Industry 4.0 and its Impact on International Trade

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List of Talks

- Issues in International Trade
- Data Requirements for International Trade
- Industry 4.0 Technologies for International Trade
- Conclusion & Benefits
Issues in International Trade
Issues in International Trade

GLOBALIZATION
OUTSOURCING
TARIFF
IMPORT
COST
CUSTOMS

INTERNATIONAL TRADE

LAW
ORIGIN
EXCHANGE RATE
INSURANCE
FREIGHT

DOCUMENTS

PRICING
Costs of Cross-Border Trade

India: 6 days to export while 13 days to import
South Asia: 7-8 days to export while 20 or so days to import
Data Requirements for International Trade
**SCM and Buyer’s Criteria**

- **Supply**
- **Make**
- **Deliver**
- **Retail**
- **Use**

**Product 1**
- Cost
- Price
- Quality
- Value

**Product 2**
- Cost
- Price
- Quality
- Value

**Product 3**
- Price
- Cost
- Quality
- Value

**Price**, **Quality**, **Innovative**, **Customizable**, **Sustainable**, **Differentiated**, **Connected**

*Image: POSTECH*
# Long Road to Industry 4.0

## Cost Focus

<table>
<thead>
<tr>
<th>Year</th>
<th>Focus</th>
<th>Industry 2.0</th>
<th>Industry 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>Production</td>
<td>Identical products</td>
<td>Product of high quality</td>
</tr>
<tr>
<td></td>
<td>Policy</td>
<td>Economies of Scale</td>
<td>Just In Time</td>
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<tr>
<td></td>
<td></td>
<td>Push Policy</td>
<td>Kanban, Pull Policy</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>Mass Production</td>
<td>Lean Production</td>
</tr>
</tbody>
</table>

## Quality Focus

<table>
<thead>
<tr>
<th>Year</th>
<th>Focus</th>
<th>Value Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td></td>
<td>Industry 4.0</td>
</tr>
<tr>
<td></td>
<td>Policy</td>
<td>High valued products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital Technology, IoT, Big Data, AI, 3D Printing</td>
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<tr>
<td></td>
<td>Production</td>
<td>Smart Factory, Smart SCM, Smart Product</td>
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<tr>
<td></td>
<td></td>
<td>Data-driven</td>
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</tbody>
</table>

## Value Focus

<table>
<thead>
<tr>
<th>Year</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Industry 4.0</td>
</tr>
</tbody>
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**Policy-driven**

**Data-driven**
**Product with IoT – Smart Product**

**Physical Components**
- Mechanical parts
- Electrical parts

**Sensory Components**
- Sensors
- Microprocessors
- Data storage
- S/W

**Connectivity Components**
- Ports
- Antennae
- Com Protocols

Car: Engine, Brakes, Tires
Car: ECS, ABS, Rain-sensor
Car: LTE port, IEEE 802.11 WAVE for V2V

**Commercial IoT**

Supply → Make → Deliver → Retail → Use
Smart Product Examples

Product with Physical Components

Product with Sensory Components

Smart Product

The Real Reason Google Paid $3.2 Billion For Nest
The potential market for its products could be big, like really big

By Verne Kopytoff Jan. 14, 2014
Machine with IoT – Smart Machine

**Physical Components**
- Mechanical parts
- Electrical parts

**Sensory Components**
- Sensors
- Microprocessors
- Data storage
- S/W

**Connectivity Components**
- Ports
- Antennae
- Com Protocols

Robot: Arm, Axis, Tool mount
Robot: Camera, Torque sensor
Robot: Ethernet/IP ControlNet

Industrial IoT

Supply → Make → Deliver → Retail → Use
Internet of Things (IoT)
- Industrial IoT (IIoT) – design, materials, production, logistics, etc.
- Commercial IoT (CIoT) – channels, usages, services, complaints, etc.

Digitalization
- Article 8, Framework agreement on facilitation of cross-border paperless trade in Asia and the Pacific
- Trade-related data & documents – payloads, locations, customs, etc.
Emerging Technologies for International Trade
Emerging Technologies with IoT & Digitalization

Information Sharing
Among stakeholders (makers, port authorities, customs, users, etc.) operating environments, etc.

Artificial Intelligence
Machine Learning
Data Analytics
Cyber Physical System

Cloud Computing
By performing some functions of the product outside the physical device

Big Data

Connectivity
Sensory
Physical

Connectivity
Sensory
Physical

Connectivity
Sensory
Physical

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Sensory
Physical

Connectivity
Sensory
Physical

Connectivity
Sensory
Physical
Business Benefits with Emerging Technologies

Applications
- Production Planning
- Predictive Maintenance
- Quality Optimization
- Energy & Environment
- Supply Chain Optimization
- Global Logistics

New Business

Platform

Big Data

Connectivity
- Sensory
- Physical

IoT

Edge

Supply
Make
Deliver
Retail
Use
Business Case – Komatsu’s Komtrax Plus

Applications

- Free remote monitoring system

Platform

- Big Data
  - Planning
  - Spare Parts

Edge

- Supply
  - Make
  - Deliver
  - Retail
  - Use

Forecasting

Production Planning

Theft Protection

Applications

- Edge Platform
  - Planning
  - Cause of Failure
  - Schedule of Oil Change

Production Planning

- Cause of Failure
- Schedule of Oil Change

Theft Protection

- Cause of Failure
- Schedule of Oil Change

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Theft Protection

- Cause of Failure
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Business Case - GE’s Jet Engine

Applications

- New Engine Design
- Predictive Maintenance
- Maintenance Planning
- Turbulence Free Route

Platform

Design update

Big Data

- Flight records
- Engine Status
- Engine Efficiency

Edge

Supply → Make → Deliver → Retail → Use

Sensors: 5000

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Recommendations

- Integrated digital platform
  - Single window digital platform to link all stakeholders to perform the whole product lifecycle
  - Reduces delays and the number of trade documents

- Integrated trade & logistics policy
  - Creating streamlined interactions with multiple stakeholders such as port authorities, customs, shipping lines, other government agencies

- Measure performance
  - With this, policy makers identify what needs to be done to create a "seamless environment"
  - Ex) loading/unloading time at a factory, the number of inter-state border checks
Conclusion & Benefits
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Industry 4.0 & Cross-Border Trade

- Background on Industry 4.0
  - Not just cost minimization and quality maximization
  - Data-driven value maximization via customization, differentiation

- Scope & Goal
  - End to End (Design to Delivery)
  - All the business data are collected and analyzed to extract knowledge and insights
    - **Indirect revenue**: Operational excellence in international trade for lead time minimization, traceability, visibility
    - **Direct revenue**: Data driven new business model – integrated digital platform
Qualitative Benefits

(End-To-End) Minimize Lead Time

Traceability of Defects

Visibility of Progress

Usability of Defined Product

Manufacturability

Supply → Make → Deliver → Retail → Use
Quantitative Benefits

SOURCE: McKinsey Industry 4.0 after the initial hype (2016)

- 10 - 40% reduction of maintenance costs
- 20 - 50% reduction in time to market
- 45 - 55% increase of productivity in technical professions through automation of knowledge work
- Costs for inventory holding decreased by 20 - 50%
- Costs for quality reduced by 10 - 20%
- Forecasting accuracy increased to 85+%