Port of Singapore: the next generation mega-port

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The port industry is a very dynamic industry. The modern Port of Singapore, being a forward-looking mega-port, is a good demonstration of how dynamic the port sector is. Singapore was established as an independent and sovereign republic in 1965. 2015 marks the country's fiftieth anniversary, and within a relatively short time span of less than 50 years, the case of Singapore shows the development of a port from almost nothing back in the 1960s to the largest transhipment hub in the world today.

The Port of Singapore is a mega-port in a very small country. Singapore is in fact a city-state with a rather small local market. The country also encounters a major limitation of space availability. However, this city-state enjoys the advantage of having an excellent geographical location along one of the world's busiest shipping lanes, the Malacca Straits.

Associated with the geographical location, Singapore also has a stable climate facilitating port and shipping operations all year round. Having a good understanding of its major strengths and weaknesses, Singapore saw the opportunity in playing a strategic role in seaborne trade in the 1960s. Among the primary priorities identified at the very beginning stage of Singapore's independence, the government of Singapore decided to construct its first container terminal in 1966.

Transhipment challenges

Since then, Singapore started to develop its port as a transhipment centre for handling international cargo. In the 1960s and 1970s, the concept of transhipment was new and yet to be accepted by shipping lines. Progressing with an ambitious strategy, the Port of Singapore has grown rapidly over the years. The Port of Singapore achieved the status of being the largest transhipment hub in the world in terms of cargo volume handled since the 1980s. For transhipment and Singapore as an island, the concept of hinterland is beyond the local or national boundary.

The hinterland of the Port of Singapore reaches as far as the Indian Subcontinent, Australasian and European markets. In particular, the port is well positioned to serve the mainline Europe-Far East shipping route, which is the largest maritime trade lane in terms of container cargo volume. In addition to container handling, the Port of Singapore also tranships vehicles and steel products, though in a relatively small volume as compared to containers.

To a certain extent, a transhipment port is different from a gateway port. Firstly, transhipment cargoes are footloose, so a transhipment port faces very severe competition from other transhipment centres. Secondly, higher cargo handling efficiency would be required for transhipment operations since relative to gateway cargo flows, ship-to-ship connections have lower tolerance for waiting time. Thirdly, transaction and data transmission volume for mega transhipment hubs is enormous, so information technology solutions should be capable of ensuring smooth operations.

Although gateway ports do require information technology solutions, the level of complexity in data management tends to be higher for transhipment hubs. These differences between a transhipment port and a gateway port also represent the major challenges faced by the contemporary transhipment hub. Until now, the Port of Singapore continues to be the world's busiest transhipment hub. The port's leading performance reveals its capability in overcoming major challenges.

Higher productivity and automation

The Port of Singapore is proactive in using innovative solutions to combat the contemporary challenges a mega port faces, especially in view of the challenges faced by transhipment hubs. The port is driven by the need for innovation in order to stay ahead of its competitors; this overall mindset and guiding principal leads to various innovation initiatives and continuous improvement.

Singapore has embarked on the programme of designing the next generation port. Technically, a primary

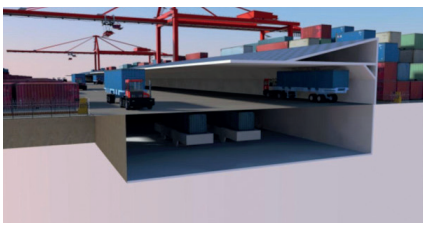

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Illustration 1. Double storage terminal design

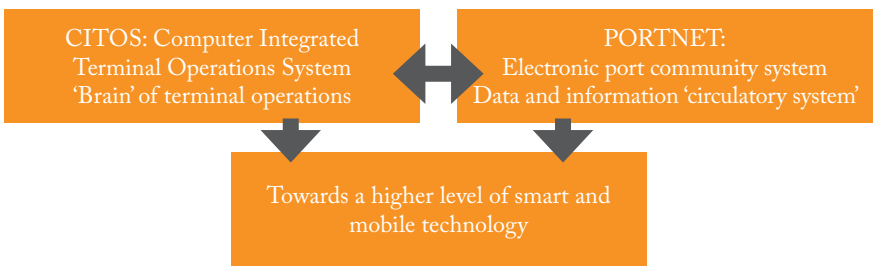

Illustration 2. Port information technology solutions in Singapore

approach is to invest in the research and development of multiple aspects such as port infrastructure, terminal facilities and information technology. For example, the Port of Singapore aims to achieve a higher level of automation in its operations. The advanced technology deployed in remote crane operations by terminal operator PSA enables a fully-automated yard crane system. Another example is the new terminal design that incorporates a double storey infrastructure with the aim to attain optimal land utilisation. This is currently being investigated (see Illustration 1).

These innovative solutions are expected to bring about a quantum leap in Singapore's container handling productivity and to provide mega-capacities for future growth. Moving in this direction is also a legitimate way to combat the city-state's physical constraints in land scarcity.

Innovation in technology

Along with the development of a new generation of port infrastructure and terminal facilities, the port also adopts an information technology-driven strategy to maintain its competitiveness. PSA's Computer Integrated Terminal Operations System (CITOS) and PORTNET, an electronic port community system, are representative state-of-the-art information technology solutions. While CITOS can be considered the 'brain' of terminal operations, PORTNET is the data and information 'circulatory system' managing business-to-business communication flows.

Moving forward, the Port of Singapore constantly upgrades its information technology solutions as well as developing new intelligent systems and applications. For example, the port is fast developing smart and mobile technology: 'PORTNET Mobile' is an application for PSA's customers to receive real-time information and interface with the maritime community on mobile phones. As a new concept, terminal operations can be managed anytime and anywhere. Mobile technology is expected to play a greater role in mega-ports such as Singapore. The situation is depicted in Illustration 2.

Government support and sustainability

The government of Singapore sees the port as a very important driver to the country's economy. As such, the government is working with the industry market players to strengthen the competitive advantage of the port. Governmental support, which includes policy and financial incentives, is strong in driving port performance. The main government organisation overseeing port development and regulatory functions in Singapore is the Maritime and Port Authority of Singapore (MPA).

MPA takes a pro-business approach to working together with terminal operators and shipping companies to advance and safeguard Singapore's status as a premier global hub port. Furthermore, the government of Singapore facilitates innovative port initiatives by funding a lot of research and development programmes.

Being a responsible global citizen, the port has also emphasised the importance of environmental sustainability in recent years. In this respect, the government again plays a part by initiating and funding environmental schemes such as the Green Port Programme to provide financial incentives for ships calling at the port in order to reduce emissions. Overall, the port strives to be sustainable in all aspects: economic, social and environmental.

Future development

Competition facing the Port of Singapore will continue to be stiff, especially from counterparts in Southeast Asia. As a mega-port, Singapore evolves to capture future opportunities to counter port competition and keep Singapore's place as a world giant in container terminal operations. Singapore actively cooperates with regional organisations and relevant authorities with the purpose of trade generation. It is noteworthy that the ASEAN Economic Community targets regional economic integration in the near future. This presents a promising opportunity as the port is strategically positioned to serve the mounting regional maritime trade. To prepare for the long term growth in shipping traffic and cargo handling, Singapore's next-generation mega-terminal will be located in a new area called Tuas in the next ten years. Nevertheless, other ports in the region are also eyeing the same growing demand. Therefore, port competition and cooperation coexist. We will see an even more thriving port sector in Southeast Asia in the coming decade.

About the author

Jasmine Siu Lee Lam is Assistant Professor and Programme Director at Nanyang Technological University, Singapore. She has been invited by various organisations such as Organisation for Economic Cooperation and Development, port authorities and banks as a speaker at international conferences and seminars. Leading a research team and working closely with the industry and government agencies, Dr Lam has completed 40 R&D projects and has over 150 publications, including 60 refereed international journal papers. She is the Editor/Associate Editor of three international journals, including Maritime Policy & Management. She is an associate member of Porteconomics.

About the organisation

PortEconomics
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PortEconomics is a web-based initiative aiming at generating and disseminating knowledge about seaports. It is developed and empowered by the members of the PortEconomics group, who are actively involved in academic and contract research in port economics, management, and policy. Since October 2012, Port Technology International and PortEconomics have been engaged in a partnership.

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