

OPPORTUNITY. 機 匯

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SINCE 1969



WORLD'S FIRST OPERATOR
TO ACHIEVE
1.3 BILLION TEU MILESTONE

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PRUDENT MANAGEMENT PROVIDES PLATFORM FOR GROWTH

In these few years, we have been focusing our efforts on cost efficiency by working smart and improving workflows. As we have just reached our 50th anniversary milestone, I am pleased to say we are now well-positioned to reap the rewards of those rigorous efforts. We have become a lean, efficient and result-oriented organisation.

In parallel to better utilising our existing assets and optimising our operations, we have also progressed in the strategic use of new technology, which are being tested and introduced at a number of our terminals around the world.

Cost efficiency itself, however, does not propel the dynamic growth of the group. We remain keen in seeking new business opportunities, pursuing every potential project to ensure that the new investment will provide value to our customers, stakeholders and shareholders.

With this approach, we have been working on many projects. These projects, once invested, would further strengthen our port network and extend our reach into new markets and businesses. I am excited to share with you that we have recently secured a few good projects in different locations. These projects will surely be propelling our future growth.

Lastly, I am proud to say that our management team has been able to tackle the many challenges we are facing today. Our accumulated experience has sharpened our perceptiveness in making decisions in these changing markets and challenging competition landscapes. Coupled with your passion and professionalism, I am confident that we are ready to continue building a bigger and stronger network, better serving the community, maritime industry and traders.

Eric Ip
Group Managing Director
Hutchison Ports

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opportunity@hutchisonports.com

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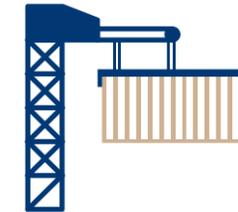




**HUTCHISON PORTS CELEBRATES
LANDMARK ANNIVERSARY**

Half a century after welcoming our first ship to our berth on Hong Kong's waterfront, Hutchison Ports is now a global port investor, developer and operator with a cumulative global throughput of 1.3 billion TEU. To illustrate the point, if you lined up all of those containers end-to-end, they would circle earth nearly two hundred times.

**THE WORLD'S
FIRST TERMINAL
OPERATOR TO HAVE
HANDLED**



**1.3
Billion TEU**

The landmark anniversary needed a party to celebrate the unique achievement. The guest list included the great and the good of business and government.

Special mention was given to staff members who laid the foundations of the company back in the 1970s and onwards, as well as the long service staff members who have worked for the company for more than 30 years.

The other star of the show was Hong Kong, the headquarters of Hutchison Ports; Eric Ip, Group Managing Director of Hutchison Ports paid tribute to the city which is the perfect place to groom talent and provides business opportunities and energy for the company's remarkable global expansion.

Speaking at the celebratory anniversary cocktail reception he said: "Our story begins here in Hong Kong with a single berth, and Hong Kong remains the key hub for our global operations – our home base for developing talent based here and overseas. Over the last fifty years, we have built a solid foundation and put in place a strong and balanced portfolio that is evenly distributed throughout all regions, creating a portfolio that is resilient, especially in times of volatility. We are extremely proud to have played our part in the growth of Hong Kong as a global trading centre. This is truly a Hong Kong success story."

"These achievements would not have been possible without the continued support from our business partners, customers and most importantly the dedication and commitment of our staff. A special tribute to the pioneers of Hutchison Ports, who ventured into the uncharted territories of the port and logistics sector with an entrepreneurial spirit. They have helped build a solid foundation for future growth," he added.



Eric Ip, Group Managing Director

Guest-of-honour at the event was Mr. Frank Chan, JP, Secretary for Transport and Housing Bureau of the HKSAR Government, who officiated at the ceremony together with the management team of Hutchison Ports. He said, "Today, over 90 per cent of freight volume to and from Hong Kong is transported by sea, demonstrating the vital importance of our maritime industry to Hong Kong's economy. Hong Kong is the seventh largest merchandise trading entity globally, and the majority of port cargo is transported in containers. Hong Kong is also one of the ten busiest container ports in the world. Hutchison Ports plays a vital role in facilitating Hong Kong as well as global container trade

and has contributed to the growth of Hong Kong as a global trading centre."

As the largest Hong Kong-based ports and logistics company with a workforce of more than 30,000 people worldwide, Hutchison Ports operates in 52 ports across 27 countries and handles 11 per cent of global marine cargo trade, meaning 1 in 9 containers shipped around the world has gone through one of its ports.

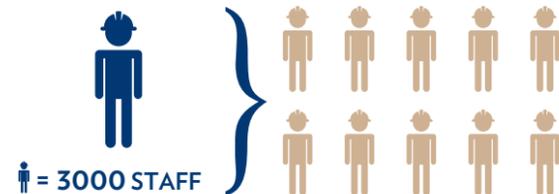
“HONG KONG IS ALSO ONE OF THE TEN BUSIEST CONTAINER PORTS IN THE WORLD.”



Eric Ip (left) and Frank Chan (right) conducted the opening ceremony at the 50th Anniversary Cocktail.

HUTCHISON PORTS

Employs over **30,000** staff globally.



Operates **52 ports** across **27 countries**.



Honour guard for long-service staff

The 2019 Annual Dinner with 50th anniversary as the theme of the night started with a march in of over twenty 30-year long-service awardees, a dance performance and singing of a new theme song. Staff from different departments of Hutchison Ports and Hongkong International Terminals (“HIT”) participated in the performances on stage including opening dance, singing by the Hutchison Ports management team, live band and percussion by HIT Engineering team.



All staff shared the joy and gave their birthday blessings to the Company. Eric Ip, Group Managing Director of Hutchison Ports, together with senior executive members and department heads attended this annual event.



As part of the Golden Jubilee celebrations, HIT the company's first business unit, organised the 50th Anniversary Family Day event at its Kwai Tsing terminal site. The event was supported by various community organisations and internal departments. Over 5,000 guests attended, including local staff and their families as well as external contractors. They enjoyed performances from magicians, singers, dancers and educational game booths for children.

Québec joins Hutchison Ports network during historic year



As the celebrations continue through 2019, Hutchison Ports signed a long-term commercial agreement with Québec Port Authority (“QPA”) and Canadian National Railway (“CN”) to build and operate a deepwater container terminal on the St. Lawrence River. This agreement increases Hutchison Ports’ global network to 52 ports spanning 27 countries.

As the major inland deep-water terminal in North America, it is the only facility on the St. Lawrence

which could accommodate the new generation mega-vessel. The terminal has direct railway and highway links connecting Canada and mid-America; and has available space to handle thousands of containers annually.

“Québec City will become Hutchison Ports’ gateway to the East coast of North America. With its fully intermodal deep-water port, its strategic location to reach the Midwest market, and the strong support shown by the local authorities, the Québec project has all the attributes to be successful in this highly important market,” said Eric Ip, Group Managing Director of Hutchison Ports.



COOL CHAIN IS COMING

From succulent seafood to essential pharmaceuticals, cold chain is coming of age as growth in demand for temperature sensitive goods continues to climb.

The container reefer trade has benefited from this rise in demand, enjoying steady but sustained growth in recent years.

Expanding global trade in seaborne perishable reefer cargo and a shift from breakbulk to containers are the main drivers for growth according to Martin Dixon, Director – Head of Research Products for Drewry.

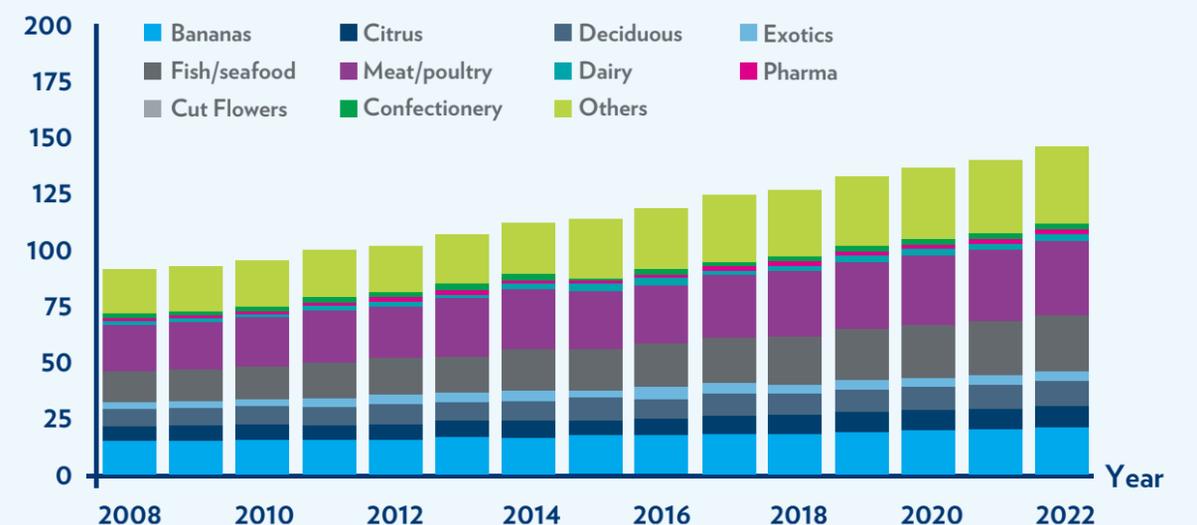
“Container shipping lines have been increasing the reefer slot proportion of their fleets, particularly the European operators with a particular focus on reefer trades, and we expect this trend to continue with rising demand,” he said.

However, *Drewry* forecasts that the growth in seaborne perishable reefer trade will moderate slightly over the next five years to around 3 per cent a year, down from past trend growth of 3.6 per cent annually. This reflects a general slowdown in global economic and trade growth and the continued trade standoff between the United States and China that affects the reefer dominant westbound transpacific trade in particular.

Drewry forecasts that the growth in seaborne perishable reefer trade will moderate slightly over the next five years to

3%

Million tonnes



Source: *Drewry's Reefer Annual Review & Forecast report. Seaborne perishable reefer trade 2008-22.*

BIRTH OF THE REEFER CONTAINER

In 1977, Barbara Pratt, also known as the 'Queen of Cool' researched how and why perishable cargo spoils in refrigerated containers (reefers) and spent many years travelling aboard container ships, living inside a specially-designed refrigerated shipping container, studying how temperature shifts outside affect the temperature shifts inside the container, and thus the shelf life of perishable goods.

Her work had led to many advances in the shipping of refrigerated goods around the world, allowing, for example, fresh fruit and vegetables to be transported great distances without getting spoiled.

2018 vs 2017 (Jan-May) year-on-year reefer growth per origins.



Source: Seabury

OCEAN GAINING GROUND IN PHARMA

Airfreight has long dominated the cold chain sector, with high end perishable products providing the mainstay of the business, but ocean has now started to make inroads in some niche sectors.

The shift has come over the last several years most notably in the pharmaceutical sector. The industry has been moving, many products from air cargo to reefer ocean containers, with the greatest cause pointing to transportation costs.

Pharmaceuticals have historically been transported via airfreight due to the sensitive nature of the product, temperature regulation, and time-sensitivity issues, according to Pharmaceutical Technology.

There has been increasing pressure: from governments to lower prices of pharmaceuticals, generic competition lowering profit margins, tighter regulations, and expiring pharmaceutical patents, as explained in Pharmaceutical Outsourcing. The hit to the bottom line translates into less ability to pay higher air cargo transportation costs.

Transporting pharmaceutical cargo via ocean freight is cheaper and provides better security, as the product is not touched once the container is sealed. However, there are still concerns with sea transportation including the quality of reefers in some regions and transit times can be quite slow, which introduces more supply chain problems.

(To learn more, please refer to OPPORTUNITY Issue 5 - "Ocean takes big bite into high-value cargo.")

GROWING PAINS AND CHALLENGES

Although there is an increase in new container vessels being built with additional 'plug' points for reefers, there is an issue regarding the availability of refrigerated containers particularly in hinterland locations where carriers have been reluctant to reposition empty reefer boxes, according to Martin Dixon.

Production of new refrigerated container equipment recovered in

2017 and 2018 and the fleet is forecast to continue growing ahead of cargo demand, but despite this tight supply conditions are expected to remain.

Vijan Chetty, Director of the Cool Chain Association, also sees poor infrastructure as a major challenge within some developing countries.

"Insufficient cold storage capacity, lack of equipment, poor port and road infrastructure are some of the challenges experienced within cool chain that results in inefficiencies and ineffective cool chain management. Global standards for cool chain processes does not exist. Therefore, harmonisation of standards within the cool chain sector do not exist. The Cool Chain Association is embarking on a project to standardise cool chain processes for the airfreight sector," he added.

On the ocean side there have been positive developments through advancements in reefer container technology.

"Remote Control Monitoring (RCM) has been installed on a large percentage of containers by some of the shipping lines. This allows the exporter and shipping line to continuously track and trace the container and monitor the temperatures. This is a major advantage for stakeholders using containers that have RCM installed," said Chetty.

IMO 2020 FUEL HIKES TO HIT OLD REEFER SHIPS

IMO 2020 will have a significant impact on carrier fuel costs, *Drewry* estimates are that those relying on burning new compliant low sulphur fuel will face an 85 per cent hike in bunker costs, collectively rising to US\$15 billion in 2020. These costs will be passed on to shippers and *Drewry* expects the new regulations to hasten the decline in the specialised reefer vessel fleet as the age of many of these vessels will make them

uneconomic to operate. Overall demand for specialised refrigerated vessels is decreasing annually anyway as shippers opt to move goods to market using refrigerated containers.

FOOD WASTE AND LOSS BOOSTING COLD CHAIN DEMAND

Food wastage and loss is also being discussed by governments, Non-Government Organisations and environmental forums and associations. In order to reduce the loss of perishable food, there are more countries looking for improved cold treatment management and stricter temperature management to reduce phytosanitary risks and spoiled food stuffs.

The main food products include fresh fruit and vegetables, poultry, fish and meat.

GLOBAL PHARMA LOGISTICS TRANSPORT COSTS



Source: IATA

HUTCHISON PORTS COOL CONNECTIONS

Hutchison Ports South China handles 70 per cent of the fresh fruit imports into China through its terminals. Across its South China network terminals offer general reefer handling, controlled atmosphere reefer handling, sensitive reefers and on-dock inspection, pre-trip inspection, pre-cooling and remote reefer monitoring.

In 2018, the top three Hutchison Ports business units handling the most reefer containers (in terms of unloading and discharging) were Hong Kong, Spain and Pakistan. While the Netherlands, Spain and the United Kingdom offers the most reefer storage in the Hutchison Ports network.

Recently, Hutchison Ports BEST terminal in the Port of Barcelona has increased its storage and connection capacity for refrigerated containers by 70 per cent from 1,600 to 2,750 connection points, making it one of the leading reefer terminals in the Mediterranean. The terminal offers a range of cold chain cargo services for the pharmaceutical and food product industries, according to Guillermo Belcastro, CEO of Hutchison Ports BEST.



RAIL REEFER

Despite growing demand from shippers in Europe and China to increase reefer capacity on the Eurasian rail freight routes, there are still technical and cost issues slowing the deployment of temperature-controlled containers.

The main issue is the cost of installing new technology and engineering components to trains on the long-haul route.

Diesel-electric reefers, commonly used on the China-Europe routes, cost some US\$68,000 per unit as opposed to electric-

powered reefers that cost approximately US\$17,000. However, the rolling stock on the long-haul routes does not have the technology to power electric reefers commonly used by major ocean carriers.

As emission controls get tougher in Europe and China, there is a growing movement to phase out the diesel-powered generators used for reefers on the routes.

In Switzerland, specially equipped locomotives power reefers directly using a continuous train busbar that provides each reefer unit with an uninterrupted power supply, according to Juergen Trojak, a rail engineering expert.

For the long-haul from Asia to Europe, however, existing rolling stock is not equipped with power converters to connect the locomotive to each wagon. Instead, operators are using diesel to power reefers.

Trojok also said that deploying RCM systems and controlled atmosphere technology will be game-changers in accelerating reefer traffic on Europe-China routes.

Cargo quality and shelf life of products are essential for the shipment of perishable goods. In addition, carefully managed CO₂ and oxygen levels are critical to delaying the ripening process of fruit and other perishables.

Without a sustainable, reliable and robust power supply, these technologies cannot be deployed on the route, where external temperatures range from plus 40 degrees Centigrade to minus 40 degrees Centigrade.

The average year-on-year increase in airfreight is 6 per cent and on ocean freight 10 per cent.



THE REEFER JOURNEY



LOADING

-  Before reefer loading on board vessel commences, check that vessel's power sockets are compatible with the reefer plugs.
-  After a reefer container has been loaded, plugged in and the power has been switched on, check the unit is running and that the temperature is correct.
-  Check if temperature gauge are in Fahrenheit or Celsius.
-  Check actual temperature of cargo matches that of temperature gauge.
-  At sea, reefer containers should be inspected at intervals not exceeding six hours.

UNLOADING IN PORT

-  Set temperature compared with manifest temperature.
-  Compare actual temperature of cargo with digital indicator.
-  Ventilator percentage open or closed, compare with manifest.
-  Check container seal record and number.
-  Check if any alarms displayed on the digital indicator.
-  Check container door seals are intact.
-  Plug in to reefer points in yard or move to reefer facility for onward journey by road or rail.



AUTOMATED VEHICLES ON THE STARTING GRID

The advent of Automated Vehicles (AV) is about to revolutionise the waterside and landside operations at container terminals around the world. The concept is nothing new as Hutchison Ports ECT Rotterdam developed the first automated terminal with Automated Guided Vehicles (AGV) since 1993.

“Container terminals are well suited for automation characterised by large volumes of goods in repetitive flows with relatively short distances. Moreover, port terminals are already well underway in implementing automated solutions that will help drive productivity and safety,” according to Mikael Karlsson, Vice President, Autonomous Solutions for Volvo Trucks.

In the last five years advances in technology have resulted in the development of reliable positioning, navigation and perception systems for unmanned vehicles and also wireless communication.

At Hutchison Ports, plans are in place to integrate artificial intelligence (AI) into the automated vehicle system.

“With well-planned terminal layout and installing positional sensors built-in to the ground, AGV operation works productively in a green field terminal,” said Herman Chiu, General Manager-Terminal Development, Group Operations at Hutchison Ports.

“Thanks to the use of AI, we are now able to navigate the terminal without those positional sensors. Next year we will see our newly built terminal in Sweden deploy automated straddle carriers that make use of AI and Global Positioning System (GPS), giving us the added flexibility for operations and generate cost savings from installing sensors built-in to the terminal.”

As one of Hutchison Ports key strategies the aim is to achieve higher operational efficiency with the use of technology and innovation. For this, different kinds of automated vehicles have long been on the radar, according to Chiu.

For Volvo Trucks a similar line of thinking evolved into the Vera project.

“A few years ago, a small group of colleagues including designers; business and technical experts at Volvo Trucks came together, united by a belief that the transport industry needed a shake-up. It needed solutions that were more efficient, more cost-effective and more sustainable, but as the small team saw it, this would only be possible by daring to think differently,” said Karlsson.



By taking the need to reduce customers' costs as the starting point, the team explored the possibilities offered by automation, connectivity and electromobility and soon devised the concept for Vera; an autonomous, fully electric vehicle that could integrate into more complex logistics systems.

GREAT MINDS THINK ALIKE

"About two years ago, we formulated a strategic roadmap for its business implementation of autonomous truck (AT) at our terminals, which can be a game-changer," said Chiu.

"Last year, we partnered with a vendor to carry out a proof-of-concept testing in one of our terminals. Since then, we have entered into the next stage using autonomous truck (AT) into live operations for one of our terminals next year."

So why have we waited nearly three decades for automated vehicles to go the next level?

"The main difference is the level of technology with more sensors and computing power that makes it possible to operate the system in a more flexible way," said Karlsson.

"Autonomous solutions are about implementing a full transport system consisting of a control tower, service and maintenance, AVs and charging stations," he added.

THE HUTCHISON PORTS AV EVOLUTION

"The prime function of AV (including AGV, Auto Straddle and AT) is to transport containers between quay and yard sides. In our brownfield terminals

operating with Rubber-Tyred Gantry Crane (RTGC) and terminal tractors, we have embarked on an automation and modernisation roadmap," said Chiu. "With the successful implementation of remote control and automated RTGCs in one of our terminals, we are moving towards a fully automated RTGC terminal conversion."

"The next step would be to replace internal tractors with AT in the near future. We foresee significant cost efficiency in terms of operating costs. By integrating with the group's proprietary Terminal Operating System, nGen, which controls the entire scope of terminal operations, enabled by powerful algorithms and AI we can maximize the utilisation of our fleet of AT with optimal routing built into the fleet management system."

FACING THE CHALLENGES OF AUTONOMOUS TRUCKS

Autonomous Trucks are part of the whole system put in place to automate terminal operations. A new configuration has to be developed to manage traffic patterns and rules, signage and signalling, control of external trucks, container crane interaction with AT as well as a workflow re-design. This is the framework needed to make AT work effectively.

"The communication and integration of all the above will be the major challenges. Another critical issue is the education of other road users, mainly truck drivers, to ensure a safe working environment," said Chiu.

Consistency and predictability are two important benefits of terminal automation. With automated vehicles, we can put a more intelligent planning module into our system that will further enhance

quayside productivity. The job nature of operations staff will shift towards a supervisory role and handling exception situations. Environmental friendliness and energy efficiency are among the top priorities in the Hutchison Ports roadmap. Diesel-powered RTGCs and AGVs were converted into hybrid or electric powered a decade ago. At new terminals electric powered AT will be targeted for deployment from day one of operations.

AUTOMATED VEHICLES TO GO GLOBAL

"The logistics industry is one of the first to embrace this new technology. Some ports have carried out proof-of-concept trials, but to put it in large-scale live operations, we expect AT to be running around at ports next year," said Chiu.

"For a widespread use of AT, it could be a matter of years. Don't be surprised if you see more AT driving inside terminals than on the public road in the next few years."

"DON'T BE SURPRISED IF YOU SEE MORE AUTONOMOUS TRUCK DRIVING INSIDE TERMINALS THAN ON THE PUBLIC ROAD IN THE NEXT FEW YEARS."



© Volvo Trucks

PROJECT VERA

Volvo Trucks has revealed that its autonomous vehicle Vera has been given a 'first assignment', forming part of an integrated solution to distribute goods around the world.

The electric and connected solution, which was first unveiled in 2018, will be utilised as part of a new collaboration between Volvo Trucks and logistics service provider Det Forenede Dampskibs-Selskab (DFDS) operating at Gothenburg Port in Sweden.

Vera, a system designed for repetitive assignments in logistics centres, factories and ports, is well suited to travelling short distances and moving large volumes of goods with a high level of precision.

Ultimately, Volvo Trucks aims to build a connected system consisting of several Vera vehicles monitored by a control tower, developing an efficient and sustainable supply chain that is responsive and flexible to changes in demand.

DIGITAL PORTS TO CREATE NEW SHIPPING ECOSYSTEM

Ports are one of the nodes in the global network providing a key link between sea and land and the connection with the hinterland. This puts the port in a good position to be a neutral platform to act as a supply chain co-ordinator, making use of its assets and knowledge of the markets and hinterland, by providing onward connections for port users.

The reality is that an ecosystem of global port platforms will emerge, and the emphasis should be on co-creating and co-operating to see where there is mutual benefit while moving away from the traditional paradigm of proprietary information and systems.

So how close are we to creating this global network of digitalised ports and compared to other industries how advanced is the shipping sector?

“All around the world and in every industry, there has always been a pursuit to make processes internally and externally more efficient and connected. The current state of technology is currently focused on faster connections to the internet, development of the cloud and connections to sensors and smart devices. This enables this digitalisation pursuit in a manner never experienced before,” said Jan Waas, Chief Information Officer for Hutchison Ports.

Digitalisation development ‘kick started’ years ago in the consumer sector, with digitalisation of music and television. In the B2C market major brands consolidated quickly, so consumers are now using a limited number of platforms provided by the well-known brands.

LOGISTICS LAGGING CONSUMER SECTOR

In the B2B market, container logistics has traditionally been slower, less co-ordinated and invested than the B2C sector. In the short term there are different platforms in development by individual companies which will have their own focus, timing and business needs.

It is unlikely that one platform will cover all or even half of all functions in container logistics; it is more likely there will be different platforms in the market supporting and overlapping to fulfil different functions. Seamless platform-to-platform communications need to be established to avoid additional manual transactions and duplication of processes. “The current focus in the container shipping industry towards standardisation of data format and protocols

(like authentication, identification, authorisation, APIs) is essential for the industry to provide integrated solutions. The goal of establishing new platforms must be to replace legacy working process. If the new platforms run in parallel with existing channels then the legacy communications tools of paper, e-mail, phone and EDI exchange will remain, cancelling out real efficiencies in the logistics chain”, said Waas.

SHARED VISION

Sharing this vision is Martijn Thijssen, who leads digital strategy, transformation and business development for Port of Rotterdam. He sees a more incremental development with ports and users leveraging existing applications.

“We need to align ports on standardisation and interoperability, making use of old standards and data points, such as application programming interfaces, which are based on current applications that work now, such as software as a service as well as new technologies that may emerge such as blockchain,” he said.

Port of Rotterdam launched Pronto last year, with an aim to make each port call like a motor racing Formula 1 pit stop.

“Pronto allows for all services to be pre-arranged before a ship calls at its next port, it provides real-time information about weather conditions, local tidal information, berthing availability, on-dock equipment allocation to ensure optimal arrival time and berthing,” said Thijssen.

PORT CONNECTIVITY

With the idea of a shared global digital platform, it provides shipping companies, agents, terminals and other service providers to exchange information about their port calls.

As soon as a ship’s Estimated Time of Arrival (ETA) is known, the vessel is assigned its own timeline. The timeline displays all events and activities during the port call: from the vessel’s arrival and stay in the port to its departure from the port.

It combines public data, data retrieved directly from participating companies and forecasts from artificial intelligence (AI) applications to generate extremely accurate information about a port call.

Users can easily filter the available data on their own dashboards and zoom in on the timeline of an individual port call. They can use this information to access and plan the activities related to a port call in real-time much more efficient than in the past.

The progress and status of the events is continuously updated on the dashboard and users can monitor the status and adjust it whenever necessary. Alerts and notifications will prompt to users if there are status changes, delays or planning conflicts.

All activities related to a port call can be pre-planned, implemented and monitored in the most efficient way possible in real time. This benefits all the parties concerned.



BENEFITS OF BUILDING A DIGITAL PORT NETWORK:

Shipping companies



Shorter port call turnaround times, better predictability, lower bunker and charter costs, lower CO₂ emissions during each port call.

Container terminals



Better terminal capacity utilisation by improving turnaround times and reduce idle of terminal operations.

Agencies



Transparent dashboard platform with real-time updates and notification; and streamlined communication to clients.

Logistical and maritime service providers



Improved service and logistics plan due to better predictability with AI and with real-time updates.

Port Authority



Increased predictability and cargo volume and reduced CO₂ emissions.

In terms of the big picture the main drivers are to be an early adopter in order to capture the benefits of advances in technology and a more practical reason to meet customer demand for more efficiency.

“DIGITALISATION IN THE FUTURE CREATES AN ADVANTAGE FOR PORT OPERATORS, PROVIDING THE CAPABILITY TO PROCESS DATA IN REAL TIME AND CREATE FULL TRANSPARENCY TO THE USERS OF THE PORT,” SAID WAAS.

The idea of this new ecosystem for the shipping industry may take some time to develop but it will be the key to enhancing global trade connectivity and port efficiency.

DIGITAL TWINS HEADING YOUR WAY

“GARTNER NAMED “DIGITAL TWIN” AS ONE OF THEIR TOP 10 STRATEGIC TECHNOLOGY TRENDS FOR 2018”



A technology widespread in the world of industrial manufacturing is slowly being recognised as a useful tool in supply chain and port planning. As a result, Gartner (a leading research and advisory company) named “digital twin” as one of their Top 10 Strategic Technology Trends for 2018. After reading this article, you will have a better idea of how the digital twin solution differs from simulation software, how digital twinning is used in maritime supply chain planning and in ports, and what does it take to implement the technology, according to Kris Kosmala, Director Smart Port Operations, Digital Solutions for Royal HaskoningDHV.

In manufacturing, a digital twin is an exact virtual replica (mathematical model) of a real machine, including its physical parameters, design characteristics, as well as interactions with the physical world to which the

product will ultimately be exposed. Those interactions may include air flow, water flow, electric current, chemical reaction, etc. Digital twin has a real-time connection to sensors that continuously report the state and conditions they are monitoring. Algorithm(s) allows computers to evaluate what is happening in the real environment and continuously run “what if” scenarios of what could (prediction) or should (decision) happen next in the operations of the digitally replicated model.

This is the key difference between simulation and digital twinning. Simulations only simulate what will happen to the machine based on what the human designer asks it to imitate. Simulations are limited by the imagination of the human deciding what events known to man can occur during operations of the machine, while digital twin is bound only by the limitations of the algorithm that continuously learns and evaluates scenarios beyond human comprehension.

Understanding the value of digital twinning specific to logistics and transportation processes requires one to let go of the assumption that supply chain and transportation models are 3-dimensional, like physical objects.

Movement of goods and people happens over time, so the traditional 3D model needs to include the time dimension. In its entirety, a digital twin spans the whole spectrum of a business process, from the highest level of the mega supply processes and networked assets down to the lowest level of operational work instructions.

The behavioural evaluation of a complete mathematical model of such a complex organism would not be possible without artificial intelligence, involving fields as diverse as machine learning (including deep learning) and image and language processing.

Digital twin involves machine observing humans and operations, mathematically modelling motions and decisions, then computationally improving the twin in search of better processes and decisions. Every improved plan can be transferred back to the real machines and real humans executing the operations. In other words, there is no gap between the simulation and the machines. Thanks to all of that, modern digital twins achieve a level of predictability and self-improvement that is unique and more accurate than every previous model.

Digital twinning is critical to the development of autonomous behaviour of machines and their awareness of their work environment – a loading/unloading robot understanding what it means when a truck is ready for operation, a container crane robot understanding when the autonomous ship is

ready to commence movement of containers, etc. Advances in the Internet of Things (IoT) space are critical to creating successful digital twins. Sensors/IoTs embedded in physical objects and attached to humans can collect massive amounts of data allowing the digital version to mimic and iteratively improve all interactions between humans and physical objects.

In the world of maritime supply chains, ports can be true beneficiaries of digital twinning, as we try to deploy autonomous pilots on autonomous ships operating with fewer human interventions.

The Port of Antwerp stated that they created a digital twin of their port environment to monitor a variety of operational events within the port. The computer was left to “imagine” any possible scenarios of behaviour, thus helping humans make better decisions affecting port operations.

On land, a large rail operator twinned their rail network and the ports they are serving. Based on real-time information received from the ports, the digital twin is used to re-plan movements of rolling stock and access to the rail network to remove any element of surprise in moving freight.

It is expected that widespread digital twinning in supply chain logistics space would lead to a 10 per cent reduction in supply chain cost, and it wouldn't be a one-time gain. While the costs of creating complex models are coming down, the ports and the maritime supply chain operators are gaining an important digital ally in their quest for a competitive position in the chain.



SPACE GAVE BIRTH TO DIGITAL TWIN

The birth of digital twins came from space exploration and NASA's need to operate, maintain and repair physical systems of its assets while in space.

When the Apollo 13 mission developed technical problems, NASA used a 'mirrored' system on earth that allowed engineers and astronauts to determine how they could rescue the mission.

It was the concept of the mirrored system and a need to drive down costs and better manage resources that NASA developed digital twins for its space programme.

This is how the concept of continuous or periodic 'twinning' of the digital to the physical in order to mirror conditions that gave birth to the digital twin.

Source: Safety4Sea

PORT OF ROTTERDAM AND IBM PIONEER DIGITAL TWINS

Port of Rotterdam and IBM IoT are building a digital twin of the port – an exact digital replica of the port's operations that will mirror all resources including tracking ship movements, infrastructure, weather, geographical and water depth data with accuracy.

This part of the port's digitization initiative which will help test scenarios and better understand improvements can be made to gain efficiencies across operations, while maintaining strict safety standards.

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