



# VALUE CREATING SMART PORTS

## EXEMPLARY CASES FROM ASIA

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Digitalization, innovation, technology – these are the buzzwords of the decade. This is because in a competitive and dynamic market, seaports must embrace digitalization, innovation, and technology in order to become smarter entities, that is, they must strive to be ‘smart ports’. This wave of industry development inevitably affects many ports in various ways, including planning, infrastructure investment, operations, and customer service. With numerous off-the-shelf solutions and a wealth of current research and development efforts, port managers should always remember that the ultimate goal of being a smart port is to create higher values above all else. Asian ports, such as the ports of Busan, Guangzhou, Shenzhen and Singapore, all provide some exemplary examples of being smart for the benefit of value creation.

### TECHNOLOGY OF THE MODERN SMART PORT

Many smart technology initiatives are available to modern ports, but when it comes to tangible value creation, it is

worth-mentioning one key example, which is the fifth generation 5G cellular network technology for enhancing Automated Guided Vehicle (AGV) operations. This is a trial programme to be conducted in PSA’s real-live terminals. Particularly in view of the next generation Tuas Mega Port in Singapore where AGVs will be a major type of cargo handling equipment which requires high-end networks to support rapidly increasing mobile capacity. As a transshipment hub, timely connection of cargo flows is critical and presents the value that Singapore provides to its customers. 5G technology enhances the productivity and precision of cargo operations, hence, brings the port to a smarter level.

### 5G

5G technology is seen to be an important facilitator for achieving smart port status. As well as the Port of Singapore, Chinese ports such as Guangzhou and Shenzhen also partner with mobile technology service providers to develop new 5G applications

for port operations. In fact, Guangzhou has started a 5G port innovation centre with the overall objective to develop new smart solutions to enhance port services. As for Shenzhen, a similar approach is adopted whereby a 5G intelligent innovation laboratory is established at the Haixing Container Terminal in which Internet of Things (IoT) applications are explored and tested. In view of the heightening complexity in container cargo handling, intelligent 5G applications would help terminal operators meet customer expectations regarding a consistently high standard of service reliability.

### THE GATE

Smart technologies do not only enhance the performance of container terminal operators, but also bulk cargo terminal operators and multi-purpose ports like Jurong Port in Singapore. Jurong Port has a ‘Smart Gate’ system, where access control of the terminals makes use of biometric verification of the human vascular vein, CCTV video

surveillance, and analytics simultaneously. Vehicle entry and exit are managed by a real-time intelligent traffic control algorithm. The safety and security level of this multi-purpose port is strengthened, at the same time, the efficiency of gate operations is getting higher.

One of the quantifiable benefits is that port users are able to save more than 60% of document processing time at the main gate. This is a concrete customer value brought by the deployment of smart technologies. Steering towards the goal of being a next generation multi-purpose port, Jurong Port sets an example that conventional terminals can be operated 'unconventionally' through innovation.

**DATA ANALYTICS**

Data analytics is an emerging trend which is underway in Asian ports. For example, Busan Port Authority has established an integrated data centre with the aim to enhance the competitive advantages of the port. The data centre works with various government and industry stakeholders, including customs, shipping companies, and terminal operators to collect data. It plays a role in analyzing these data and puts forth recommendations for the potential improvement in operations and management. For instance, cargo and vehicle traffic data are traced and analyzed.

Bottlenecks, shipment information, and other types of terminal performance measures can also be identified. Specifically, this may help reduce congestion and waiting time by port users and lead to a higher port productivity level. Asset utilization, cost effectiveness and decision-making may also be improved. The better a port performance is, the more it generates customer value and shareholder value. Busan Port Authority's data centre presents an example of how a smart port creates opportunities not only for the port but also its stakeholders. More data-enabled applications are expected to be on the rise in the near future in the port industry.

Furthermore, the Korean government has created the Port Management Information System (Port-MIS) 2.0 in order to upgrade Korean ports' data processing capability. 'Yes! U-Port' (integrated management brand for shipping and port-logistics) is a very-first collaborative business project planned by the government and private enterprises to advance the maritime industry in Korea. It is a representative port-logistics system built by integration of domestic shipping and port-logistics information system (SP-IDC). It provides total logistics information to realize safer, faster and easier information technology port network that supports harmonious flow of port-logistics business, regardless of time and place. These technology solutions facilitate more efficient port logistics operations in Busan.



**OTHER KEY AREAS**

In addition to terminal operations and cargo handling, other port services, such as bunkering processes, can also become smarter. Singapore is the world's largest bunkering port in terms of sales volume. It is the first country in the world mandating the use of a mass flow metering (MFM) system for the delivery of marine fuel oil and distillates to ships. MFM uses sensors to register the oscillation frequency of the measuring tubes and computes the rate of mass flow.

By using the MFM system, manual tank gauging by cargo officers on bunker tankers can be replaced. Efficient and transparent bunkering operations facilitate this essential port service to ships. This would in turn lead to time saving and lower number of disputes in bunker fuel delivery quantity. Therefore, a port may become more bunkering-smart, generating higher customer value to ships and shipping companies. Tapping on the MFM system, bunkering processes in the industry have a higher potential to go digital. New digital solutions for port services may emerge.

The Port of Singapore also strives to be energy-smart, which is essential as the country does not have natural energy resources. Both terminal operators Jurong Port and PSA embark on collaborative research and development projects to enhance energy efficiency of cargo handling equipment, explore smart grids, and review energy management systems, as well as optimize the deployment of solar energy as a clean and renewable energy.

These initiatives will create shareholder value by lowering energy consumption and cost. At the same time, environmental value is generated by enhancing the eco-efficiency of terminal operations and reducing pollutants and carbon footprint. Hence, innovation and technology enable ports to become energy-smart and contribute to sustainability.

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**ABOUT THE ORGANIZATION**

Nanyang Technological University, Singapore (NTU) is a research-intensive public university with 33,000 undergraduate and postgraduate students. NTU was placed the world's best young university (under 50 years old) by QS for the sixth consecutive year in 2019 and 11th in the world and the best in Asia in the QS World University Rankings.

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