DIGITAL PORT TRANSITION AND APPLICATION OF NEW TECHNOLOGIES

National Workshop on Sustainable Maritime and Port Connectivity for Resilient and Efficient Supply Chains

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I. Introduction

Logistics 4.0

Logistics 1.0 (20th Century ~)
Mechanization of transportation
- High speed and large capacity of land transportation by truck or rail
- Ship's operational stability improvement by the spread of steamships/aircraft

Logistics 2.0 (from 60's ~)
Automation of Cargo Handling
- Partially mechanized on cargo handling work in warehouses by practical application of logistics equipment
- Mechanization of port cargo handling due to the spread of container ships

Logistics 3.0 (from 60's ~)
Systematization of logistics management
- Automation and efficiency of logistics management with the widespread use of IT system such as WMS, TMS
- Digitalization of work process with the infrastructure systems

Logistics 4.0
- Labor saving and standardization through the evolution of IoT
  - Labor saving with warehouse robots and automated driving
  - Standardization by connecting logistics functions throughout the supply chain

Source: Roland Berger, Re-drawn by author using a source
I. Introduction

Logistics 4.0

Source: Roland Berger, Re-drawn by author using a source
I. Introduction

Concept of smart port

- Sustainable development
  - sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs

- Sustainable development in ports
  - Introducing regulations on various pollutants such as IMO 2020, the sustainability of the port is being recognized as the competitiveness of the port
  - Indeed, sustainable development has been set up as one of the main goals in most countries' ports
I. Introduction

Concept of smart port

- Smart port
  - can be considered to mean ports that autonomously process port operations and optimize logistics flow by applying new and the advanced technologies
  - Port Technology International defines a smart port as a port that uses automation and innovative technologies including AI, Big Data, IoT and Blockchain to improve its performance
  - KMI defines smart port as a comprehensive concept, aiming at automation, logistics optimization, energy efficiency, eco-friendliness and reinforcement of connectivity with hinter cities through process innovation and the introduction of information technologies (IT) such as IoT, AI, Robot etc.

In ESCAP Report released in Feb. 2020, a smart port can be defined as a port that pursues port facility automation and becomes an autonomous port with integrated information management, rational decision-making, and efficient use of resources through the 4IR technologies.
I. Introduction

Trend of transport and logistics

- Global logistics market reached a value of $4.92 Trillion in 2021. Looking forward, the publisher expects the market to reach $6.55 Trillion by 2027, exhibiting at a CAGR of 4.7% during 2022-2027


- Market share of main transport and logistics sector

  ![Market share chart]

  *Source: PwC 2018, FinancesOnline Reviews for Business*

- 34% of companies who have moved their supply chain to the cloud said that one of the benefits is giving everyone access to the same information. (Logistics Management, 2019)
I. Introduction

Trend of transport and logistics

- Today, what happening in transport and logistics domain
  - vessel sizes and cargo volumes have surged upwards
  - Needs to strengthen the competitiveness of logistics based such as seaport, railway station, etc.
  - Increasing social demand for reducing ship emissions gas and carbon neutrality
  - Willing to realize green logistics using electronic truck/ship, automated equipment
  - A dramatic innovation with business model (service) as well as technology

- challenges
  - Lack of efficiency in port operations and on-demand port service
  - Lack of interoperability between transport means
  - Environmental impacts: ship and port wastes, oil waste and sewage, etc. CO₂ emission
  - Week of physical and cyber port security

- Significant trends in Logistics industry (by Forbes)
  - Cloud based system and integration, AI and machine learning, Blockchain
  - Autonomous vehicles, Real-time analytics and tracking
II. Case Study: digitalizing the logistics sector

Thailand

Source: Royal Thai Embassy, Washington D.C.
II. Case Study: digitalizing the logistics sector

Thailand’s Laem Chabang Deep Seaport

Laem Chabang Port and the Eastern Economic Corridor

Source: ASEAN Briefing
II. Case Study: digitalizing the logistics sector

Indonesia

- Peraturan Presiden No 26 Tahun 2012 (THE BLUEPRINT OF NATIONAL LOGISTIC SYSTEM DEVELOPMENT)
  - 2nd phase: Integration of ASEAN logistics system (2016~2020)
  - 3rd phase: Integration of global logistics system (2021~2025)

- Medium-Term National Development Plan (RPJMN) 2015~2019 and the maritime expressway construction plan
  - large-scale construction, expansion, and repair of roads, railways, airports, ports, and transportation infrastructure
  - This project includes 24 strategic ports, of which 5 are hub ports and 19 are feeder ports
    - opened three routes in 2015, and a total of six routes were operated in 2016. The MOT decided to build a total of 13 routes in 2017 and a total of 18 routes in 2018.
    - 14 routes are long-distance routes, and 4 routes are feeder routes.
II. Case Study: digitalizing the logistics sector

Indonesia maritime expressway routes in 2018

Source: Indonesia, MOT (Ministry of Transport)
II. Case Study: digitalizing the logistics sector

Malaysia

Logistics and Trade Facilitation masterplan

5 Strategic Shifts and 21 Action Items to be "The Preferred Logistics Gateway to Asia"

Strategic Shifts

- Strengthening the institutional and regulatory framework
- Enhancing trade facilitation mechanism
- Developing infrastructure and freight demand
- Strengthening technology & human capital
- Internationalising logistics services

2015 & 2016

- Debottleneck
- Enhance Domestic Growth
- Create Regional Footprint

- Action Items

1. MOT as champion
2. Create National Logistics Taskforce
3. Improve last mile connectivity to Port Klang
4. Address bottlenecks in Padang Besar
5. Enhance efficiency of import/export process including security
6. Regulate and monitor warehouse and off-dock depots development
7. Enhance road freight transport productivity
8. Streamline processes and procedures related to licensing and air freight
9. Establish national freight data program
10. Increase quality of goods vehicles drivers
11. Review Malaysian Ship Registry structure

2016 & 2019

1. Create an integrated hub and spoke model
   - Develop KLIA as air cargo hub
   - Develop Port Klang as maritime centre
   - Cargo village development
2. Enhance capabilities of logistics service providers
3. Increase compliance levels with trade partner market regulations
4. Develop freight hubs
5. Establish Public Private Partnership for rail operations and infrastructure

2020 and beyond

1. Leverage on the potential of e-commerce
2. Provide green initiatives support
3. Promote efficient urban logistics
4. Undertake R&D on supply chain innovation
5. Enhance convergence of global supply chain

Source: Malaysia, MOT (Ministry of Transport)
II. Case Study: digitalizing the logistics sector

Malaysia, Westports

- Westports expansion
  - is making a concerted effort to invest in emerging technologies and automation (automated container equipment) as it works on creating extra capacity
    - Expect capacity to double from 14 million TEU currently to up to 30 million TEU once CT17 is fully operational
    - Alongside investment in automated equipment, the company aims to become a “logistics technology sandbox,” experimenting with several companies on an AI system for yard optimisation.
  - Use of Westport’s E-Service reached an average of 98% in December 2020 and from July 2021 the company plans to operate online-only communications with customers as part of its digitalisation efforts.
  - Westports, a multi-cargo terminal located in Port Klang, Malaysia, expects to invest RM12.6 billion ($3.12 billion) over a 20-30 year time period as part of the expansion to CT17
II. Case Study: digitalizing the logistics sector

VietNam, Saigon Newport

1. EDO (e-Delivery Order)
2. EDO (e-Delivery Order)
3. Customs Clearance
4. Vietnam e-Customs
5. Apply by on-line
6. Payment
7. Issue e-Invoice

Source: Saigon Newport ePort, Re-drawn by author using a source

Connect to NAPAS Payment
(The National Payment Corporation of Vietnam)
VietNam, Da Nang

- The government of Vietnam has approved a $147 million (VND3.4 trillion) infrastructure plan at the Lien Chieu Port in Da Nang, according to Pinsent Masons, specialists in infrastructure construction law.
- Once operational, the Port is expected to handle general cargo and container vessels with a capacity of 6,000 – 8,000 TEU.
- Construction work will include breakwater embankments, breakwaters and ship passages.
II. Case Study: digitalizing the logistics sector

Korea

MOF released “the Strategy for smartization 2.0” in 2022 Feb.

Source: ROK MOF (the Ministry of Ocean and Fisheries)
II. Case Study: digitalizing the logistics sector

BPA Chain Portal - Korea

Source: BPA, Re-drawn by author using a source
Ⅲ. What to do for digitalization in port

**Status of Cambodia port**

- Two main ports
  - Phnom Penh Autonomous Port (PPAP) and Sihanoukville Autonomous Port (SAP)
    - PPAP, which is an inland river port near the confluence of the Tonle Sap and Mekong rivers.
    - SAP, which is Cambodia’s only existing deep-water port
  - Both are financially independent state-owned enterprises, and they hold the majority of the import-export volume (12.9 million tons at PPAP and 5.2 million tons through SAP in 2018)
- Many smaller ports along the Mekong, Bassac, and Tonle Sap Rivers that supply local communities
- Three smaller maritime ports in Koh Kong Province—Okhna Mong, Sre Ambel, and Koh Kong—are used primarily for importing goods from Thailand
- No Port EDI system, No connection and no information sharing with other organizations
- The government does have plans to expand port infrastructure
  - Priority activities include developing technical standards for further port development and operation; rehabilitate existing waterways, ports, and related infrastructure; improve classification of vessels and waterway depths to improve navigation; and dredge waterways to improve access for larger vessels along inland waterways
Ⅲ. What to do for digitalization in port

Status of Cambodia port

- **SAP**
  - Multi-purpose port,
    - gross revenue of 373 billion riels (about $93.2 million) 2021
    - handled 6.9 million tons of containerized cargoes last year, up 6 percent year-on-year, it added
  - Will build New Container terminal
    - a depth of 14.5 meters in order to accommodate large ships
    - first phase is expected to start in 2022 and to finish in 2025, estimated cost $220 million
  - Port operation
    - User sends data to Port Authority by email or SNS, then PAS enter data to system by manually
    - Have their own system for port operation such as port clearance, payment, RoRo (Roll-on Roll-off), etc., but not EDI system (IMO FAL Form 1, 2, and 7)
    - Terminal operation: user submits paper document

- **PPAP**
  - reported total revenue of 138 billion riels ($34.5 million) 2021, up 14 percent year-on-year
  - the freshwater port accommodated 4.2 million tons of containerized goods, up 13 percent
### Status of Cambodia port

- Begins construction of 1.5-bln-USD seaport in southwest province
  - invested by the local company Kampot Logistics and Port, and the construction is undertaken by the Shanghai Construction Group and the China Road and Bridge Corporation
  - Will be capable of handling 300,000 TEUs in 2025 and up to 600,000 TEUs in 2030
  - Will be the third-largest port in the Southeast Asian country

### What to do

- Plan to implement PCS, EDI system for work automation to eliminate the use of paper document and the duplicated input
- Plan to implement National Single Window
- Plan to exchange or share data/information with other organizations
- Expand into other countries for cross-border paperless transport facilitation

*Source: Thai PBS World article, May 5, 2022*
IV. The Required technologies for digitalization

Technologies (ex) for a smart port

- Use a logical way of thinking, learning and judging, like humans, on a computer
- Accumulated experience and a learning-based prediction model
- The best route navigation and recommendations.

- Decision-making support system based on a predictive model of behavior
- Port facility management with drones.

- A machine that replaces or supports human work
- Exoskeletons turn workers into human robots in order to reduce the work burden and promote safety
- Performs facility maintenance, defect status check, and underwater work etc., on behalf of workers.

- Robotics port, Unmanned transport robot
- Exoskeleton robot for workers
- Underwater construction robot

- An intelligent infrastructure and service technology for exchanging and communicating information
- Collection of information in real time from IoT sensors of containers, cargo, equipment, ships, trucks, roads etc.

- Real-time cargo flow tracking, Cargo and ship monitoring.
- Port of data-centric decision-making, Intelligent wharf wall.

- Virtualization solution implementation
- Able to improve the efficiency of all processes, from design to manufacturing and services
- Pre-verification through simulation before actual operation

- Ship life-cycle management, Facility management
- Smart ship sailing, Smart port operation management
- Container status monitoring

- Prevents data fabrication & modification
- Verifies transaction
- Record immutability, transparency

- Able to provide common management of resources, cost reduction and operational efficiency improvement

- A method of data processing at device (system) close to the network edge where data is generated
V. Conclusion

Why starting toward to a smart transport and logistics using digitalization?

- **Digital transformation** and globalization, information should be exchanged between cross-border countries for connectivity, interoperability, reliability, or safety, etc.

- **Technical trend is also changing**, therefore many organizations try to adopt new technology to enhance their capability.

<table>
<thead>
<tr>
<th>Goal</th>
<th>Direction</th>
<th>Strategy</th>
<th>Roadmap</th>
<th>Masterplan</th>
<th>Strong leadership</th>
<th>Close relationship</th>
<th>Digitalization with Technology</th>
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</table>
V. Conclusion

Future model

Global transport and logistics Community

- Intelligeant and Sustainable Logistics

D Distributed/Localized Logistics Base, Hub Logistics (Pickup and Delivery)

Operational Transport and Yard Capacity Planning

Seamless Logistics Transport Lifecycle Management

Risk Management and Recovery

On-Demand Service

Valuable Information

u-IT Technology (RFID, Sensor, IoT, etc.) based monitoring

Risk Detection and Alternate Method Planning

Transport Route Optimization, Risk Detection

Operational Capacity Planning, Facility Automation and Improving

Data Analytics and Prediction

Strategic Network Planning

Customer Loyalty and retention

Tightly coupled relationship

New Business

Optimized Logistics Operations

Logistics Network

Customer Business Synch with

Supply chain partners

Partnership Collaboration with external information system

Manufacturer

e-Business (Trader)

e-Business (Commerce)

SME Business Entity

B2C (End User)

Manufacturer

e-Business (Trader)

e-Business (Commerce)

SME Business Entity

B2C (End User)
감사합니다.

Thank you
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