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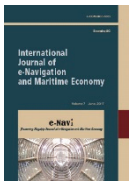

Original article

Preparation of dry ports for a competitive environment in the container seaport system: A process benchmarking approach*

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Abstract

The significant exodus of containers inland due to the container revolution has increased the salience of inland terminals for efficient freight distribution. Further, the migration of containers gradually inland has forced seaports to depend on these inland terminals to determine their competitiveness and offer a mechanism for competitive freight price to the consumer. The performance of dry ports need to be improved along with the dynamic nature of maritime business, to efficiently fulfil the demand all the key players in the container seaport system, provide economies of scale and scope to their respective clients and enhances the importance of inland networks to improve and consistently elongate the competitiveness of container seaports. Predicated to these importance, this paper aims to enhance dry port performance by adapting a process benchmarking strategy among the Malaysian dry ports. Prior to the adaptation of the process benchmarking approach, a grounded theory had been conducted as a method of analysis among the key players of the Malaysian container seaport system in order to provide essential inputs for the benchmarking. Through this paper, the outcome shows all four Malaysian dry ports need to improve their transportation infrastructure and operation facilities, container planning strategy, competition, location and externalities in order to assist all the key players in the container seaport system efficiently and effectively.

Key words: dry ports, Malaysia, container seaports, benchmarking, grounded theory

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1. Introduction

The consistent growth of containerization since the middle of 1900s requires the integration of intermodal terminals in the container seaport system to manage and develop the significant components in seaport competitiveness. The assistance of intermodal systems especially dry ports are highly anticipated by the container seaports and other key players in order to move along the shifting paradigm of seaport centric logistics towards consumer centric logistics which has been widely discussed by Lee and Cullinane (2016).The evolution of seaports from 4th generation towards 5th generation demanded an intersection of dry ports to assist container seaports to adapt with the current trends in global trade. As a result, the emergence of dry ports in the seaports system has become a significant complement for seaports due to the vicissitude nature of seaports.

Dry ports have become an important medium for seaports to face the instability of global trade, rapid changes in globalization as well as prioritization of regionalization to fulfill the need of economies of scale and scope especially from the Asian economic community. Predictably, the dynamic nature of maritime business, the changes from various components especially from shipping activities, seaport operations as well as inland network have brought a significant impact on the competitiveness of container seaports. Hence, dry ports which possess optimum operational elasticity have become a main component for seaports as a place to rely on to sustain in the competitive market.

Nevertheless, the dependency of seaports on dry ports to preserve the competitiveness requires dry ports to have optimum productivity, maximum process efficiency as well as satisfied service quality. Therefore, a benchmarking tool has been adapted in order to enhance dry ports efficiency and simultaneously improve container seaport efficiency. According to Dias et al. (2009), the benchmarking strategy is critical to compare their performance with respective competitors and design their own strategy to sustain in the dynamic market. This paper intends to conduct a benchmarking analysis on the main Malaysian dry ports by focusing on their respective roles in the container seaport system. It is important to improve the performance of these intermodal terminals in the container seaports system as well as accelerating the efficiency of freight distribution from seaport to dry ports and vice versa. To attain this analysis, a grounded theory has been implemented as a methodological approach to explore the internal and external performance of Malaysian dry ports in the container seaport system. Taking into account that dry ports are key components in freight logistics networks, the performance evaluation is essential to provide an effective decision prior to improving their efficiency and therefore enhance the competitiveness of container seaports in this region.

2. Motivation for a process benchmarking in Malaysian dry ports

Major impediments particularly from the intermodal system especially on transportation inefficiency, lack of effective container management, high competition with seaports, location of some intermodal terminals in less strategic perimeters, and externalities (Jeevan et al. 2015) indicated the seaports are unable to rely on the dry ports in order to improve their performance. This is because the current limitation faced by the dry ports has caused several significant issues on dry port performance as well as to the seaports.

Aforementioned issues have affected the competitiveness of seaports in this nation. For example, key issues especially in punctuality in serving their hinterland and foreland stakeholders, leaving empty space in the vessels, congestion and frequent accidents at seaports, delays in vessels turnaround time, ineffective seaport-hinterland connectivity, monopoly among road freight hauliers, limitation in modal shifting facilities, inefficient container management system, over-reliance on road transportation, less integrity in container flow to and from seaports and unhealthy and weak road infrastructure were detected as major issues faced by Malaysian dry ports (Jeevan et al. 2014). Those implications limit the real potential of Malaysian dry ports and as a consequence have affected the performance of container seaports. Hence, this situation limits the capacity of dry ports and

container seaports to cater to their clients during the accelerating trend of container volumes at present and in the future. The Malaysian intermodal system has become the main interface between seaports and hinterland (Figure 1). Any impediments that occur in this intermodal system may result in substantial consequences for the whole container seaport competitiveness. Therefore, to ensure the quality of dry port performance, a benchmarking tool has been adapted to improve dry port performance as well as strengthening the competitiveness of seaports in the system.

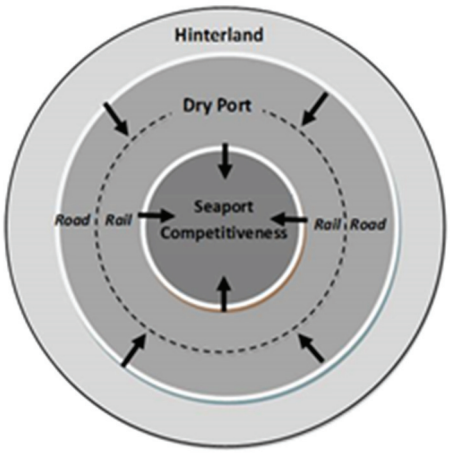

Figure 1: Intersect of dry ports in the seaport system

Source: Authors

3. Methodology and conceptual framework

To achieve the aim of this paper, an inductive approach has been used to gain all the required data because this approach is suitable to explore current capacity and resources to prepare Malaysian dry ports to face a competitive environment in the container seaport system. Therefore, face- to-face semi structured interview were conducted to gather the information on current capabilities of Malaysian dry ports. A total of 14 potential participants at middle and higher managerial levels have been selected through convenience sampling procedure which is appropriate to select potential participants. The participants from middle level and higher level management were selected because they have decision roles to confirm that their respective organizations optimize the resources and development strategies (DuBrin 2003).

A convenience sampling strategy has been adopted by choosing the respective participants who meet the specific criteria and select them by first come and first serve basis (Klassen et al. 2012). This sampling strategy was beneficial especially to collect the data from the samples in the maritime industry which are highly occupied for 24 hours and 7 days per week. A total of 14 potential participants with sufficient experience and knowledge were invited for the closed interview session. All participants were selected from Malaysian seaport authorities, seaport operators, dry port operators, and government bodies.

There are four (4) main stages involved before executing the benchmarking application in Malaysian dry ports (Figure 2). Firstly, face-to-face interviews have been implemented because this technique provided an advantage when studying a small number of respondents (n=10-15). Churchill (1995) recommended a few steps in the development of interview questions such as specify what information will be sought, select type of questionnaire, determine the content of individual questions, determine the number of questions and the sequence, re-examine the previous steps and pre-test.

Secondly, grounded theory is used for collecting and analyzing the qualitative data. In grounded theory, systematic design is selected and this design emphasizes the use of data analysis steps of open, axial and selective coding (Strauss & Corbin 1998; Hsieh 2005).Grounded theory provides better explanations of the theories that are not fully addressed, fit the situation, work in practice and represent all the complexity actually found in the process. In this study, the existing theory on dry ports' development and the impact on seaport competitiveness are not fully covered from a Malaysian perspective. Grounded theory is a systematic qualitative procedure used to develop a theory that explains the interaction about a substantive topic (Charmaz 2006). Grounded theory proceeds through systematic procedures of data collection, categories or themes identification, connecting the themes, and forming a theory that explains the process (Corbin & Strauss 2008).

Thirdly, SWOT analysis provides a framework to analyse the situation and developing suitable strategy and tactics as a basis for assessing core capabilities and competences of the organization. The process to identify the organization's strength, weaknesses, opportunities and threats are gathered from the people who have experiences in the particular field (Bradshaw & Boose 1990). The benefits from the SWOT analysis are factual data to understand external factors and internal capabilities. At the same time, this analysis reveals the external opportunities and threats of an organization and reveals the factual evaluation on strength and weaknesses (Cuadrado et al. 2004).

Finally, predicated the output at stage 1,2 and 3, a process benchmarking will be executed by improving dry port performance by identifying, understanding and adapting outstanding practices found in another dry ports. In this study, a process benchmarking strategy will be implemented within the dry ports in Malaysia. It means that, the outstanding performance by any dry ports will be identified, understand and suggested to other dry ports.

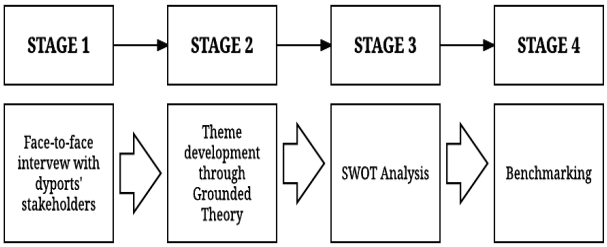

Figure 2: Development stages in benchmarking

Source: Authors

On average, each interview session took about 30-40 minutes to complete. All the collected data was analysed by using grounded theory method, which was highly compatible for a case study research which eventually will improve the validity of a qualitative research procedure (Parker and Roffey 1997). Before the theme developed, all 5 systematic steps in grounded theory including familiarization, reflection, open coding, axial coding and selective coding were adopted carefully (Creswell 2008). In this research, qualitative software was avoided to preserve theoretical sensitivity, which is very important during the interview session (Suddaby 2006).

Accordingly, 11 interview sessions were completed which were participated in by 4 dry port managers, 4 seaport managers, 2 personnel from government bodies and an operational manager from a logistics based organization. The semi structure interview questions consist of 3 main sections i.e. the key role of dry ports in Malaysia, the main challenges of these intermodal terminals and potential strategies to overcome the challenges of Malaysian dry ports to enhance the seaport competitiveness as shown in Figure 3. All 14 participants were selected due to their significant profile in maritime transportation, container operations and involvement in the Logistics and Trade Facilitation Master Plan (2015 -2020) which is designed to improve inland freight facilities in order to enhance the national trade facilitation mechanism. The interview sessions were conducted in the respective location of each participant.

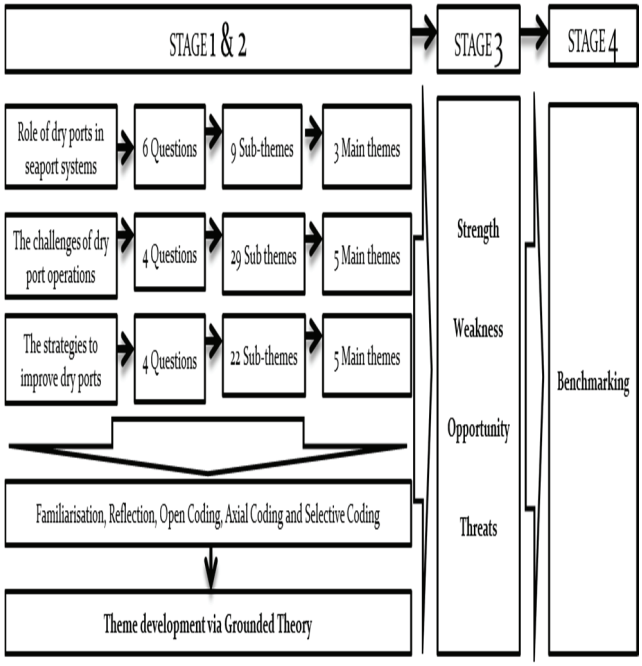

Figure 3: Implementation of Grounded Theory in the research

Source: Authors

4. Role of Malaysian dry ports in the container seaport system

Malaysian dry ports are demarcated as an extended seaports which comprise various functions such as facilitators in supply chains, boosters for seaport competitiveness, provide time and cost advantage to the customer and provide continuity in volume of containers to seaports. Dry ports in Malaysia are believed to be an identical entity as seaports which

are within the urban area and provide sufficient volume of containers to the seaports. They play a key role as regional intermodal nodes comprise the function of dry ports as regional inland ports, inland trans-shipment ports and also as inland terminals. Malaysian dry ports are classified as regional intermodal nodes which are important for regional development.

Finally, interface terminal is another dimension given to Malaysian dry ports as it connects various modes of transportation and links seaports and manufacturers or production centers. The location of dry ports is profitable if they are located near the manufacturing area, or industrial park. It will assist most of the industrialists to be well versed with the role of dry ports in the seaports system. At the same time the utilization of dry ports by the manufacturer will reduce the facilities pressure and capacity constraint faced by most of the Malaysian seaports and multimodal transport system.

Padang Besar Cargo Terminal (PBCT) is a border centric dry port and located in the northern region at the Malaysia-Thailand border. This dry port is connected to Penang Port and Port Klang especially for the freight transportation via road and rail. Then, Ipoh Cargo Terminal (ICT) is a city centric dry port which is connected to all three major seaports in Malaysia including Penang Port, Port Klang and Port of Tanjung Pelepas (PTP) through road and rail. Thirdly, Nilai Inland Port (NIP) is located in the centre of the peninsular and a city centric dry port in this region. NIP is connected to Port Klang and PTP by road to ease freight consolidation and deconsolidation in the central region of the peninsular of Malaysia. Finally SIP (Segamat Inland Port) is a border centric dry port which is connected to Port Klang and PTP via road and rail. The location of Malaysian dry ports and major container seaports is depicted in Figure 4.

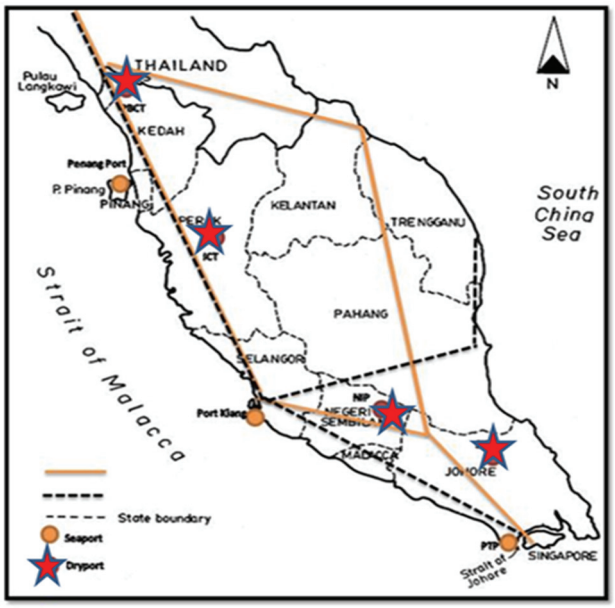

Figure 4: Mapping the location of Malaysian dry ports
Source: Authors

4.1 Objectives of dry ports

The objectives of dry ports are to enhance the maritime business and trigger regional economic development (Jeevan et al. 2015) and the mission of dry ports in this region is aligned with the outcome from several authors including Ng & Gujar (2009); Doust & Black (2009); Ngoc et al. (2011) and Werikhe & Jin (2015). Firstly, the objective of Malaysian dry ports is to accelerate national and international businesses. The national business referred to the volume of containers contributed by dry ports to container seaports. By the way, the international business in Malaysia is referred to the border transaction between Thailand and Singapore.

Perlis is one of the Malaysian states located in the northern tip of peninsular Malaysia and is left far behind in economic development. This state is highly dependent on grains and other agricultural products. Thus, the existence of PBCT increases employment opportunities for this dry port. The development of PBCT as one of the Malaysian dry ports aggravates more investment in this state and increases cross-border transactions. The volume of containers from southern Thailand to Penang port increased since the year 2000. PBCT contributes a high volume of containers from southern Thailand from 48,239 TEUs in 2000 to 100,371 TEUs in 2013. Every year PBCT contributes approximately 30% to 40% of container volume to Penang Port.

Secondly, this intermodal terminal also activates the infrastructure development for intermodal transportation in the state. Manufacturers from the southern part of Thailand prefer to use PBCT as an intermediate to the Penang port rather than Bangkok Port because the distance to Penang port is nearer than Bangkok Port and there are a lack of facilities to transport containers from southern Thailand to Bangkok Port. Additionally, the mode of transportation in Malaysia is more convenient compared to Thailand. In addition, most of the manufacturers prefer the intermodal system in PBCT to reduce the transportation cost.

Thirdly, the development of Malaysian dry ports has contributed to regional development. Besides enhancing cross border transactions, the objectives of Malaysian dry ports are to perform as container consolidation and deconsolidation park to some of the states in Malaysia which has no seaports and located far from main seaports. NIP is executes the function as consolidation and deconsolidation parks to the nearest states such as Malacca, south Selangor, Seremban and northern Johor. These states are renowned as manufacturing areas for electronics parts, food and agricultural products. The credibility of NIP providing space to the containers from other states and channel them to the main seaport reduces the time of delivery as well as freighting costs from the industrial park to the seaports. Services such as customs services, client's facilities, brokerage, forwarding agents and transportation advises are highly required by the stakeholders.

Fourthly, dry ports in Malaysia are an important node to enhance container seaport competitiveness. The presence of dry ports will assist the seaports to improve their effectiveness and efficiency in operations. For example, additional capacity is required in Port Klang, PTP and Penang Port to reduce traffic congestion. Additional space and adequate multimodal transportation systems in ICT and SIP may provide high relief to those seaports and ease the container movement to and from seaport. The development of dry ports is a medium to establishing the national seaport policy. The policies such as developing seaport facilities, enhancing and utilizing seaport facilities, improving the efficiency of seaport operation, promoting multi-modalism, developing seaport ancillary services and improving hinterland transportation are the major aspects in the national seaport policy (Mak & Tai 2010).

4.2 Functionalities of dry ports

Dry ports in Malaysia execute a similar function as seaports. Dry ports function is to mainly perform as transport and logistics functions. The dry ports in Malaysia serve as warehouses to assist the manufacturer and at the same time contributing to the container enhancement in the seaports. The main function of dry ports as container storage areas and customs clearance centres assisting seaport to ease the import and export procedure. Dry ports in Malaysia assist container seaports to focus on the primary activities which are container trans-loading and transhipment.

Secondly, dry ports also perform as information processing terminals for customs clearance, immigration centres and for police departments to ease the domestic and international container distribution. Dry ports perform seaport functions inland. The consistence of container supply and clearance to and from Port Klang allocates more spaces to port operators such as North Port to provide more spaces and capacity for Vehicle Transit Centre (VTC). Malaysian dry ports assist the seaports to utilise the space and capacity in seaports with various commodities and at the same time enhance the seaports performance.

Dry ports also perform as value added service centres. Most of the stakeholders anticipate various value added services from dry ports such as assorting, mixing, blending, packaging and repackaging, labelling and relabeling, offering tailored services beyond the standard offer, export packaging for transport requirement, disposal services and product advice to consignees. They believe the variation in value added services will increase the demand for dry ports among their clients.

5. Synthesising the process benchmarking in Malaysian dry port operations

The summary of internal and external circumstances of Malaysian dry ports will be synthesised in order to gain a valuable lesson derived from their current

operations. The lesson from other dry ports will be used to reduce negative implications in the current dry ports. Through this strategy, the quality of the operation level of this specific intermodal terminal will be improved and optimized.

In this section the internal and external evaluation of Malaysian dry ports will be revealed. In each separate section, the strength of this specific intermodal terminal will be identified and to be adapted in the operational system in other dry ports which has a lack of strength. Moreover, the weaknesses in Malaysian dry ports also will be revealed to ensure other dry ports learn valuable lessons from the particular dry port operations. In addition to that, opportunities and threats faced by each dry port will be discovered to provide guidelines to other dry ports for operational improvement.

5.1 Strength of Malaysian dry ports

Location of PBCT is the main strength of PBCT because the strategic location in the northern region and interface between Thailand international borders promotes cross border transaction. According to Beresford et al. (2004) border based dry ports perform as trans-modal centres for connecting inland freight distribution systems in different hinterlands.

The percentage of the total contribution of containers from PBCT shows that almost 50% of the containers which originated from Thailand transported to Malaysian seaports through dry ports. Distance and time advantage are the key parameters benefiting PBCT from industries based in south Thailand. A combination of various industries such as rubber, electrical and electronics, automotive, perishable products prefer to use PBCT as a regional transhipment centre to Penang Port due to a considerably shorter distance. In 2010, container traffic projection at this dry port was 138,848 TEUs and increased to 167,310 TEUs in 2014. In 2020, total container projected will be 236, 005 TEUs with 70% of growth in 10 years.

The total time to travel from Surat Thani to PBCT takes 6 hours compared to Lat Krabang Inland Container Depot (LKICD) on the way to Laem Chabang Port it takes 9 hours via inland transportation. In contrast, total shipping cost which include container handling cost, storage cost and customs clearance cost is marginally higher to transport containers to Penang Port from Thailand industrial park. For example, transporting containers via Chabang Port from LKICD to China cost RM 2,470/TEUs by rail and RM 2,970/TEUs by road to seaports. Meanwhile transporting containers via Penang Port from PBCT to China costs RM 2,690 by rail and RM 3,370 by road to seaports in comparison the price is marginally higher via Penang Port. At the same time, Penang Port has a significant time advantage facilitating faster churning of laden container to shippers.

Time advantage is the main strength of PBCT. The total time lost due to congestion at Penang Port is recorded as 3 hours and 7 hours at Laem Chabang Port and makes PBCT as an attractive location for shippers from southern Thailand. They prefer transporting containers via PBCT to reduce the cost accrued for container congestions at LKICD. The current yard capacity for PBCT accommodates 800 TEUs and this capacity is not efficient to cater to the 70% increment in the container volume in 2020. Therefore, PBCT has to upgrade its services and infrastructure facilities though LKICD or it will have less preference as a intermodal terminal among the shippers.

ICT is another prominent dry port in Malaysia and it promotes the economic and industrial development of the state. Currently, the container yard capacity in ICT is currently 800 TEUs and space for empty container yard is 1,800 TEUs. ICT promotes intermodal transport system by applying multi-modalism in the container freight system to and from seaport and ICT. Almost 50% of the containers in major Malaysian seaports are originated from ICT and this dry port is well connected by road hauliers and rail system.

Currently there are 9 container haulage operators operating in ICT which consists of Multimodal Fright, MISC haulage, Petikemas Logistics, Sentiasa Hebat, Kontena Nasional, Pintaran Timur Malaysia, Ipoh Logistics and Priority Haulage Distribution to provide effective door-to-door delivery from seaports to the final destination. ICT located near to the Kinta economic zones to ensure the continuity of the container supply to seaports and perform as

consolidation and deconsolidation centres for inland container distribution.

The Bilateral cross border trade agreement between Malaysia and Thailand in 1979 allows the movement of perishable goods in transit in quantities of up to 30,000 tonnes a year to Singapore (Vier 2010). Therefore, the transaction between Thailand and Singapore through Malaysian dry ports increases transhipment of goods from Thailand to Singapore and at the same time benefits Malaysian dry ports in terms of commodity traffic. Growth of perishable containers from Thailand to Singapore through Malaysian dry ports is expected to grow from 2010 until 2020. In 2010, about 8,973 TEUs recorded and reaching 10,004 TEUs in 2015. Finally in 2020, almost 11,341 TEUs are projected with 26% growth rate from 2010 until 2020.

NIP is one of the well-known dry ports among manufacturers in the central region of Malaysia. NIP assists local manufacturers from Malacca, south Selangor, Seremban and northern Johor as their consolidation and deconsolidation dry ports. Even though NIP is operating by single mode of transportation, it provides haulage services to their customers from central Malaysia until Bangkok in the north and Singapore in the south. NIP provides 15,000 square meters of yard area and 500 units of trucks to facilitate the stakeholders in container distribution especially to and from Port Klang and Johor Port. The container proportion contributed by NIP to Port Klang is about 60% and almost 10% channelled to Johor Port.

NIP is classified as a city based dry port because the location of this dry port is geographically located near to the main cities in Malaysia such as Selangor, Kuala Lumpur, Seremban and northern Johor and at the same time located near to Port Klang and PTP as well. NIP takes advantage of its location to offer shippers container distribution facilities, warehouses for storage, packing, stuffing, un-stuffing and provide clearance documentation for moving the containers to and from seaports. Therefore the location of NIP and well-connected road links makes the disconnection of rail link in NIP not an obstacle for this intermodal terminal to be active in the seaport system.

NIP also established its network with an existing industrial park and in fact NIP is the only dry port in Malaysia which has connection with many industrial parks such as Nilai Industrial Estate, Nilai Industrial Park, Nilai Utama Enterprise Park, Arab Malaysian Industrial Park, Techpark, Senawang Industrial Park, Tuanku Jaafar Industrial Park, Sendayan Tech Valley, Galla Industrial Park, Sungai Gadut Wood Industrial Estate, Oakland Industrial Park, Chembong Industrial Estate, Springhill Industrial Park and Batang Benar Industrial Park (Tenth Malaysia Plan 2011). The industrial parks which are linked with NIP, produce various types of products such as soft drinks, marine paints, automobile spare parts, electronic parts, pharmaceuticals, agrochemicals, aircraft braking system and others.

Meanwhile SIP is linked with Port Klang and Johor Port and the proportion of containers contributed by this dry port is marginally very low compared to other dry ports in Malaysia. SIP contributes 10% of its containers to Port Klang and the same portion to Johor Port. Based on the geographical location, SIP is categorised as a border based dry port because of SIP's location close to Singapore. SIP is connected by rail link and road haulage to and from the seaport for container distribution purposes. The main strength of SIP is the availability of space to accommodate increasing numbers of containers in PTP and in Port Klang. Currently, total yard area in SIP is almost 90, 200 square meters which has 7,000 TEUs for container yard capacity and 5,000 TEUs for empty container yard.

5.2 Weaknesses of Malaysian dry ports

Besides the significant strengths of Malaysian dry ports, they have some weakness during operation in the container seaport system. The main weakness faced by PBCT is rail system inefficiency. Limited railway tracks and low capacity of train decks makes the container movement from PBCT to Penang port much slower. Insufficient railway tracks which causes low frequency of rail trips creates container congestion in PBCT itself. Therefore, a single railway track is not economical because the high volume of containers from Thailand. In conjunction to this issue, Penang Port is unable to load the containers to the vessels on schedule and prolong the

waiting time of vessels and affecting the competitiveness of container seaports.

Moreover, PBCT's weaknesses are not only on its railway inefficiency, but also on the range of services. For example, PBCT does not provide services such as bonded and non-bonded warehouses, stuffing and un-stuffing yard, empty container yard, container repair yard, express clearance lane, customs office, immigration and quarantine office, truck parking bay and does not have a wide internal road. All these unavailable services are considered as important services for dry ports operation (UNESCAP 2008). Limited services provided by PBCT may affect the attractiveness of this dry port and affect the container transport chain during container distribution to and from the seaport (Beresford et al. 2012).

ICT faces the same weakness in term of rail efficiency as PBCT. ICT also faces another issue from local haulers, where the local haulers are not interested to deliver and pick up the container in zone. The haulers believe the freight chargers for zone 1 (less than 20 kilometres) are not economical and profitable. Thus, the haulers in the ICT area anticipate trips to zone 2 (between 20-30 kilometres) and zone 3 (more than 30 kilometres). Another weakness in ICT is the limitation of space for future expansion. Additional spaces are required for future development especially to accommodate containers to and from seaports.

The main weakness of NIP is the lack of rail connectivity provided by Malaysian railway in this particular dry port although it possesses a strategic location and significant road links. NIP is the only dry port in Malaysia that operates with a single mode of transport for container distributions and preventing modal splits and at the same time, decreasing the comparative advantages arises from modal shift such as cost and time reduction, transportation capacity enhancement as well as flexibility and reliability. NIP does not provide additional space for empty containers. Providing spaces for empty containers will minimise empty container movement across the hinterland and assist shippers to distribute their products directly to dry ports which enhances economic links in the supply chain and reduces inland transit time (Horst & Langen 2008). Moreover, repositioning empty containers in dry ports reduce container turnaround time, provides adequate supply of containers for shippers when they need them and finally reducing unnecessary transport trips generated across the hinterland which produce significant effect to traffic and costs (Horst & Langen 2008). Since the trade volume in Malaysia is balanced between import and export (MOT 2015) fast movement of empty containers are required to reduce the inefficiency activity in the seaports.

The weakness in SIP is different compared to other dry ports whereby, this particular dry port faces high competition from container seaports. The investors especially from shipping lines in seaports have a high intention to dominate the hinterland market by providing not only port-to-port service but also door-to-door service. Therefore SIP has to compete with dedicated haulers assigned by seaports. SIP admits that the cheaper freighting from SIP makes stakeholders prefer to choose freight facilities arranged by seaports themselves.

The location of SIP is another weakness in this dry port. SIP is located away from the manufacturing area and only contributes 20% of containers to Johor Port and Port Klang. Initially, SIP had been set up to accommodate agricultural products from the southern region of Malaysia in 1998. Since 2000, the access road facilities have been upgraded to PTP and a second link to Singapore and rail link to Port Klang from SIP also has been introduced (Eighth Malaysia Plan 2001). The development of transport infrastructure in SIP transforms this dry port to be a part of the transport chain especially in the southern region of Malaysia. Unfortunately, the location of SIP away from the production centre makes this dry port unfavourable among the manufacturers or stakeholders who are reluctant to use the facilities provided by SIP.

5.3 Opportunities for Malaysian dry ports

Malaysian dry ports have various opportunities which have become important elements for development prospects. In PBCT, availability of various modes of transportation increases the connectivity between Thailand and Malaysia. The location in the international border enhances cross-border transactions between these two countries. The

distance from LKICD to Laem Chabang Port is longer than PBCT and this opportunity utilised by the manufacturers from southern Thailand to export their commodities, especially perishable goods.

Furthermore the availability of PBCT in northern Malaysia activates regional economic development by providing job opportunities and business opportunities to the locals. PBCT is highly exposed to national and international regional planning strategy such as NCER and IMT-GT which provide various opportunities in infrastructure and logistics development. Moreover, opportunities in intra and inter regional road and rail network such as Malaysia-Thailand land-bridge, SKRL, AHN and TAR provide bright opportunities to serve not only the domestic market but also wide international markets.

On the other hand, ICT is well connected to the major container seaports in Malaysia and has multiple choices of transportation provided by ICT, which enhances the precision on container delivery and reduction in cost of container distribution. Availability of legal administrative such as customs clearances eliminates container inspection time in seaports and reduces vessels turnaround time in seaports. One of the Port Klang operators needs additional space to perform as a Vehicle Transit Centre (VTC). Therefore, fast clearances of containers from this seaport operator provide an opportunity for the seaport to utilise the space for other types of cargo. Similar to PBCT, ICT is expected to gain various benefits from infrastructure and logistics development though NCER and IMT-GT as well as multimodal development via SKRL, AHN, and TAR.

The strategic location of NIP has very high opportunity to assist regional development in Seremban, Malacca, Senawang and northern Johor. This dry port would be able to attract various investors form the central and southern region near to NIP and enjoy the benefits from the establishment of a dry port, especially on cost and time benefits. Moreover, owning space for future development to provide space capacity to the seaport especially to Port Klang and Johor Port creates a bright future for NIP. This central region dry port is expected to gain benefits from AHN development strategy. This strategy emphasises road network development which covers 32 countries from Japan, Turkey, Russian Federation and Indonesia (UNESCAP 2013).

SIP has very significant opportunities for development because this dry port possess the highest container yard capacity and largest yard area among the other Malaysian dry ports. SIP has the highest space capacity for empty containers and land for future development. Furthermore, the location of SIP proximity to Singapore will be an advantage to SIP because the SKRL network via Malaysia is 7,000 km long, which starts operation in 2021 and will enhance the opportunity of SIP to develop further and boost the role of the railway network in the container seaport system (ASEAN 2011). Other than the SKRL network, SIP is also exposed to the TAR and AHN multimodal network planning. Moreover SIP is has a lot of opportunities to gain from inter and intra-regional planning strategies such as IM and IMS-GT.

5.4 Threats for Malaysian dry ports

The main threat in PBCT is the imbalance volume of inbound compared to outbound cross borders containers which cause inefficiency of container transfer to seaport. This happened because of the low frequency of the train system and unorganised container planning system in the rail deck. Low frequency of the train system and unorganised container planning system will effect vessel schedule and increase vessel turnaround time in Penang Port. Therefore, the competitiveness of Penang Port will be jeopardised and reduce the volume of containers from Thailand. Most of the clients form Thailand choose Penang Port through PBCT because most of their cargo is perishable and needs fast shipment. Even though PBCT possess temperature control container service for perishable cargo but, longer transit time, poor train schedule and low capacity will be the main threat for PBCT.

ICT requires ample of space to accommodate the high volume of containers because this intermodal terminal is connected to all major seaports. The main threat to ICT is the limited space for future expansion. ICT and PBCT share similarities in this issue. Space capacity is the main advantage of dry ports to support seaport activities and also assist seaports to remain

attractive. Space constrains for future development in ICT and PBCT have become the main threats to both of this dry ports.

Multi-modalism is the main prerequisite to establish dry ports and the inability to perform modal shifts is the major threat for NIP because of the limited choice for transportation options. This dry port does not have rail links which will be the main threat for this dry port because the stakeholders expecting economies of scale from the implementation of a modal shift which reduce the cost and time. Unable to accomplish a modal shift for NIP stakeholders will cause the stakeholders to choose other dry ports and affect the volume of containers in NIP. This phenomenon leaves a strong pressure on road infrastructure, noise and air pollution, congestion which not only affects the community but also reduces the attractiveness of seaports especially Johor Port and Port Klang. On the other hand, the major threat in SIP is the reputation of this dry port among the stakeholders is not dominant. Most of the stakeholders assume that dry ports in Malaysia are an unnecessary form of container distribution platform to and from seaports to the customers. Lack of recognition from seaports especially Johor Port and PTP is affecting dry ports reputations and as a result a low volume of containers has been recorded in SIP.

6. Implications of process benchmarking on dry ports

Based on the benchmarking procedure, five main strategies have been identified to improve Malaysian dry port operations in the container seaport system. Those components are including transportation infrastructure and operation, container planning, competition, location and externalities (see Table 1). All participants (100%) stated that the infrastructure and operation of transport is the main challenge faced by dry ports, in particular rail transportation. Almost 73% of interview participants stated that Malaysian dry ports faced challenges in container planning which related to the management of empty containers. The cooperation between dry ports and seaports is necessary for increasing the scale of business in a comparatively lucrative segment when adding dry ports to the container freight system (Klink 2000).

Table 1: Outcome from process benchmarking

Dry ports	*Key component for dry ports derived from process benchmarking*	*Lesson learned for present and future dry port operations*
General recommendations for all dry ports	i. Transportation infrastructure & operation ii. Container planning	• Providing sufficient railway tracks (i) • Introducing high frequency of rail trips & • High capacity of rail decks (i) • Developing wide road access (i) • Providing express clearance lane at terminals (ii)
PBCT	i. Transportation infrastructure & operation ii. Container planning iii. Competition iv. Location v. Externalities	• Improving container transfer procedure from dry ports to seaports and vice versa (i & ii) • Enhancing the integration of container planning on the railway deck to improve seaport competitiveness (i & ii) • Providing space for future container & empty container management (ii, iv) • Improving intermodal transport connectivity to increase the schedule integrity at seaports (i,ii & v) • Enhance value added services with sufficient facilities (iii) • Speedy recovery & upgrading the transport infrastructure in regional city/town (i)
ICT	i. Transportation infrastructure & operation ii. Container planning iii. Competition iv. Location	• Improve the participation of local haulage for short distance delivery (iii) • Providing sufficient space for accommodating increased volume of containers (ii & iv) • Reducing traffic congestion in selected regional area via modal shifting and transport coordination (i) • Promptly upgrading the infrastructure in regional city/town (i)

NIP	i. Transportation infrastructure & operation ii. Container planning v. Externalities	• Transforming from unimodal to bimodal or trimodal freight transportation facility (i& ii) • Reducing sound pollution and air pollution from the impact of multimodal applications (v) • Promptly upgrading the infrastructure in regional city/town (i) • Reducing traffic congestion in selected regional area (v)
SIP	i. Transportation infrastructure & operation iii. Competition iv. Location v. Externalities	• Improving intermodal transport connectivity to increase the schedule integrity at seaports (i, ii & v) • Improve the cooperation between seaports and dry port by enhancing dry ports capability (iii) • Boosting dry port marketing to attract shipping lines to invest in Malaysian dry ports (v) • Providing various of value added services to improve low volume records and convincing people to utilise this entity (iii) • Reducing competition from seaports and generate cooperate relationship to dominate the freight distribution market (iii) • Reducing competition with private hauliers (iii) • Re-location to cater southern and east coast region as well as connected to production zone (iv) • Expose dry ports credibility to the stakeholders (v)

Source: Authors

However, in this paper almost 55% of the participants indicated that some dry ports received insubstantial cooperation and recognition from seaports and shipping lines.

Although location was regarded as one of the strengths of Malaysian dry ports, about 55% of the participants revealed that the location is also a challenge faced by them. They expressed that the location of Malaysian dry ports are not all strategic and therefore creates challenges during dry port operations. Malaysian dry ports have generated concerns from the community. About 45% of the interview participants indicated that dry ports generate issues that affect the local community. The main issues include noise and air pollution generated by freight vehicles, the operations of handling equipment, and traffic congestion in some regional areas.

In general, the transport infrastructure has become the main agenda for Malaysian dry ports to improve their performance in the seaport system. For example, all these terminals must provide sufficient railway tracks, introducing high frequency of rail trips with high capacity of rail decks and developing wide road access for effective freight movement and enhance the last mile connectivity. Almost all dry ports in this region are operating without express clearance lane. Therefore, the implementation of express clearance lane may smoothen the traffic at the dry ports and preventing congestions at dry ports which located at the high transport density parameters.

6.1 Lesson for PBCT

The outcome from the benchmarking indicates that PBCT need to improve container transfer procedure to and from dry ports. This is important to enhance the punctuality and reducing the congestion at this dry port. The container planning on the railway deck also needs to be improved to enhance the competitiveness at Penang Port. The demand for containers will be improved, therefore, this dry port needs to follow in NIP and SIP's footsteps by allocating additional space to accommodate those boxes. The lesson from ICT and SIP needs to be considered in order to provide space for empty containers. It is important to determine the reduction in pollution, reducing empty containers and vehicle movement as well as improving the efficiency of seaport performance.

In addition to that, PBCT needs to improve intermodal transport connectivity to increase the schedule integrity especially at Penang Port. Currently the bimodal application in this dry port is not effective because the low frequency of land-bridge system, low capacity of rail freight with

limited frequency. Proactively, this dry port is required to enhance their value added services and improve the transport infrastructure.

6.2 Lesson for ICT

The application of benchmarking at ICT has identified that this particular dry port needs to improve the participation of local haulage for short distance delivery. Further, they need to provide sufficient space for accommodating increased volume of containers as NIP and SIP. In addition to that, this dry port must provide a significant plan to reduce traffic congestion in selected regional areas via modal shifting, transport coordination and also promptly upgrading the infrastructure in regional city/town.

6.3 Lesson for NIP

Based on the outcomes, the process benchmarking has suggested to transform this dry port from providing unimodal freight transportation towards bimodal or tri-modal freight transportation facility. Then, this dry port must also apply effective intermodal application to reduce sound pollution and air pollution in order to create a healthy environment for the residents whom are located adjacent to the dry port. Moreover, this dry port also suggested to promptly upgrade the infrastructure in regional city/town to reduce traffic congestion in selected regional areas.

6.4 Lesson for SIP

The benchmarking tool has suggested SIP improve intermodal transport connectivity to increase the schedule integrity at seaports. It also needs to improve the cooperation between seaports by enhancing dry ports capability. SIP is expected to boost their dry port marketing strategy to attract shipping lines to invest in Malaysian dry ports as they have done at seaports. This dry port must be able to provide several value added services to improve low volume records and to convince people to utilise this entity. It is also encouraged to generate cooperative relationships to dominate the freight distribution market especially to reduce competition with private hauliers in the southern region of Malaysia. In addition to that, this dry port needs to be re-located to cater to the southern and east coast region, well connected to production zones and expose the dry ports credibility to the stakeholders.

7. Conclusion

This paper overviews the preparation of Malaysian dry ports to encounter the competitive environment in the container seaport system through the application of the process benchmarking approach. The findings reveal that five major components including transportation infrastructure and operation, container planning, competition, location and externalities are the fundamental guidelines that need to be applied by each dry port in this region in order to improve their performance as indicated in Table 1. All dry ports in this region need to improve their transportation infrastructure, operational reliability and container planning system so that they can be trusted by seaports and other key players during the freight distribution to or from inland towards seaports. Although the container throughput record in this region is improving year by year, not all resources were fully utilised. There are more spaces, opportunities and resources that can be utilised to achieve an outstanding performance among the Malaysian container seaports. Road and rail freight systems and other particles in the supply chain are the main inputs to be explored. Hence, policy to utilise unexplored resources in this region is immediately required not only for optimisation but as initial strategy to improve container seaport competitiveness and prepare for undetermined trends of maritime business in the future.

As a guideline for future research, the application of different types of benchmarking such as competitive benchmarking, internal benchmarking and generic benchmarking is worth to be explored to identify the differentiation of benefits that will be gained by each dry port. From the methodological perspectives, the outcome from this paper can be validated through quantification of the outcome via exploratory factor analysis and confirmatory factor analysis. This approach will provide significant outcomes for Malaysian dry ports to identify, understand and adapt significant practices for the improvement in their performance. This strategy will narrow down the substantial benchmarking approach for dry port

development in the container seaport system

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