry out seaport production and services. For example, who actually owns and invests in seaport infrastructure and/or superstructure? Who exercises terminal operation functions and cargo handling? At what government levels are ports regulated? Another approach has been to create an index to capture and quantify multiple aspects of seaport institutions. This index aggregates firm characteristics of port organizations and operational aspects of seaport terminals.

In fact, seaport management structures at the port authority or corporate level can differ from how the day-to-day terminal operations and major assets for cargo services are organized at the terminal level. For example, a decentralized corporate structure and autonomy at a port authority are not always synonymous with the decentralized structure of seaport asset ownership and management at a terminal level, with diverse private sector participation and investment mechanisms. When an econometric study evaluates the impact of port ownership and institutions on seaport efficiency, these multiple institutional aspects should be disaggregated rather than aggregated. Otherwise, it is difficult to examine where the sources of efficiency gaps come from: for example, do efficiency gains originate from the fact that seaport managers and authorities can exercise their autonomy based on a decentralized organizational structure? Or, are the gains caused by removing the container terminal operation functions from government hands and placing them into the control of more specialized entities?

**Conclusions**

This paper has explored the adjustment and strategic adaptation of shipping industry in the era of the 21st century, especially in part of container terminal operator in seaport. The findings suggest that the institutional reform and suitable strategies are important in the competency of each seaport as the gateway of containerized cargo flows. However, the factors, which are important to the seaport users, are high seaport efficiency, good geographical location, low port charges, adequate infrastructure, wide range of seaport services, connectivity to other seaports, adequate infrastructure and others.

Their relative importance with seaport efficiency is considered as the most important factor. This finding is confirmed by the recent study of Ugboma et al. (2006) in the context of Nigerian ports, which further reinforced the high important shippers attached to port efficiency in their port choice decisions. To a certain extent, the findings in this explored study support to the proposition that seaports are not viewed by the freight forwarders in isolation but are considered together with other requirements associated with the movement of cargoes across the maritime supply chain. It, therefore, supports the new approach that has expected seaport performance as a value added node for maritime supply chain, which can provide the highest performance of value, added services in the seaport terminal area.

Seaports must respond to the globalization trends. Globalization has also meant changes in transportation modes: particularly in the intermodal trades. There has been an ongoing concentration of container shipping in larger vessels under umbrella alliances or even mergers of shipping companies. Adjustments to the globalization phenomena of the 21st century must necessarily take place at the local level.

Port authorities need to pay more attention to risk management. The need to revise the expansion of project and avoid the risk of price wars to increase public money and funding a market characterized by overcapacity. The economic crisis has resulted in very substantial cargo shifts between seaports and more attention to such shifts is needed.

Strategic collaborations in maritime supply chain networks provide opportunities not only for growth and innovation, but also to reduce the risks faced by threats to sustainability, such as the financial crisis. Port authorities, with a central role in many logistics networks and maritime supply chains are situated to access knowledge that is strategically useful for innovation. To successfully integrate that knowledge base into their strategic planning system, port authorities can ensure that there are levels of common knowledge, norms, language and experience, including strategic thinking skills, at all management levels.

Efficient communication systems at all levels, both within and external to the port authority, including the strategic information system, may contribute to the effective and efficient flow of key information from the port authorities' trading network and cluster of seaport users. Collaborating provides many opportunities to reduce risks and create growth opportunities. Container terminal providers and port authorities can both exploit current competitive advantage and successfully explore for future sustainable advantage of maritime industry by approaching global knowledge base strategy.

## REFERENCES

Barros, C. 2003. Incentive regulation and efficiency of Portuguese port authorities. *Maritime Economics and Logistics* 5 (1): 55–69.

Browne, M., and Allen, J. 2001. Logistics outsourcing. In: Brewer, A.M., Button, K.J., Hensher, D.A. (Eds.) *Handbook of Logistics and Supply-Chain Management.* Pergamon, Oxford, pp. 253-267.

Cheon, S. H., Dowall, D. E., and Song, D.W. 2010. Evaluating impacts of institutional reforms on port efficiency changes: Ownership, corporate structure, and total factor productivity changes of world container ports. *Transportation Research* Part E 46: 546 – 561.

Cheung, R. K., Tong, J. H., and Slack, B. 2003. The transition from freight consolidation to logistics: the case of Hong Kong. *Journal of Transport Geography* 11: 45-253.

Coto-Millan, P., Banos-Pino, J., and Rodriguez-Alvarez, A. 2000. Economic efficiency in Spanish ports: some empirical evidence. *Maritime Policy and Management* 27 (2): 169–174.

Cullinane, K., Song, D -W., and Gray, R. 2002. A stochastic frontier model of the efficiency of major container terminals in Asia: assessing the influence of administrative and owner ship structures. *Transportation Research* Part A 36: 743–762.

De Langen, P.W. 2007. Port competition and selection in contestable hinterlands: the case of Austria. *European Journal of Transport and Infrastructure Research* 7 (1): 1- 14.

Estache, A., Gonzalez, M., and Trujillo, L. 2002. Efficiency gains from port reform and the potential for yardstick competition: lessons from Mexico. *World Development* 30 (4): 545–560.

Gonzalez, M., and Trujillo, L., 2009. Efficiency Measurement in the Port Industry: A Survey of the Empirical Evidence. CCRP Working Paper No. 8. Economics Department, City University, London, UK.

Haugstetter, H., and Cahoon, S. 2010. Strategic intent: guiding port authorities to their new world? In A. K. Y. Ng and J. J. Liu (Eds.) Maritime Industries in the Pose –2008 Environment.

*Research in transportation economics* series, 27 (1): 30 – 36. (Oxford: Elsevier)

Hesse, M., and Rodrigue, J.P. 2004. The transportation geography of logistics and freight distribution. *Journal of Transport Geography* 12 (3): 171-184.

Liu, Z. 1995. The comparative performance of public and private enterprises: the case of British ports. *Journal of Transport Economics and Policy* 29 (3): 263–274.

Notteboom, T., Coeck, C., and van den Broeck, J. 2000. Measuring and explaining the relative efficiency of container terminals by means of Bayesian Stochastic Frontier Models. *International Journal of Maritime Economics* 2: 83–106.

Tongzon, J., and Heng, W., 2005. Port privatization, efficiency and competitiveness: some empirical evidence from container ports (terminals). *Transportation Research* Part A 39 (5), pp. 405–424.

Tongzon, J. L. 2009. Port choice and freight forwards. *Transportation Research* Part E 45: 186-196.

Ugboma, C., Ugboma, J., and Ogwude, I. 2006. An Analytic Hierarchy Process (AHP) approach to port selection decisions – empirical evidence from Nigerian ports. *Maritime Economics and Logistics* 8: 251 – 266.