



Measuring the performance of Malaysian container ports



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Abstract

Competition is rising among Malaysia's container ports and also between them and other container ports in the region to attract users. The performance of container ports is usually indicated by their ability to handle ships and cargos in a cost competitive way. In this regard, container ports must always improve their performance and overall competitiveness to retain clients and attract new users and investments. The availability of a widely-accepted, non-subjective performance measurement instrument can be useful to ports to assess and improve their performance and also for other port stakeholders such as their users, regulatory authorities and economic planners. This study attempts to address the absence of a reliable, widely accepted performance measurement for Malaysian container ports by recommending a model to measure their performance that covers measurable performance indicators, financial performance of the port operating companies and new port performance indicators. The measurement model - incorporating the port's assets, cost and port performance indicators - was developed by drawing from the literature on the subject of port performance measurement and guided by the views of local container port operators, authorities and users. The study takes into account that there are differences among these ports in many aspects such as business strategies, clientele, connectivity, efficiency, layout, location, productivity and tariff structures. It also stresses on several provisos, for example certain ports enjoy a 'natural monopoly' by virtue of being designated as load centers, and that the productivity of port depends on various factors beyond the control of port operators such as weather and timeliness of arrival of ships at their ports. As such, the study emphasizes the need to compare like-for-like elements in gauging the performance of container ports on a level playing field. The study concludes that while it is useful for port stakeholders to have a generally-agreed way of measuring port performance of local container ports, such a measurement model can be useful only up to a certain point and in the exercise of measuring port performance, the many differences that determine their performance should not be ignored.

Keywords : Malaysia, container ports, performance measures, performance indicators

Executive summary

Competition is rising among Malaysia's container ports and also between them and other container ports in the region to attract users, namely shipping lines and shippers. As such, port operators are always working hard at increasing their performance to be able to serve their users satisfactorily and providing the best services at the most competitive cost.

Amid a range of choices of container ports which are competing with one another to provide good services at competitive prices, users are spoilt. As such, they have become discerning in their choice of which ports to call and use. This choice is largely made based on their assessment and judgment on the performance of the ports in terms of their latter's capability and capacity of handling ships and cargos and the competitiveness of the services they provide.

Performance of container ports is mainly measured by their ability to handle ships and containers (measured mainly in terms of turnaround time of ships and containers) in a cost competitive way. Ports must always improve their performance and overall competitiveness to retain clients and attract new users and investments. The availability of a widely-accepted performance measurement instrument can be a useful marketing tool for container ports.

In this regard, it is important that the performance of Malaysian container ports can be measured in a way that is acceptable to port users, authorities, users and other stakeholders to assess where these ports stand vis a vis other ports. Such a measurement mechanism can provide useful indicator of the ability of the port to handle ships and cargos and can be used by their existing clients and prospective users to gauge their performance. The availability of a reliable measurement of the ports' performance can also be helpful in identifying areas for improvement, upgrading and investment to enable the ports to perform better as an essential service provider to the nation and to facilitate its trade and economic growth.

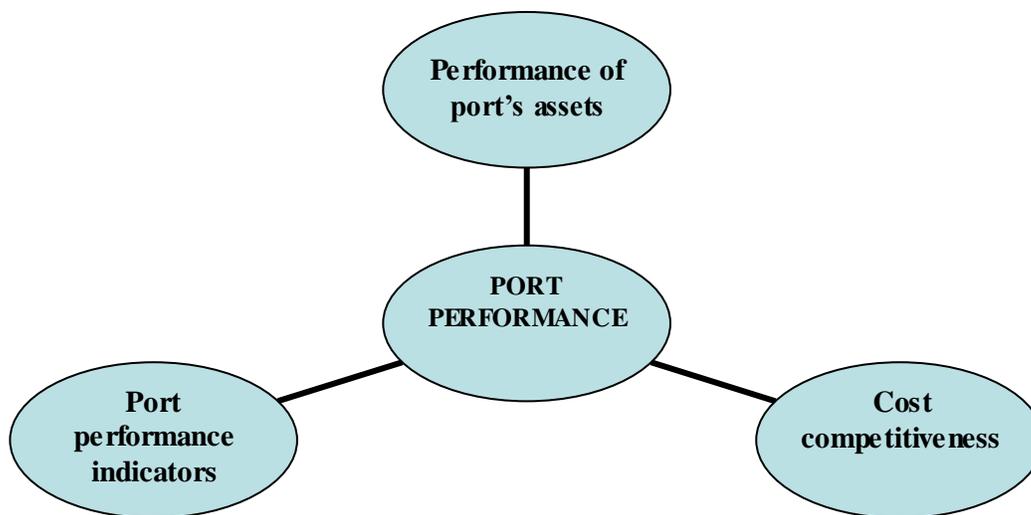
This study attempts to address the absence of a reliable performance measurement for Malaysian container ports by recommending an index to measure their performance using a simple index that uses empirical, easily obtained variables such as throughput volumes, waiting hours for ship, and moves of cranes per hour. In coming up with a measurement tool for the performance of Malaysia's container ports, the study draws from the work of various scholars on the subject of performance, especially port performance, and also looked at the way performance is measured at two renowned international container ports, Rotterdam Port in the Netherlands and Singapore Port. It also drew from the perspectives of port users, port operators/authorities and Government agencies to obtain a big picture view on the subject of container port performance.

The study highlights the various differences among container ports in terms of location, ownership, business strategy layout, connectivity with other ports and other transport modes, assets, tariff structure, level of utilization of technology, physical and man-made features, clientele/cargos handled, support given by the government and many other aspects. Hence, the factors driving and influencing the performance of one port may differ from another port. To compound this, different stakeholders view port performance from different perspectives which makes comparing the performance of one port to another an academic exercise. Even a well-

developed performance measurement tool cannot tell the whole story about a port's competitiveness and the complex environment in which it operates.

The study recommends a method that incorporates the measurement of the performance of a container port's assets such as cranes and vehicles used in handling containers and turning around vessel, the cost competitiveness of the port based on its tariff, and other port performance indicators (PPIs) to evaluate the performance of Malaysia's container ports (see Diagram 1). This model does not lead to a single numerical value that represents the performance of a container port in the way that an index does. This limitation is an acknowledgment of the differences among container ports in terms of location, physical features, policy support, assets, manpower, clientele and business strategies, among others. However, the model proposed strives to capture the entire breadth and range of measurable key performance indicators of a container port.

Diagram 1
Proposed model to measure the performance of Malaysia's container ports



The study concludes that measuring the performance of container ports is not a straightforward task but the availability of a measurement tool that measures their key performance indicators such as ship and cargo turnaround time can provide a reliable means of doing so. It ends up with a hopeful note that measuring port performance using the proposed model can be useful to port users in deciding which ports to use, for port operators and authorities in identifying areas of weaknesses and improvements, for Government agencies to allocate public investment and introducing policies to develop and promote the container ports, and even for the nation to assess its competitiveness as a trading and maritime nation.

1. Introduction

Being a trade-dependent nation and a nation whose majority of trade volume is carried by seaborne transport, the importance for Malaysia to have seaports which are efficient and competitive cannot be overemphasized. Its main ports, namely Port Klang and Port of Tanjung Pelepas (PTP), have done well to be in the list of the world's top 20 container ports in terms of throughput handled,¹ they have to continuously improve their efficiency and competitiveness to retain existing business and attract new users, especially main line operators (MLOs). However, competition is rising from ports in the region which are also keen to attract MLOs.² Amid the intense competition, Malaysian ports must always improve their performance in order to provide good services at competitive rates, win more business and handle more trade.

In this regard, it is important that the performance of Malaysian ports can be measured to enable port operators, authorities, users and other stakeholders to assess where these ports stand vis a vis other ports, and how Malaysia fares as a maritime nation compared to others. The availability of a reliable measurement to gauge the ports' performance can also be helpful in identifying areas for improvement, upgrading and investment to enable the ports to perform better as an essential service provider to the nation and to facilitate its trade and economic growth.

1.1 Problem statement

There exists no widely accepted way to measure the performance of Malaysian container ports. Port operators and authorities tend to publicize achievements such as growth of throughput handled (including empty containers) and short berthing time to vessels calling at those ports. Westports, one of the two terminal operators in Port Klang, proudly claimed to hold the world record for productivity in clearing containers from a vessel. Impressive as this achievement may be, it is not a very helpful indicator to assess the performance of the terminal and is not considered as an internationally accepted benchmark for container port performance.³ The lack of a 'measurement mechanism' that comprehensively covers the multitude of elements that makes ports tick does not allow port operators, port authorities, port users and other stakeholders to objectively and accurately evaluate the performance of the ports.

¹ Containerisation International list of top 20 container ports in the world by way of throughput handled in 2011 listed Port Klang and Port of Tanjung Pelepas at 13th and 17th respectively.

² Several established ports in the South East Asian region such as Laem Chabang Port in Thailand and Singapore Port are undertaking expansion to enhance their capacity and capability to handle more throughput and attract more users. In addition, there are plans to build new container ports and terminals, for example at Dawei in Myanmar and near Ho Chi Minh City in Vietnam.

³ Communication with several maritime economists and scholars on ports revealed that they do not subscribe to using 'number of movements per hour of crane' as a reliable indicator of container port performance. Impressive number of movements per hour of crane can be achieved on a quiet day at a port when several cranes and a good number of personnel can be devoted to clear containers on a single ship. The level of productivity of clearing containers off a ship also depends on the weather; on days with strong winds, cranes cannot perform at optimal productivity levels.

³ Communication with two leading European-based scholars on Maritime Economics in October 2010 and November 2011.

1.2 Objective of the study

The key objective of this study is to recommend a model to measure the performance of Malaysian container ports based on widely accepted performance indicators and parameters for container ports.

1.3 Significance of the study

Having a performance measurement which is based on a range of widely accepted yardsticks to measure the performance of Malaysia's container ports will provide a credible, useful and reliable indicator for the ports operator and their users and other stakeholders. This can help the port operators and authorities and other stakeholders to identify areas which need improvement to enhance the performance of the ports. It can also provide a measurement as to where Malaysia stand as a maritime nation in attracting shipping lines and handling trade, in the context of its container ports' performance.

1.4 Methodology

The conduct of this study involves the following :

- reviewing the literature on performance, performance measurement and port performance;
- communication with container port operators and other stakeholders such as authorities and users, and also scholars working on the subject of Maritime Economics and ports in particular;
- drawing the feedback gained from a stakeholder meeting on 20 December 2012 during which the findings of the study were presented to representatives from Malaysian port operating companies, port authorities, port users, government agencies, the academia and other relevant parties; and
- distributing questionnaire (see Appendix I) to several local container port stakeholders to gauge their responses to several questions on container port performance.

1.5 Key definitions

Container ports

Seaports handling import, export and transshipment of containerized cargos.

Port performance

Accomplishment of key operational tasks by port operators based on widely accepted standards, speed, cost, accuracy and other measurements such as throughput volume, berthing time for ships and efficiency of value-adding services offered to port users.

Performance indicator

A representation of quantifiable measurement to evaluate performance.

2. Literature review

There exists a wealth of literature on the need for ports to measure their performance for various reasons. There are also established yardsticks to measure the efficiency and competitiveness of ports. These works and models provide useful reference to this study in terms of understanding the dynamics of port performance measurement and in developing a mechanism to measure the performance of Malaysia's container ports.

i) On port performance, efficiency and competitiveness

UNCTAD (1976) pointed out that the performance of ports should be gauged based on their operational and financial aspects. This is indeed useful as operational and financial measurements are useful for the medium- term planning and control of the ports.

Kaplan (1984) argued that superior financial performance of ports may be due to the use of 'novel financing and ownership arrangements' rather than to efficient operating and management systems. In these arrangements, the allocation of overhead costs such as labor and machine hours on a volume basis is done arbitrarily. In addition, the calculation of depreciation uses traditional accounting systems whereby assets which written down facilities tend to be favored to new ones.

Tongzon (1995) established a model of port performance and efficiency, specifying and empirically testing factors which influence port performance and efficiency. It provides an empirical basis for the crucial role of terminal efficiency relative to other factors in overall port performance. Applying the findings of the study to Port Klang and PTP and comparing them with other ports in Malaysia, it can be confirmed that the efficiency of terminal operations at these two ports make them far superior in terms of performance compared to the other ports.

Clark, Dollar and Micco (2004) posited that port efficiency is only partly dependent on distance and its effect on transport costs, and the capital investment on port facilities. Factors such as port activities and services such as pilotage, towing, tug assistance or cargo handling, to name a few, are important as well when assessing the efficiency of a port. Inefficient ports increase handling costs, which are one of the components of shipping costs. Variations in port efficiency are also linked to excessive regulation, the prevalence of organized crime, and the general condition of the country's infrastructure. Pilots at Westports in Port Klang interviewed in the course of this study agreed that such ancillary services can make a huge difference in terms of ship turnaround time and in the time taken for cargo loading and offloading.

A report by IFO (2004) highlighted that port efficiency is only partly dependent on distance and its effect on transport costs, and the capital investment on port facilities. Factors such as port activities and services such as pilotage, towing, tug assistance or cargo handling, to name a few,

are important as well when assessing the efficiency of a port. As with the study by Clark, Dollar and Micco (2004), the report also mentioned that port efficiency is affected by the customs clearing requirements and timing of port operations. This certainly applies to Malaysian ports and a fact concurred with by executives of port operating companies spoken to. Port operators and officials from port authorities interviewed emphasized that port efficiency is one of the determining factor of shipping costs. Inefficient ports result in port users incurring unnecessary handling costs and delays in the supply chains.

A research by Lam and Yap (2006) found that the competitive advantage of a container terminal operator goes beyond the elements that can be quantified. The paper finds that the increasingly cost competitive operators in Port Klang and PTP were able to close the gap with Singapore Port in the overall costs of using their terminal facilities between 1998 and 2002. The findings of this study yield valuable leads on the opportunities available to Malaysian container terminal operators to advance and capitalize on their competitive advantages beyond aggressive price competition.

An analysis by Yap (2009) on inter-port relationships revealed that it was important to take into account the complementary aspects of ports in assessing their competitiveness. In doing so, distinction must be made between competitiveness which is based on cost of providing port services and that which is based on pricing. This provides a crucial pointer in studying the competitiveness of Malaysian ports. Several ports enjoy certain advantages beyond pricing. For example, Port Klang, which is designated as the National Load Center, enjoys sizeable volume of domestic cargo and good intermodal connectivity which results in lower overall cost of seaborne transport. It also enjoys a 'natural monopoly' by virtue of its location and policy push, factors which must be taken into account in assessing its competitiveness and when comparing its competitiveness with other ports.

In a study by Shinohara (2009), it was pointed out that the nature of competition among ports is ambiguous owing to ports pursuing their own profit-oriented objectives. It may be questioned if ports are meant to compete with one another. This literature may be applied selectively to the Malaysian ports covered in this study. Some do not consider themselves to be competing with certain local ports based on several factors such as the differences in their nature of business, capacity, clientele and location.

ii) On measuring and benchmarking port performance

The literature on measuring and benchmarking port performance is dominated by assessing the performance of ports based on narrow performance metrics focusing mainly on the throughput and ship handling performance of ports. Although various mechanisms and techniques to measure port performance and efficiency have been proposed in these literature, they appear fragmented and do not synthesize key systems in the port environment such as operational, functional and spatial. Very few take into account non-operational factors such as policies (for example load centering, hubbing and Cabotage rules), shipping and cargo movement dynamics, value-adding services provided by ports to their users.

The United Nations Conference on Trade and Development (UNCTAD) (1978) listed two categories of performance indicators for ports, namely financial and operational indicators, as follows :

Table 2. Financial and operational indicators of port performance

Financial indicator	Operational indicator
Tonnage worked	Waiting time
Berth occupancy revenue per ton of cargo	Turnaround Time
Cargo handling revenue per ton of cargo	Tonnage per ship
Labor expenditure	Number of gangs employed per ship per shift
Capital equipment expenditure per ton cargo	Ton per ship hour at berth
Contribution per ton cargo	Tons per gang hours
Total contribution	Fraction of time gang idle

Source: UNCTAD

The above indicators have to a certain extent been helpful for port operators, port authorities, port users, governments and investors to gauge the performance of ports. However, UNCTAD had admitted that there still lacks a model or measurement tool that uses standard indicators to compare the performance of ports and to be used to gauge whether reforms and improvements are needed to improve port performance.

There are differences and even conflicts among these measurement approaches and in their methodologies. According to Bichou (2007), differences can be found in areas such as :⁴

- Definition of terminologies related to performance, such as efficiency, productivity, effectiveness and competitiveness and in the manner they are measured and benchmarked.
- Difference in the perceptions among port stakeholders such as port authorities, terminal operator, shipping lines, shippers, logistics service providers and coastal communities, among many others. The differences give rise to clashing objectives, designs and implementation of performance measurement matrices and indices for ports.
- Nature of operations of ports including types of ships and cargos; services provided; equipment, processes and systems used, layout and configuration; and dimensions. These differences make it difficult to determine what aspects of port performance to measure, how to measure, how long to measure and what benchmark to use.

⁴ This list is compiled based on the responses to a survey among administered to 15 port stakeholders from April to July 2012.

- Institutional and regulatory framework, scopes of functions and strategic plans of the ports compared to one another and with other international ports.

Given these differences, it is therefore essential to come up with an integrated approach to measure port performance by viewing ports beyond their traditional role of facilitating the loading and unloading of cargos. However, it must be stressed that these performance indicators of course do not reveal much or anything at all about other aspects of port performance such as economic impact of the ports, attractiveness of the ports to users and efficiency of value-adding services provided by the ports.

iii) On measuring financial performance of port operating companies

Measuring the financial performance of port operating companies is not considered a reliable means of assessing their performance. Several literature reviewed caution against this approach which they maintain do not do justice to the complexity and multiplicity of factors involved in port operations.

Holmberg (2000) maintained that the main bias of financial techniques is that they reflect the results of past actions and are designed to meet external evaluators' needs and expectations. Vitale and Mavrinac (1995) came up with a critique on using financial ratios to measure port performance owing to their limitation in assessing the contribution of intangible activities at ports. Such activities include innovation and development that lead to better performance and customer service. A report by I the US Maritime Administration or MARAD (2003) stated that the common measures for the financial performance in the maritime industry include return on investment, return on assets, capital structure and short-term liquidity. It argued against using conventional financial ratios to measure port performance and benchmarking for a number of reasons. These include the little correlation with the efficient and effective use of resources given that the profitability of the port operating companies may be driven by price inflation and other external conditions rather than by efficiency, productivity or utilization of resources.

The discourse on measuring the performance of container ports ought to take note of these arguments and counter-arguments. Financial ratios, which tend to be oriented towards short-term profitability, are not consistent with the long-term nature and objective of investment in ports. As such, measuring financial performance of port operating companies by itself cannot be depended upon to gauge the overall performance of ports. This approach can at best be used as part of a broad-based measurement of port performance to include operational efficiency and productivity and other performance measures to enable port performance to be evaluated in a holistic manner.

iv) *On measuring performance*

Literature on performance measurement suggests that there are various ways to determine the performance of organizations. They include qualitative and quantitative methods, and a combination of both.

Clark and Schkade (1979) said there was no one set formula or algorithm for generating an index but there are certain concepts that apply to all indexes. This adheres to the fact that indices are designed for a particular purpose. The process of designing a measurement tool involves choosing the correct (related) indicators and then combining them in a manner that supports the index's objective. Eastman Kodak Company (1994) introduced a methodology for creating performance indexes involving mapping the range of performance for several metrics onto a fixed scale. This was achieved by applying a multiplier to the value extracted from the scale, and adding the results together.

A study by Easterly and Levine (2002) noted that firms are embedded in inter-firm relationships with networks of suppliers, buyers and even competitors that help them to gain competitive advantages. The drive of enterprises is to maintain and improve their own competitiveness. This concept certainly applies to Malaysian ports run by private companies whose principle motive is to maximize their shareholders' wealth. As such, they are always striving to improve their competitiveness by way of having the necessary assets, features, capacity and capacity.

This literature proved useful pointers in evaluating the viability of using an index to measure the performance of Malaysian ports.

v) *Other supporting literature*

Kelywegt et al (2002) listed several important factors taken into account by carriers when choosing a port include costs, quality of service, adequacy of port facilities, access to connecting modes of transportation and supporting services, efficiency of the port, and industrial relations with government and businesses. These factors are useful in comparing the competitiveness of Malaysian ports with one another and between them and regional rivals in terms of attracting shipping lines.

Fagerberg and Srholec (2007) conducted an empirical analysis, based on a sample of 90 countries on different levels of development during 1980–2002, which showed the relevance of technology, capacity and demand competitiveness for growth and development. As Malaysian ports handle more trade and host users whose needs have become more complex, their reliance on technology and the need to have in place adequate capacity, and high level of productivity and efficiency have also increased. Without these, their business cannot grow.

Medda and Carbonaro (2007) examined the developments in seaborne traffic within the Mediterranean basin focusing on maritime transport chains and ports. It stresses the importance of strong links along the maritime supply chains in an area like the Mediterranean which depends on maritime transport to facilitate the region's international trade. The study provides

confirmation that there are many external factors contributing to the competitiveness of ports. Chief of these is intermodal connectivity and availability of integrated logistics services supporting the ports. In that respect, Malaysia's major seaports can be said to be more competitive compared to other ports which do not enjoy such features and support.

This study also took a cursory glance at literature on engineering and manufacturing in order to broaden the scope of the literature review. Wheelwright (1978) suggested that efficiency within an engineering environment encompasses at least two dimensions, namely cost efficiency (which entails low production costs) and capital efficiency (notably low investments). However, he said that in production economics, efficiency is usually decomposed into three categories of efficiency, namely technical allocative and distributional.⁵ This literature helped to supplement the author's understanding on the dynamics of performance especially in a different operational environment by comparing and contrasting them with the port operating environment.

2.2 Summary of the literature

From the literature reviewed, most practical and theoretical methods to measure and benchmark port performance and measurement benchmarking can be categorized into three areas, namely : (i) metrics and index, (ii) economic impact, and (iii) efficiency. Despite the availability of several performance models and measurement systems, there lacks a comprehensive and integrated approach to measure port performance to encompass both the maritime and land dimensions that Malaysian container ports operate.

The literature also reveals that measuring container port performance is not unlike most other operating and management systems. It begins with the individual metrics at each functional or operational level of the container ports, for example time, resources and cost. A performance measure or metric is quantified or captured numerically to enable like-for-like comparison, for example in the areas of throughput volume handled, connectivity and business strategy.

From the performance metrics reviewed in the literature, output measures (such as throughput volumes, profit of the port operating companies) and composite measures (such as efficiency, productivity and efficiency of utilization of equipment and resources) are quantified. They are usually represented in the form of output/input ratios, with the

⁵ According to Wheelwright, technical efficiency is measured in terms of the ability to produce the maximum level of output from a given set of inputs (output-oriented) or to reduce the input to the minimum given the same output (input-oriented). Allocative efficiency reflects the ability to optimally allocate inputs at a minimum cost of outputs, for a given set of input prices and technology. The combination of the two measures leads to economic efficiency. Distributional efficiency, on the other hand, is related to consumer choice and preference.

objective of maximizing composite measures and/or minimizing output measures. The composite index may be further broken down into two or more components, depending on the method used to measure the performance, and the typology and dimensions involved.

The literature also recommends that measuring port performance can also be accomplished by assessing the financial performance of their operating companies. Financial metrics use ratios applied in costing and management accounting systems in an approach similar to that of physical indicators, with the difference of using monetary values for input and output data. Financial performance measurement is close to the concept of profitability, usually defined as being the ratio between revenue and cost. In the port industry, financial ratios are used widely with the most cited and comprehensive study being the annual survey of financial performance of US public ports undertaken by MARAD (2003).

Another measurement of port performance is evaluating their 'physical' productivity. This approach commonly uses a single productivity indicator as a ratio to measure of a single output quantity against the quantity of a single factor input. The input quantity is typically based on an input resource (namely labor, land and capital) while the output quantity is usually based on the cost drivers of the activity or resource which is being measured. The difficulty in using this technique is that data on the cost drivers in ports are often difficult to obtain for purpose of research or are simply unavailable. As a compromise, researchers use 'physical' productivity measures instead.

3. An overview of Malaysian ports

Malaysia's ports act as gateways to the nation's economy, facilitating 90% of the country's trade. Malaysia boasts of having two ports in the list of the world's 20 busiest container ports in terms of throughput volume handled, namely Port Klang and Port of Tanjung Pelepas (PTP) which were ranked 13th and 17th respectively (Containerisation International, 2011). These two ports are strategically located along the Straits of Malacca, the world's busiest shipping lane and among the most strategic, can be considered world-class ports which are able to host the world's largest merchant vessels. Bintulu Port is the world's largest export terminal for LNG while Johor Port is the world's largest export terminal for palm oil and is accredited by London Metal Exchange to handle its warehousing facilities and activities.

The last decade has seen an impressive growth among leading Malaysian ports, especially in terms of container throughput. *Table 1* shows an increasing trend in container throughput in those ports in the last decade, in line with the increase in the nation's international trade. This impressive growth in throughput was made possible by among others favorable economic and trade conditions and the expansion in capacity of ports plus their increasing efficiency and productivity.

Barring anything dramatic, Malaysia's trade is expected to grow in the foreseeable future. Local ports are busy undertaking expansion plan to add new berths, increase container yard space and acquire new cranes and port vehicles and equipment to be able to have extra capacity and handle greater throughput volumes. This will augur well with Malaysia's ambition to become a regional shipping hub and to reach its target of handling 36 mil. TEU by 2020, as set in the Third Industrial Master Plan 2005-2020 (IMP3).

Table 1
Total container throughput of Malaysian ports (in TEU), 2005- 2010

Ports	2005	2006	2007	2008	2009	2010
Port Klang	5,543,527	6,346,295	7,118,714	7,973,579	7,309,779	8,871,745
Penang	795,289	849,730	925,991	917,631	958,476	1,108,428
Johor	842,303	880,611	927,284	934,767	844,856	876,268
Kuantan	119,075	125,920	127,600	127,061	132,252	142,080
Bintulu	147,800	199,704	251,800	290,167	248,390	251,284
Kuching	143,096	152,394	163,338	171,943	161,091	190,642
Miri	14,823	16,837	21,159	28,085	25,102	28,959
Rajang	54,377	53,741	65,908	74,320	66,210	80,333
Sabah	208,488	227,084	271,471	292,688	277,905	98,873
PTP	4,177,123	4,637,419	5,297,631	5,466,191	5,835,085	6,535,838
Total	12,044,229	13,489,735	15,170,896	15,170,896	15,859,146	18,409,525

Source: Ministry of Transport Malaysia

Amid rising trade volume and In this regard, the Ministry of Transport Malaysia (MOT), particularly the Maritime Division, works to ensure Malaysian ports are efficient and be able to lure main line operators (MLOs) to enhance connectivity of those ports. To do so, the local ports must be able to offer a decent amount of cargo, and this is attained by designating Port Klang as a National Load Center and PTP as a transshipment hub. The ports must also have the necessary features such as deep draft, equipment, berths. MOT also works at ensuring Malaysian ports are secure and comply with international maritime security measures such as ISPS Code.⁶ The Port State Control regime ensures that ships calling at Malaysian ports are safe, while navigation systems such as lighthouses, Traffic Separation System, Vessels Tracking System (VTS) and Automatic Identification System (AIS) in the Straits of Malacca, managed and administered by Marine Department Malaysia, ensures navigation safety to ships traversing Malaysian waters.

MOT compiles several statistics related to local ports. These include volumes of cargos and containers handled, movement of port cranes per hour and number of ship calls (and by types of ships). These statistics are useful for policymakers and for port users, researchers and other

⁶ As of December 2012, 80% of Malaysian ports are ISPS Code compliant while 100% of international ships calling at its major seaports are ISPS Code compliant.

parties interested to assess the performance of Malaysian ports. Other information and data available, although in patches and not always fastidiously recorded or updated, include barter trade, port limits, port clearance and private jetties. MOT also spearheads international initiatives related to maritime transport, which relates to ports, for example the Maritime Transport Working Group (MTWG) and Senior Transport Officials Meeting (STOM), under which region-wide measures related to ports are initiated and discussed.

To be competitive, ports must stay abreast of the rapid changes in the shipping industry and trends in cargo transportation. Take the emergence and deployment of larger and more sophisticated ships, for example.⁷ These big ships also have sophisticated onboard equipment such as engines and navigation equipment. They demand adequate port facilities and land-based support which can match their size and sophistication. Cargo handling capability must match the enormous variety and volumes of cargos carried by the ships. Waiting time and the length stay of ships at ports must be minimized and this requires ports and players providing logistics services to be at their optimal level of performance, productivity and efficiency.

Ports unable to accommodate the big vessels will be bypassed by them and will be reduced to playing a feeder role to larger ports where these behemoths can call. As ships grow larger, they will be making fewer port calls hence will only call at ports, namely hub ports, that can accommodate them and have a large cargo base. The largest container vessels are mainly deployed in the Asia-Europe shipping trade, in which Malaysian ports are among the last port of calls in the routes of westbound vessels sailing from the Far East. Malaysian ports should provide the necessary features and have a high level of productivity and efficiency to stand a chance of being included in the loop of these large ships.

In addition to this, Malaysian ports are facing intense competition from regional ports in the battle to attract MLOs and to handle more cargos. In recent years, ports in the region have embarked on aggressive expansion to serve their users better and in anticipation of growing demand for shipping services and global seaborne trade. Not only their operators are offering features and facilities of international standards, they are doing so at very competitive rates. The emergence of Shanghai Port, already the world's busiest container port measured by volume handled, and the expansion of ports such as Laem Chabang in Thailand and Tanjung Priok in Indonesia have increased the competition among regional ports to lure shipping lines and cargos. In addition, competition is also posed by new and expanded ports in the Far East, namely China, and South Asia.

Malaysian ports can no longer bank on their advantages of strategic location, good infrastructures and competitive tariffs as other ports in the region can also boast of the same features and are giving our ports a run for their money. As competition among ports to attract

⁷ A combination of shipping economics, accommodating ship financing market, advent in shipbuilding technology and enhancement of port capacity, productivity and efficiency has conspired to fuel the bullishness of shipowners to commission the construction of bigger ships. The largest bulk carrier (carrying commodities such as iron ore and coal) in existence today has a capacity of 380,000 DWT (deadweight tonnage) while the biggest container ship in service have 18,000 TEU (twenty-foot equivalent unit) capacity. Such ships require ports with deep draft to enable the ships to call at those ports, not to mention adequate facilities like cranes and trucks and a high degree of productivity and efficiency to enable their massive cargos to be loaded and unloaded in the shortest time possible.

shipping lines and handle more cargos heats up, Malaysian ports must strive to leverage on their strengths and continuously improve their productivity and efficiency and provide value-adding services to compete with neighboring ports.

In this very competitive operating environment it is essential that Malaysian ports continuously enhance their efficiency, productivity and overall competitiveness to attract MLOs, handle more throughput and to serve the nation's ever-growing trade. This underscores the need for their performance to be measured to enable the port operators and authorities to gauge where their ports stand compared to other local and international ports and to identify areas of improvements to enable them to serve their users and stakeholders better.

4. Measuring port performance : Case studies of Rotterdam Port and Singapore Port

This section discusses the way performance is measured at two renowned international container ports, Rotterdam Port in the Netherlands and Singapore Port. The lessons drawn from these two busy ports - widely renowned by shipping lines worldwide for their efficiency and productivity⁸ – provides useful pointers in measuring the performance of Malaysia's container ports.

4.1 Case study I : Rotterdam Port

Rotterdam Port is the biggest and busiest port in the European continent and the gateway port to the continent.⁹ It was ranked as the world's fifth busiest container port in 2011 by way of annual cargo volume handled, and was the world's busiest up to 2004.¹⁰

Port of Rotterdam features facilities and services for cargo handling, storage and distribution, and accommodates an extensive industrial complex. Served by most major shipping lines, the strategically located port acts as a gateway for containers destined for the Dutch hinterland and other countries in the European continent. These containers are then forwarded by feeder services, inland vessels, railway or trucks to warehouses, distribution centers, markets and industries.

Port of Rotterdam Authority (PRA) uses various performance indicators to gauge the port's performance. One such measurement is the Turn Around Time (TAT) which measures monthly sailing time of each sea-going vessel to the port.¹¹ PRA prides itself for maintaining fairly quick TAT despite the fact that transshipment traffic at the port has increased. It takes this measurement seriously as an indication of the port's performance; should there be any indication that the TAT will increase, PRA will launch investigation and introduce measures to reduce the TAT, if need be.

⁸ Around ten shipping executives and ship captains spoken to in the course of conducting this study generally gave the thumbs-up to both ports for their efficiency in loading and unloading cargos and for their reasonable quick turnaround time for ships despite being very busy ports.

⁹ The port hosts 35,000 seagoing vessels and 133,000 inland vessels annually, and handled 430 mil. tons of goods in 2011 (of which more than 110 mil. tons are classified by IMO as dangerous goods).

¹⁰ Containerisation International's 2011 ranking.

¹¹ Port of Rotterdam. Port Information Guide. August 2012.

PRA also uses the indication of its safety record based on the occurrence of nautical incidents in the port. It reported in August 2012 that such incidents had shown a ‘steady decline’ over the past years despite the busy traffic at the port (around 1 million movements of seagoing and inland vessels annually). Any such incidents such as fires, collisions and spills were mostly without ‘major consequences’ to safety and the flow of shipping traffic at the port and they are analyzed to draw lessons from them.

There has been an emergence of new performance measurement indicators (PPIs)¹² at the port in recent decades in keeping with the port’s changing role, operating environment and expectation from stakeholders.¹³ From using simple indicators such as number of ship calls and throughput volume to measure its performance, the port had gradually focused on wider aspects of their operations and other dimensions such as employment and investment generated, its contribution to the economy of its host country the Netherlands, and value-adding services it provides to its users (see *Table 2*) to gauge its performance. This reflects not only the expanded role of the port as a trade gateway to Europe but also the growing complexity of its port operating environment. The evolving manner in which the port measures its performance is also an indication of its acute sense of awareness of its role as a trade facilitator and its importance in the scheme of things.

Table 2
Changing port performance indicators at Rotterdam Port

Year-period	Indicators
Beginning of 20 th century	Number of ship calls Throughput volume handled
1990s	Port related employment generated Value-adding services provided Value-adding services provided as a percentage of regional GDP
2002	Improvement in turnover Profitability of firms with presence in the port area
2003	Investment level of private firms in port area
2004	Establishment of new companies in port area
2012	Number of seagoing and inland vessel calls

Source : *Port of Rotterdam (2006), Rabobank (2003), ECORYS-NEI (2003), Rebel Group / Buck (2005)*

¹² The functions of PPIs are as follows : (i) Providing management information for organizations, (ii) Serving to compare performance of other organizations and other units such as countries, and (iii) Enabling communication with relevant stakeholders. See De Langden, P., Nijdam, M. and van der Horst, M. (2007), New Indicators to Measure Port Performance, *Journal of Maritime Research*, IV(1), 23-36.

¹³ Ibid.

4.2 Case study 2 : Singapore Port

Singapore's success as a maritime nation is well documented. In describing its maritime industry, Singapore uses the concept 'Maritime Singapore' which entails an "ecosystem of maritime and port services where the international community congregates and where ideas and opportunities abound".¹⁴

The city-state features Singapore Port, which was the world's second busiest in terms of cargo volume handled (29.37 mil. TEU) after Shanghai Port (31.74 mil.) in 2011.¹⁵ Besides being known as a duty-free port, Singapore Port is renowned as an efficient and high-tech port, features which have contributed to making it a competitive and world-class megahub.

Singapore Port's commanding position as one of the world's top container ports owes in large part to the relentless support of the Singaporean government to develop and promote the port. The Singaporean government is renowned for being proactive, efficient and customer-friendly in servicing and supporting the maritime industry. Strong institutional support for the maritime sector is provided by the Ministry of Transport, which oversees the development and regulation of the maritime sector and sets the policy and strategic direction of the sector, while Maritime Port Authority of Singapore (MPA) acts as the 'champion agency' to develop and promote Singapore as a premier global hub port and International Maritime Center (IMC).

Singapore Port is managed and operated by PSA International, one of the world's leading port management groups. PSA Singapore Terminals at Singapore Port is the flagship of PSA International which has investments in 29 projects in 17 countries in Europe, the Americas and Asia. PSA International frequently uses the following accolades in promoting the performance and achievement of PSA Singapore Terminal :¹⁶

- the port handles 5% of world's port container throughput
- it is the world's largest transshipment port by volume handled, handling about a seventh of the world total
- it is the world's largest bunker port in terms of volume of bunker fuel supplied
- it handles half of the world's seaborne supply of crude oil
- it boasts connectivity with around 600 ports in 123 countries across six continents
- it is one of the world's largest reefer (refrigerated) ports with 7,000 reefer points and handling 1.32 mil. TEU of reefer containers in 2011

Despite Singapore Port's command as the world's top container port, it cannot possibly serve everyone and cater to every single party along the growing maritime trade sector. For example, Singapore does not enjoy the luxury of having huge expanse of greensites that certain Malaysian ports enjoy, and a large volume of domestic cargoes.

¹⁴ See 'Maritime Singapore', available at MOPA website at http://www.mpa.gov.sg/sites/global_navigation/maritime_singapore.page

¹⁵ Containerisation International's 2011 ranking.

¹⁶ Information from Port of Singapore website at www.singaporepsa.com and MPA's website at www.mpa.gov.sg

5. Discussion on Malaysia's port performance

This section discusses the performance of Malaysian container ports from three perspectives, namely those of port operators, port users and the government. They are chosen based on the author's own assessment that they represent stakeholders with the biggest interest and stake in these ports.

The first part of this section discusses how port operators measure their performance, mainly by using commonly used port performance indicators. The second part looks at the perspective of port users who have a different take on how to measure port performance. This is followed by the perspective of the government, another key stakeholder of the ports which provides funds to develop and maintain them and put in place policies to ensure their competitiveness to facilitate the nation's trade and economic growth. The perspectives and arguments of the three key stakeholders are then summarized and used as a basis for coming up with a recommendation on the best methods to measure the performance of Malaysia's container ports.

5.1 Port operator's' perspectives

Malaysia's leading container ports are, in order of throughput volumes handled, Port Klang (which consists of two terminals, Northport and Westports), PTP and Bintulu Port. PTP is the country's busiest container terminal, on account of the 7 mil. TEU it handled in 2011. In the same year, Westports handled 6.4 mil TEU, Northport 3.2 mil. TEU, Penang Port 1.2 mil. TEU while Bintulu Port processed 215,000 TEU. Malaysian seaports handled a total of mil. TEU in 2011.¹⁷

The container port operators use several indicators to measure their performance and they are discussed as follows :

i) Using throughput volume to measure port performance

Malaysian container ports commonly measure their performance by using the throughput volume handled (expressed in TEU) per unit of crane (or 'work station') per hour.¹⁸ Such measurement is also used by government agencies such as MOT, Ministry of International Trade and Industries (MITI) and Economic Planning Unit (EPU), the media, the academia and industry associations.¹⁹

¹⁷ Figures obtained from Ministry of Transport Malaysia.

¹⁸ The 'work station' differs according to the cargos handled. For example, the 'work station' for general cargos is the 'gang' or stevedoring/wharf crew loading or unloading the cargos. In this case, the size and productivity of the gang, and also the size and variety of cargos, are influential to the performance of the port in its handling of general cargos. Generally speaking, the larger the gang and the more homogenous the cargos, the greater the productivity and the better the performance. As such, ports handling general cargos tend to use tonnage handled per man hour to measure their performance.

¹⁹ Measuring port performance using throughput volumes is also a common international practice. The annual ranking of world's top container ports by Containerisation International, a widely read publication on maritime

In using throughput volume as a measurement indicator, year-on-year growth in the volume handled is considered as a reliable evidence of good or improving performance by the ports. For example, Port Klang Authority used the growth of 8.25% of the total number of containers handled by its two terminals in 2011 (9.6 mil. TEU) compared to 8.87 million TEUs in 2010 to highlight its performance.²⁰

However, this indicator is not without its limitations though. The major limitation is that growing throughput volume is not always down to the performance of the ports but due to trade and other external factors such as shipping lines' strategies. Secondly, throughput performance does not say much about the economic contribution of the ports to the local and even regional economies. The contribution of a port like PTP, 95% of whose total throughput is transshipment, certainly cannot be measured by how it affects the hinterland. Thirdly, using throughput as a measurement indicator is based on an aggregated throughput figure which is made of the volumes of various commodities. This prevents meaningful comparison between ports from being made. Last but not least, throughput volumes also include empty containers. Ports which handle sizeable volumes of 'empties' arising from being in the loop of shipping services doing repositioning of boxes may give the impression of having better performance than ports having a smaller total throughput but handling larger volumes of laden boxes.

ii) Using ship turnaround time to measure port performance

Ship turnaround time is another common indicator used by Malaysian container ports to measure their performance. This time indicates the duration of a vessel's stay in port from the time it arrives until the time it departs the port, and is commonly expressed in hours. The average turnaround time per vessel is computed dividing the total hours by the total number of vessels calling at a port. Statistics for turnaround time over periods of monthly and annual average are compiled by port authorities. For example, Port Klang Authority, Johor Port Authority, Penang Port Commission and Bintulu Port Authority compile statistics on ship turnaround time which provides a useful indication of the performance of these ports.

iii) Using other measures

There are several other indicators used by Malaysian container ports to indicate good performance. Westports, one of the two terminal operators in Port Klang, proudly claimed to hold the world record for productivity in clearing containers from a vessel. It set two 'world records for productivity' on 7 November 2008 by achieving a speed of 665 moves per hour in the first hour of operations and moved 4,427 TEUs within 10 hours. Westports widely publicized its

transport, is considered by many industry players among the most authoritative indicator. Equally followed is the ranking of world container ports in Review of Maritime Transport, an annual publication by the United Nations Conference on Trade and Development (UNCTAD), which also ranks ports according to their throughput volume handled.

achievement in breaking the world record for crane movements per hour.²¹ Such a measurement is not commonly used by other terminal operators elsewhere; in fact several port users and maritime economists interviewed in the course of conducting this research raised doubt over the reliability of using this to measure performance on a sustainable basis.²²

Another measure used is financial performance of the port operating company to indicate improvement in the performance of the port. Northport's operating company, namely NCB Holdings Berhad, highlighted that the company is in a healthy financial position thanks to the performance of its two key subsidiaries and main businesses, Northport and Kontena Nasional Berhad. For the full year ended 31 December 2011, NCB posted a net profit of RM158.93 million gained on the back of a revenue of RM928.02.²³

5.2 Port users' perspective

As end users and recipients of port services, their take on port performance could be different from the port operators and authorities and other stakeholders. Several port users spoken to in the course of conducting this research stated that the idle time of cargos is the most important and pertinent indicator of a container port's performance. This is measured in terms of the number of days or hours that cargos - usually measured in freightweight ton (FWT) - stay in the ports.

This should not come as a surprise as to shippers (importers and exporters), time is money and the longer time their cargos spend in the ports, the more cost they incur and the longer the delay along their supply chains. A long idle (or dwell) time at a port indicates some form of inefficiency or delay that can be attributed to the port's own performance.

While shippers feel this indicator is a reliable measure of container port performance,²⁴ it must be pointed out that the idle time does not reveal much in terms of where the inefficiency or delay is, and does not point towards areas of improvement for the port in question. This is due to the fact that the idle time is not broken down to the various times taken in the process of loading or unloading cargos, which include activities such as cargo inspection, waiting for haulier and equipment, and Customs clearance.

Measuring the tonnage handled per day/hour spent by the vessel at port provides a more reliable means to gauge the port's performance. The average tonnage handled per day/hour by each ship - measured by dividing the total tonnage of cargo loaded

²¹ See 'Westports set 2 world records for productivity'. Business Times. Available at <http://www.btimes.com.my/Current_News/BTIMES/articles/wport30/Article/#ixzz2Cx56OEVl>

²² Interviews conducted in person and via e-mail between May and August 2012.

²³ Singh, B. (2012, April 2). Malaysian Reserves. 'New top 2 executives expected to be appointed at Northport'. Available at http://themalaysianreserve.com/main/index.php?option=com_content&view=article&id=1387:new-top-2-executives-expected-to-be-appointed-at-northport&catid=36:corporate-malaysia&Itemid=120

²⁴ For ports handling a variety of cargos, idle time differs according to the types and cargos handled.

onto and discharged from the ship by the total number of days-hours spent by the vessel at the port.

To compile this figure, the port needs to break down the duration spent by vessel at the port into the time at berth and time away from the berth. This is essential as vessels are subject to various ‘surprises’ such as bad weather or equipment breakdown that may cause idle time that prolongs their stay at ports. Shipowners interviewed stated that the ratio between the waiting time for berthing and the actual time spent at berth is a reliable indicator of the port’s performance as a big ratio suggests congestion at the port that could arise from among others equipment breakdown and lack of efficiency and productivity.

5.3 Government’s perspective

The Malaysian government places strong emphasis on developing the nation’s ports, befitting their enormous importance and role in facilitating much of its trade. Huge amount of public funds has been spent on building, developing and maintaining ports. The government also offers various incentives for ports to promote their growth in the form of financing and tax breaks.

Institutional support is provided through the Ports Unit of the Maritime Division, MOT which oversees policies to develop Malaysian ports; Port Consultative Committee which consists of officials from government agencies including port authorities; and National Maritime Council which provides a platform for port authorities to discuss issues related to ports that require policy intervention. Port authorities and commission provide directions and strategic planning for the orderly development of the ports under their administration and help promote their services.

It is therefore in the Malaysian government’s interest to see the nation’s ports to become efficient, productive and competitive. In attaining this, the government is committed to provide funds to Federal ports to ensure they have the necessary features to accommodate large ships, for example in dredging the port harbors to ensure adequate draft. Providing navigation safety to ships traversing in and out of Malaysian ports is also a matter of tremendous importance to the government. It provides huge amounts of funds to put in place navigation safety systems and equipment to monitor vessel traffic and ensure their safety to facilitate the nation’s trade.

Over the years, the Minister of Transport frequently highlights annual and quarterly throughput growth of Malaysian ports to indicate their performance. At the beginning of the year, the Minister announces the throughout performance of Malaysian ports for the previous year. For example, Dato’ Seri Kong Cho Ha highlighted the increase in container throughput of 6.5% to 5.1 million TEUs in the first quarter

of 2012 compared with the same period in 2011.²⁵ In addition to highlighting the growth of throughput, he also drew attention to the decline in volume handled by certain ports and offered explanations to this.²⁶

Given the importance of ports to the nation's trade and economic wellbeing, it is in the government's interest to see them perform at their optimal capacity. The government commonly uses the throughput volume of ports as a measure of their performance, as seen in various official documents and speeches by ministers and high ranking government officials. Throughput volume is also used to set performance target; for example, the government has set a target for Malaysian container ports to handle 36 mil. TEU by 2020, as stated in the Third Industrial Master Plan 2005-2020.

In order to attain this ambitious target, the port operators will be counting on the government to assist and support their development of their capacity and capability by way of providing incentives and putting in place policies related to ports.

5.4 Discussion on measuring the performance of Malaysian container ports

It must be pointed out that at the early stage of this study, the author was keen to recommend constructing an index to measure the performance of Malaysia's container ports. It was earlier thought that a weighted average index would be useful to port operators and authorities to have an insight into their ports' performance, and also to port users and other stakeholders with socio-economic interests in the ports. This idea was largely dismissed by the port stakeholders interviewed in this study (through direct communication and survey attached in Appendix I) and those who participated in a stakeholder meeting organized by the author on 20 December 2012, as reflected in the opinions below :

- i) An executive of a port operating company said that using such an index would not fairly depict the 'true situation' and the 'complex operating environment' of the ports in Malaysia. He specifically pointed out that a weighted-average index would not reflect certain advantages that the nation's two largest ports enjoy. Pointing to Port Klang which is designated National Load Center, he said that the port enjoy a 'natural monopoly' that sets it apart from other ports and gives it a distinct advantage that others cannot replicate. As such, having an index to measure the performance of all the container in Malaysia would be futile as it would not be fair to compare other container ports in the country with Port Klang which enjoys what he described as a 'supreme edge'.

²⁵ Bernama Online (2012, May 3). Malaysia ports record higher container throughput. Available at <http://maritime.bernama.com/news.php?id=663518&lang=>

²⁶ Ibid. In announcing that all ports in Malaysia experienced positive growth of between 1% and 24% in the first quarter of 2012, he pointed out to the throughput of Johor Port, Kuantan Port and Miri Port, which declined by 8.9%, 6.7% and 0.7% respectively during that period. He said that the drop in Johor Port's container throughput was due to a 30% decrease in container transshipment to the port compared with the same period in 2011, while the decline in Kuantan Port was due to empty containers as a result of lower import and export trade.

- ii) A scholar who has published extensively on Maritime Economics pointed that newer ports tend to have advantage over older ports which have limited space or no longer have space for expansion.²⁷ He gave the example of PTP, which began operations in 2003 and has since become Malaysia's busiest container terminal and one of the world's fastest growing container terminals in the world in the last decade, which has an edge over Johor Port in Pasir Gudang. PTP has a generous amount of greensites to build new berths and container yards while Johor Port has very little space to expand its container handling capacity, if at all. Ports with extra capacity naturally have greater advantage than those with limited or no space to provide extra capacity, hence the former tend to be able to perform better, for example in cargo handling and turning around ships, compared to the latter.
- iii) It is important to understand the nature of competition between and among ports before measuring and compare their performance. There are terminal operators located in the same port that compete with one another, for example Northport and Westports in Port Klang. PTP considers Port Klang a competitor in the transshipment business. The large local ports also compete with regional and international ports.
- iv) Executive of smaller ports in Malaysia did not see the need to have such an index as they are more concerned about more basic things like increasing capacity, ensuring minimal breakdown of equipment, increasing connectivity, providing adequate draft to attract bigger ships, rising competition from regional ports, raising financing for expansion, increasing productivity and utilizing their capacity optimally.
- v) Representatives from several ports interviewed thought having an index would be helpful but are apprehensive about the idea. They cautioned that the index must also take into account other intangible advantages and that every port must be subjected to the same measurement parameters. For example, several port executives pointed to the natural monopoly that Port Klang enjoys as a national load center and the strategic location that PTP enjoys at the confluence of the busy shipping lanes of the Straits of Malacca. They consider these as major advantages that their own ports cannot match and hence should not be used to compare performance with those two leading ports.
- vi) To shipping lines, the cost of using a port is crucial in determining whether they will call at the port. Port-related charges represent a major component in the voyage costs of shipping companies. These charges include fees imposed on vessels and/or cargos and for the use of port facilities and services rendered by the port operator. The key costs are port dues and service charges, although different ports have varying charges depending on their business. The actual level of port charges in Malaysia depends on various factors including the pricing policy of the port authorities, the size of vessel, the time spent by vessels at ports and type of cargos loaded or unloaded. The cost of handing cargos at ports is very important to shipping lines, especially liner service providers. Activities involved in cargo handling include loading, stowing and discharging cargos. Ports which

²⁷ Personal communication on 14 August 2012.

do not provide speedy, efficient and cost-competitive cargo handling service will add to the cost of shipping companies and may even be shunned by them.

- vii) The stakeholders consulted thought a more useful exercise than to come up with an index to measure the performance of Malaysian container ports is to recommend new indicators that reflect the growing complexity of their operating environment and their role and position within the global maritime trade chains. They appeared contented with the way port performance is measured (namely by measuring their throughput handled, berthing time and cost of services) but stressed on the need for the use of indicators beyond the 'traditional' measurement yardstick in order to keep up with the changing times and dynamic operating environment.

Based on the literature reviewed and the feedback attained from port stakeholders, it can be said that the theoretical approaches and techniques to measure port performance are incompatible with modern-day roles and operations of container ports and the dynamics of maritime trade. They do not take into account factors and developments affecting ports' business and performance such as the growing integration of logistics services, changing regulatory and institutional framework, and emergence of new supply chain management techniques and consideration.

A key finding based on the stakeholders' feedback is that while throughput volume of ports is a useful indicator of their performance, it does not reflect the complexity of the ports' operating environment and the multitude of factors involved in determining their performance. It also does not capture certain advantages and disadvantages that the ports have that make them perform better or worse than others. This fact, said the stakeholders consulted in this study, should inform attempts to measure the performance of ports. They strongly emphasized that and the many differences they have should be put into perspective in order not to generalize them as like-for-like entities whose performance can be simply measured using a common measurement tool.

This view is best appreciated by taking into account that there are differences in the way port operators, port users and government agencies - as key stakeholders of ports - view the performance of ports. The discourse on port performance and attempt to come with a tool or method to measure their performance must take into account these perspectives.

Based on the literature reviewed and feedback given by port stakeholders, it can be concluded that measuring port performance using an index is not a reliable way to gauge their performance. Given the differences in capacity, efficiency, location and productivity; history; and the advantages and disadvantages among them, it would not help to put them in the same basket and measure their collective performance using an index in the same manner one measure the performance of a collection of stocks.

While the importance of measuring the performance of Malaysian ports is undeniable, the stakeholders must not lose sight of the 'big picture'. They must realize that the

total of the national interest to enhance trade and economic trade is greater than the sum of its parts. There is much value and benefit for the port authorities, owners and operators to work together to safeguard broader national interests while harnessing their own uniqueness, strengths and competitive advantages. Being already blessed with a strategic location in a dynamic economic region and a busy shipping route, Malaysian ports can gain a lot more by finding synergies among them and complement the strengths of one another.

This is especially important in the context of Malaysia wanting to become a regional shipping and logistics hub. It is already well-positioned to attain this status but its ports must focus on identifying and exploiting complementarities among them and position the country's ports as key stopovers to shipping lines, especially MLOs. As the economic, trade, production, consumption and financial landscapes change, Malaysian ports will be influenced by the ebb and flow of these forces that shape global seaborne trade. The rules of the game and the dynamics of the operating environment for ports will continue to change, hence their authorities, owners and operators, and the government, must also be prepared to change strategies and mindsets and be innovative to match the changing economic, trade and maritime industry landscape.

As the ASEAN Economic Community (AEC) inches closer to being realized in 2015, there is an urgent need for Malaysia to start effort to position its ports to reap the projected growth in intra-ASEAN trade. To do so, the ports must strive to create synergy among them instead of engaging in destructive competition with one another. Other nations are working hard at enhancing the capacity and capability of their ports to attract more shipping lines, especially MLOs, and handle greater trade volumes.

6. Suggested performance measurement model for Malaysian container ports

Given the increasingly complex role that container ports play these days in facilitating the movement of goods across supply chains and in enabling the transportation of much of global trade, there is a strong case of measuring the performance of ports beyond just their performance of handling ships and cargos. Areas such as institutional framework, regulatory structure, availability of financing, market access, monopoly and autonomy in decision-making should also be taken into consideration given their influence on determining the performance of the ports. Differences in these areas among Malaysian ports present a challenge in the attempt to draw comparison among their performances.²⁸

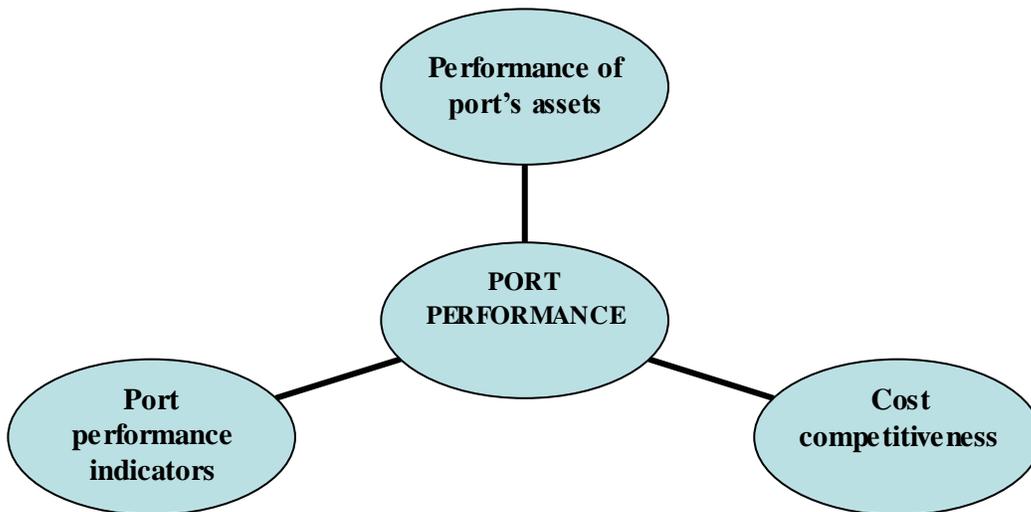
Further compounding to this challenge is the lack of agreement among port operators, port authorities, port users, other port stakeholders such as government agencies, and scholars – based on interviews and literature reviewed – on what constitutes a reliable measurement method for port

²⁸ Personal communication with several executives of Malaysian port operating companies between May and August 2012.

performance. This, and the examples of some of the world's top container ports in measuring their performance, has shifted the focus of measuring port performance from just using 'traditional indicators' such as throughput volume and turnaround time to other areas such as financial performance of the port operating companies and other aspects not directly related to cargo and ship handling.

Based on the literature review, the nature of operations of Malaysia's container ports, and the insights and feedback obtained from port stakeholders, it is recommended that a method that incorporates the measurement of the performance of the port's assets such as cranes and vehicles used in cargo handling and turning around ships, the cost competitiveness of using a port based on its charges, and other port performance indicators (PPIs) (such as the ones suggested in the literature reviewed and the ones used by leading international container ports) is used to gauge the performance of the nation's container ports (see *Diagram 1*). Although this model does not result in a single numerical value representing the performance of a port (as an index does), it captures as best as it possibly can the range of factors that is influential to the performance of a container port. In this regard, this model represents a fair method of measuring port performance given the differences among the ports in areas such as location, features, assets, tariff structure, business focus, strategy and government support.

Diagram 1
Proposed model to measure the performance of Malaysia's container ports



It must be stressed though that measuring port performance and suggesting a performance measurement indicator for them is not a straightforward task. As stressed earlier, ports are no longer stand-alone unit that merely act as a

place where cargos are loaded and unloaded. They have become central in the global trade supply chain and have become so integrated with other components of the logistics industry that facilitate the movements of much of the world's goods. In the context of this study, distinction must be drawn between measuring the performance of container port terminals and measuring the performance of the entire ports which also include other operations involving many types of cargos including bulk, general and even passengers.

In order to avoid 'comparing apples and oranges', it is essential for the performance of Malaysian container ports to be measured using the same parameters. This means comparing a subset of outputs to a subset of inputs in cases where multiple inputs and outputs are involved. In doing so, a performance measure that directly compares one or more outputs to one or more inputs can be constructed. Some of the areas that can be compared among the ports include :

- crane throughput per machine hour
- berth or quay throughput per square meter capacity
- worker or gang output per man-hour.

Despite the fact that the above are not difficult to calculate, they focus on a single or partial form of output and are 'subjective' by nature, hence constitute a major bias.

7. Conclusion

The increasing competition among ports has increased the need for their performance to be measured to enable their stakeholders to evaluate where the ports stand in terms of their performance, efficiency, productivity and cost competitiveness. Measuring port performance is important to gauge the overall competitiveness of ports. A performance measurement model can be used as a management tool and useful yardstick for port operators, authorities and users and even policymakers and investors.

However, measuring port performance is not a straight-forward task. To begin with, ports are different in terms of location, ownership, business strategy layout, connectivity with other ports and other transport modes, assets, tariff structure, level of utilization of technology, physical and man-made features, clientele/cargos handled, support given by the government and many other aspects. Hence, the factors driving and influencing the performance of one port may differ from another port. To compound this, different stakeholders view port performance from different perspectives which makes comparing the performance of one port to another an academic exercise. Even a well-developed performance measurement tool cannot tell the whole story about a port's competitiveness and the complex environment in which it operates.

It must be admitted that even with the leads obtained from literature review and from consultation with stakeholders, this study can only produce a measurement model that can only gauge the performance of ports in Malaysia in a cursory manner. It is hoped that the

recommendations and findings of this study can be helpful to those interested in the subject to further improve on them.

Given the complex nature of seaports and the position they assume in the global maritime trade, and the fact that the ports are made up of so many different parts, players and operations, it should not come as a surprise that their operators and authorities do not collect PPIs in a structured manner. This is observed among leading Malaysian container ports; although they collect data such as throughput volumes to measure their performance, they do not compile a wide range of PPIs and emerging ones such as education and wage levels of their employees, number of patents they produce, and real estate prices within their vicinity. However, as the ports assume an even more important and central role as facilitators of much of global trade, and as they become more integrated into the global logistics chains, they will be expected to introduce new PPIs such as the ones mentioned.

To ensure the performance of Malaysian ports is measured using like-for-like elements, the measurement model recommended in this study incorporates the performance of the ports' assets, the financial performance of the operating companies and new PPIs. They are useful to gauge the performance of ports in a comprehensive manner using indicators that are not ambiguous and non-subjective and are measured by all the ports. This indicator also allows port operators and authorities and their stakeholders to compare the performance of those ports with one another, and also to determine areas of improvements for those ports. Using new PPIs such as the range of value-adding services provided by the ports and the ports' efficiency and integration in the context of supply chain management within the logistics chain allows the port operators and authorities to communicate with their stakeholders information about the ports' performance.

Having a model to comprehensively measure the performance of container ports can be useful to various port stakeholders. Port operators and authorities can use the measurement to identify areas that need reform or improvement to enhance the efficiency and performance of their ports. Port users can use it to gauge where the ports stand compared to others in terms of their performance, efficiency and cost, which can help determine their decision whether or not to use the ports. The measurement can also be useful for policymakers in determining the assistance needed to support the development of the ports and to introduce and amend policies related thereto. This will be especially helpful in ensuring that public funds are used and managed effectively and in measuring the return on the investment of those funds. Apart from being a means to communicate the ports' performance to their stakeholders, the indicator can also be used to compare Malaysian ports' performance with their foreign counterparts, and even measure Malaysia's performance and competitiveness as a trading nation.

8. Areas for future studies

Among areas for future studies that can be pursued in relation to this study are :

- i) Measuring port performance based on the new PPIs mentioned in this study, for example in the context of their role, position and linkage within the global logistics chain.
- ii) Assessing port performance from a logistics and supply chain management (SCM)²⁹ perspective. An SCM-based framework can cover a range of measurable performance indicators and can even highlight areas of further research and improvement for the ports.
- ii) Measuring port performance by way of studying the links and integrations between ports and other institutions by way of their design, functions and services.
- iii) Developing performance indicators for Malaysian ports handling other types of cargos.

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- Scholars working in the field of Maritime Economics

²⁹ SCM is defined as the management of a network of interconnected business entities involved in the provision of products and services required by the end customers in a supply chain,. SCM spans all the movements and storage of materials, work-in-process inventory and finished goods from the point of origin to the point of consumption. See Harland, C.M. (1996), Supply Chain Management, Purchasing and Supply Management, Logistics, Vertical Integration, Materials Management and Supply Chain Dynamics. In: Slack, N (ed.) Blackwell *Encyclopedic Dictionary of Operations Management*. Oxford, UK : Blackwell.

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Appendix I

Survey administered to selected stakeholders

	Question	Sample answers
Q1	How important is performance measurement to your port?	<ul style="list-style-type: none"> • Very important as it shows our investments and efforts are bearing fruit. • Important because it can act as a marketing tool for our ports to attract more users.
Q2	Do you think it is fair to compare the performance of your port which is similar in many ways to you?	<ul style="list-style-type: none"> • Yes. We always want to know where we stand and want to benchmark ourselves against in-class ports. • Not really. Every port is unique so comparing performance is not be useful.
Q3	Do you think a survey like this is useful in deciding what to performance indicators to measure and what areas indeed improvement?	<ul style="list-style-type: none"> • Yes if it asks all the right questions. • No. Each port tends to publicize areas of performance in which it is good. There is no uniformity.
Q4	Do you think it is helpful to have an index to measure the competitiveness of ports?	<ul style="list-style-type: none"> • Yes if the ports being indexed are similar in most ways • No as ports are different in nature and are measured differently in terms of performance
Q5	Do you think a well-constructed index can fairly give an indication of performance for ports?	<ul style="list-style-type: none"> • No • Not sure • No opinion • Yes, if direct comparison is made i.e. on volume of container handled, berthing time, connectivity with other ports.
Q6	Do you think such an index would be a useful performance management tool to your port?	<ul style="list-style-type: none"> • Yes. • No. We already have in place ways to measure our own performance.
Q7	What top five elements you consider important in measuring your port's performance?	Throughput volumes, physical features (i.e. location, draft, proximity to economic areas), connectivity with other ports, intermodal connectivity, number of ship calls, revenues earned, capacity, efficiency measured by berthing time and speed of cargo clearance, financial performance.
Q8	What areas would you like to see improve at your port?	Throughput volumes, port channel features, balance between domestic and transshipment cargos, connectivity, value-adding services, investment, berthing time, cargo clearance, quality of manpower, tariff.

	Question	Sample answers
Q9	Do you pay attention to what scholars / academicians write about port performance?	<ul style="list-style-type: none"> • No. They are mostly 'theorists' and have no idea how things work at ports. • Sometimes. Some academic works are quite helpful.
Q10	Any opinions you might have on this study and on port performance in general?	<ul style="list-style-type: none"> • Could be a useful study • Do research on more practical areas like what policies can be introduced to ports improve performance • There are other practical/easier ways to measure port performance instead of coming up with a index.