KETI Korea Electronics Technology Institute

Smart Factory SMIC Smart Manufacturing Innovation Center

SMART FACTORY

Manufacturing Renaissance

Made in Korea

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I.

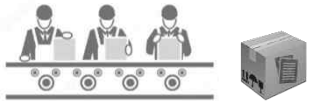
Global Trends of Future Manufacturing

1 Paradigm Shift in Manufacturing

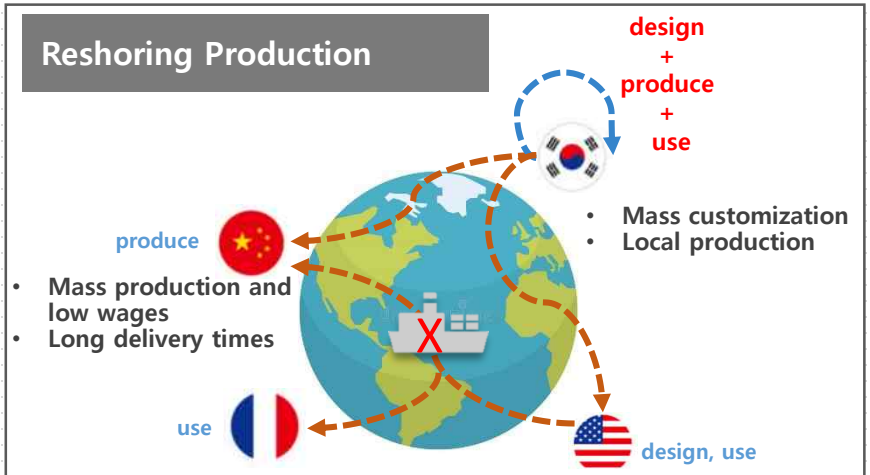
Customer's Changing paradigms

Paradigm of the past → Paradigm of the future

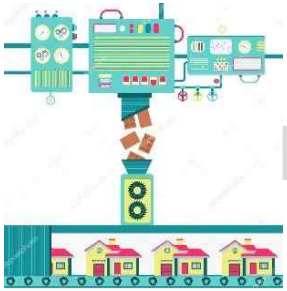
cheap, cheaper, cheapest!



Reshoring Production



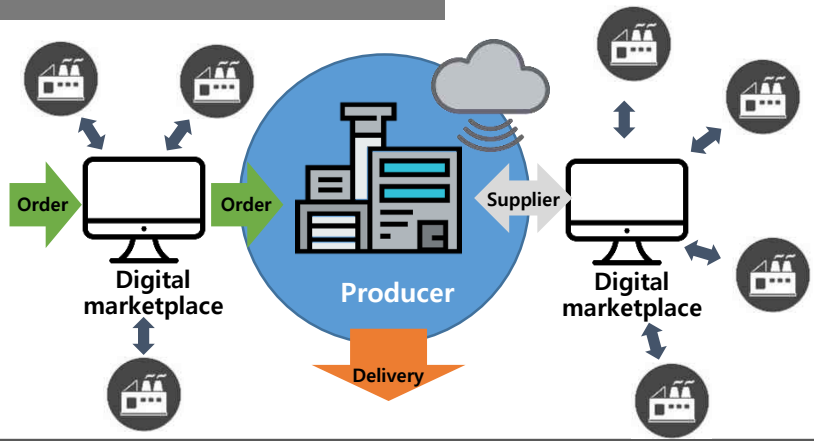
Personalized Production



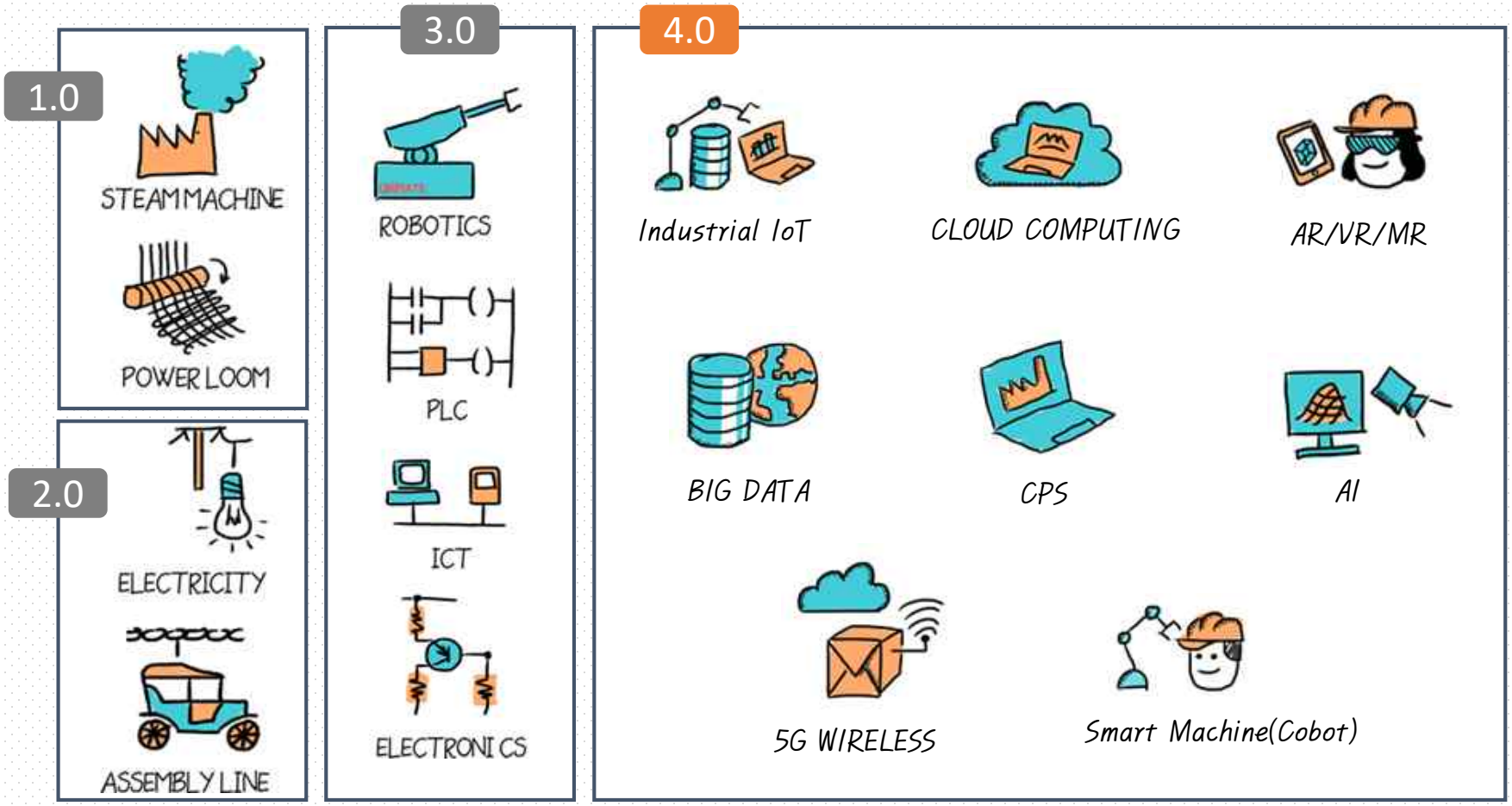
mass production

personalized products

Production in Networks

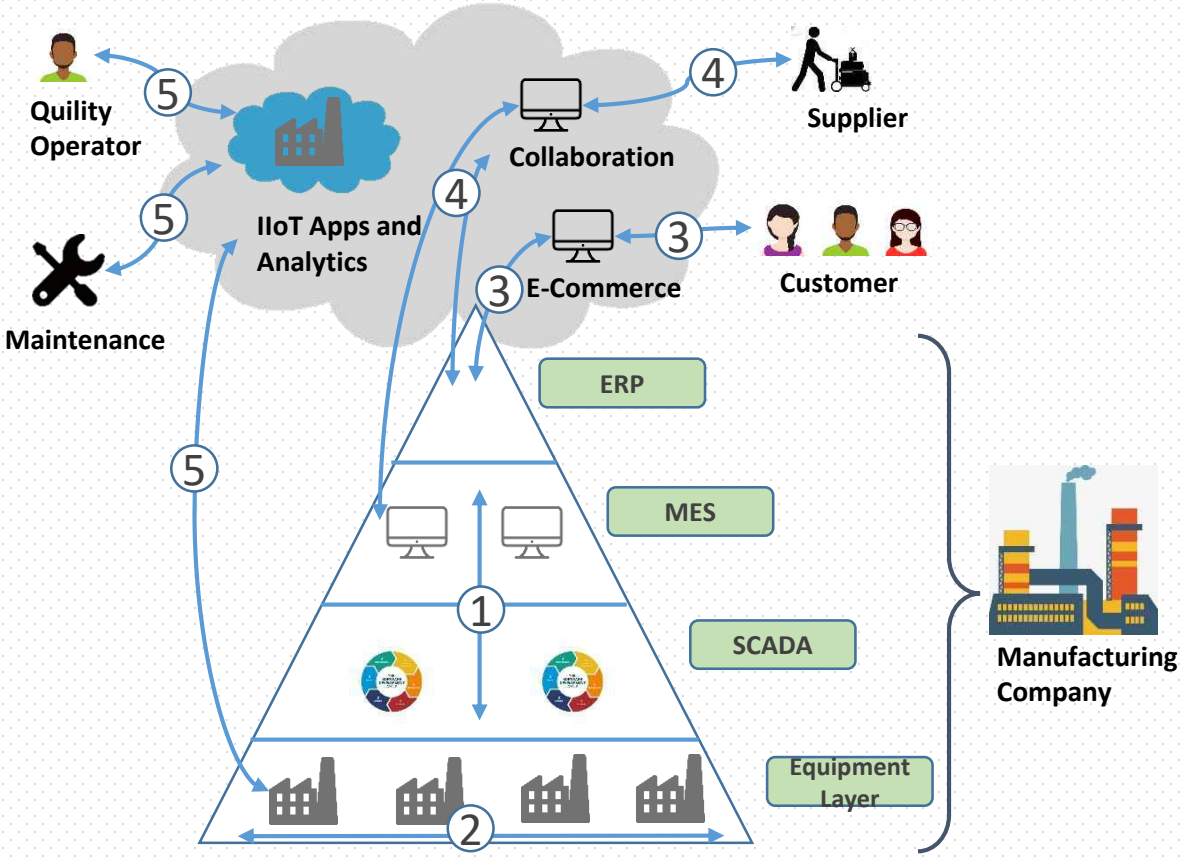


2 Enabling Technology for Manufacturing Revolution



3 Smart Factory Model– 5 key scenarios

Smart Factory Implementation Model



Integration Scenarios:

1. **Shop floor to Top floor**
   -Intra company vertical integration
2. **Machine to Machine (M2M)**
   - Autonomous equipment
3. **eCommerce Integration**
   - Direct integration of e-shops
   -Usage pattern improvement
4. **Manufacturing Collaboration**
   - Track and Trace
   -Genealogy/Recipe
   -Direct replenishment
5. **Analytics (AI)**
   -Predictive maintenance
   -Predictive quality/Reduced scrap
   - OEE
   -Energy Mgmt.

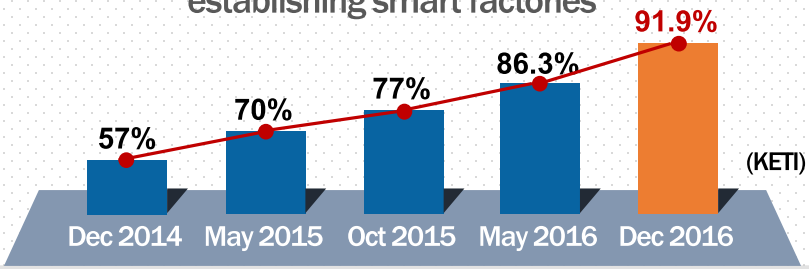
II.

Korea Smart Factory Policies

1 Korea's Atmosphere for Smart Factory Implementation

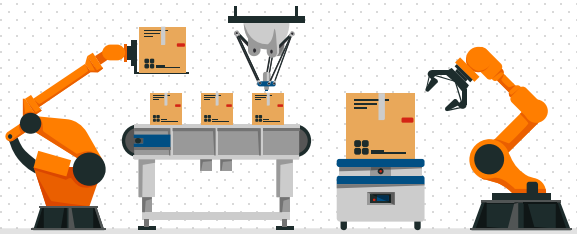
SMEs and middle-standing firms 91.9%

"Consensus toward the necessity of establishing smart factories"



SMEs and middle-standing firms 77.6%

"Willing to implement immediately into their factories"



- Increased technology implementations among multinational corporations and middle-standing firms
- Increasing number of companies in ICT supply industry (IoT, CPS, Cloud, Big data, etc.) for establishment of smart factories

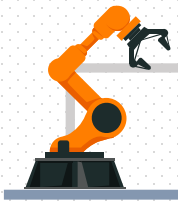
2 Manufacturing Renaissance: Made in Korea (1/2)

Goal

Make the World's four major Manufacturing Powers Leap through Manufacturing Revival until 2030

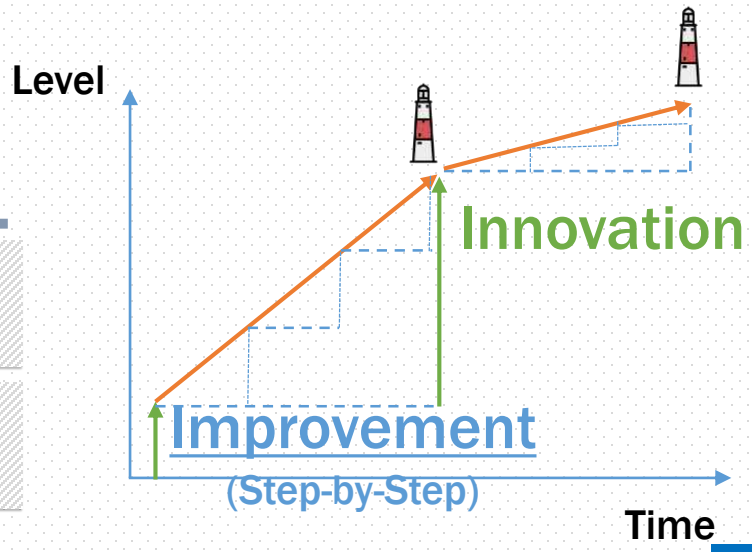
Plan

1. Accelerate the innovations in industrial structure through the digitalization, eco-friendliness, and convergence of each industry.
2. Spread enabling technologies to SME companies in cooperation with domestic and foreign companies.



2 Major Programs

1. Smart Manufacturing Improvement Program
2. Smart Manufacturing Innovation Program



2 Improvement Program (1/2)

Great technology gaps between the SMEs and leading companies

Need for customized solution for each step

Develop policies for step-by-step upgrades of smart factory for SMEs

SMART FACTORY

[Advanced Level]
Flexible customized production
based on IoT and CPS

[Intermediate-2 Level]
Real-time integrated Control on IT/SW basis

Domestic and Foreign Leaders

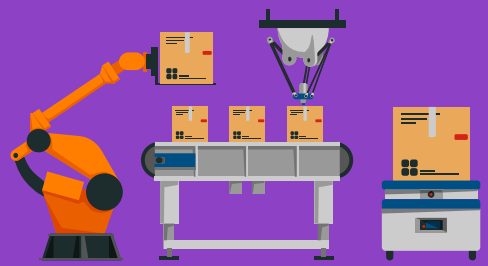
Large Enterprise

[Intermediate-1 Level]
Real-time production information collection and monitoring

Small powerful firms, Middle-standing firms

[Basic Level]
Production record tracking & management

Most SMEs



HYUNDAI MOTOR GROUP LG Life's Good SAMSUNG

3 Improvement Program (2/2)

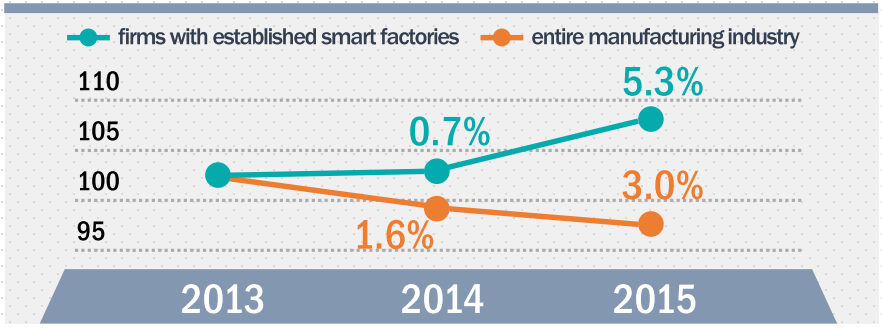
Instructions customized by levels

- Instructions by expert consultants, customized to level of the firm, based on industry standard reference model* (basic 》Intermediate 1 》 Intermediate 2)
- Constant management by expert consultants (coordinators) after completion of smart factory establishment

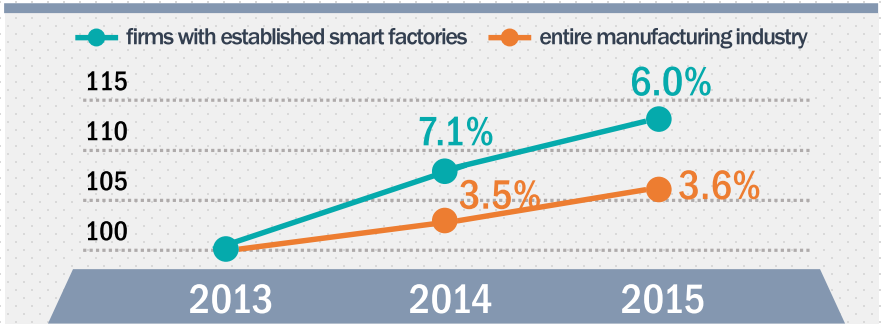
Outcome of Smart Factory Ready Program

time series analysis of 277 firms which applied for establishment

Increased Sales



Increased Employment



4 Innovation Program (by SMIC)

1 R&D, Creating Foundation

- Building “best practices and enabling technologies” smart model factory
  - **Operating Model**: Support benchmarking for establishment of real smart factories
  - **Demonstration**:
    - Propose new processes and technologies for smart factories
    - Utilize common R&D and testbed

- Concentrating support for core technology development of smart factory
  - Develop smart equipment such as controllers, and technologies such as smart sensors and ICT

2 Human resources

- Support operational instructions of smart factories
  (e.g. Smart Factory Academy), targeted toward SMEs
- Support establishment of smart manufacturing graduate courses (2017~)

3 Standards/Certifications

- Develop international standards
  Joint proposal of smart factory standards (ex, IIC)
- Build “Interoperability Test Center” based on the international standards
  Equipment for Interoperability certification testing

4-1 Operating Model Factory

	Before	After
Automation	- Limited automation only for specific production	- Implement an automated infrastructure to support multi-product and flexible production
Digitalization	- Separated operation for digitalized design and real-time process monitoring - Partially production control automation	- Connecting virtual and physical production based on the IoT·CPS Intelligent control and automation based on the Big data

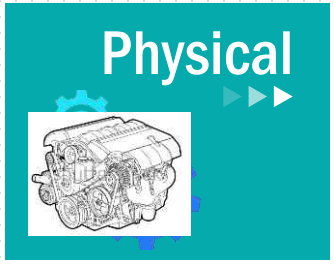
Product Design

Process Design / Simulation

Process Monitoring (Control Center)

IIoT
Open Hardware Interface

OpenAPI
Open SW Interface



Casting line controlled by robots

Flexible processing line

Surface treatment line

Assembly Line

Data Mgmt

4-2 Demonstration Factory (Demo Factory)

Propose direction of 4th industrial revolution (Lighthouse Project)

- Suggest direction how to advanced level for the domestic manufacturing industry
- Suggest the application plan considering global and industrial standards (de-facto)
  - ≫ Propose application plans of the IEC/ISO, Industry 4.0 and IIC standards and their linkage

Establish the global&korea smart factory reference model (Reference Testbed)

- Develop the testbed using 8 smart manufacturing technologies
- Operate an interoperability certification lab based on the standards
  - ≫ Environments for technical tests (linked with international certification test)

1	IIoT	5	Cloud
2	AR/VR/MR	6	Smart Machine-Cobot
3	5G	7	Big Data
4	AI	8	CPS(Digital Twin)

FEATURES OF THE SMART FACTORY: WHAT MAKES IT DIFFERENT?

Self-optimize performance | **Self-adapt to and learn** | **Autonomously run entire**

III.

Innovation Programs

Smart Manufacturing Innovation Center (SMIC)

1 SMIC Introduction (1/4)

Hub Center for Smart Manufacturing Innovation Program

SMIC Building

SMIC CPS(Cyber Physical System) System

SMIC Demo Production Lines

SMIC R&D Members

Visitors

1 SMIC Introduction (2/4)

- Provide the process of testing, evaluating, and integrating enabling technologies required for manufacturing innovation

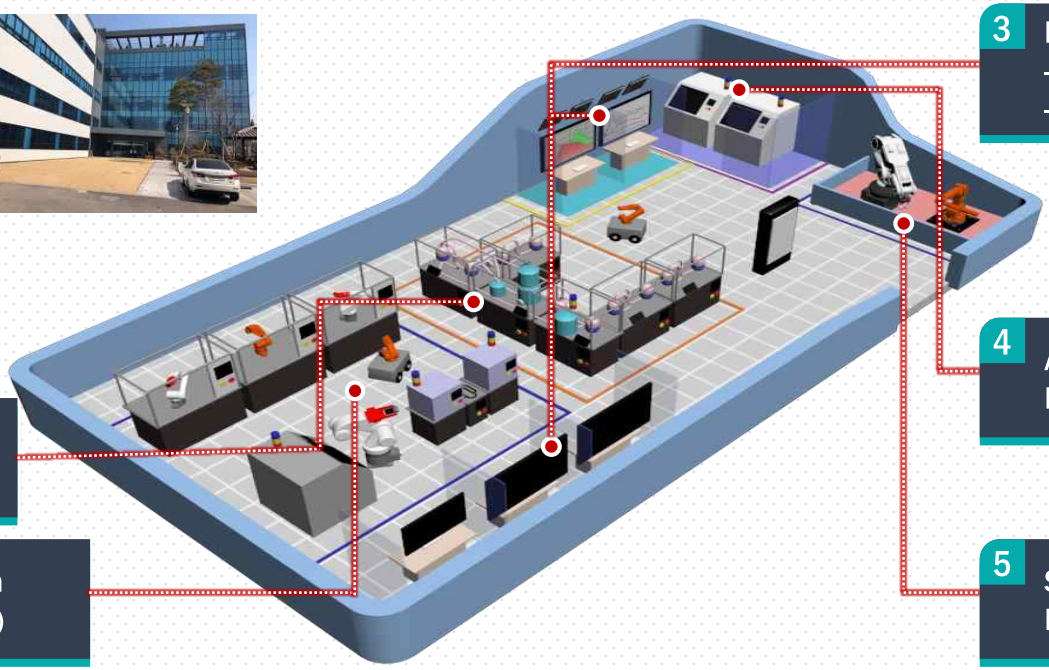
Pre-Test

Requirement Analysis → Data Analysis & Test

Experiment & Demonstration

Verification: Korea Smart Factory Foundation Demonstration Factory → Demonstration: Operating Factory

1 SMIC Introduction (3/4)



3 Digitalization Zone
- Total Operation
- Digital Twin

4 Additive manufacturing Machine Zone

5 Smart Manufacturing Robot Zone

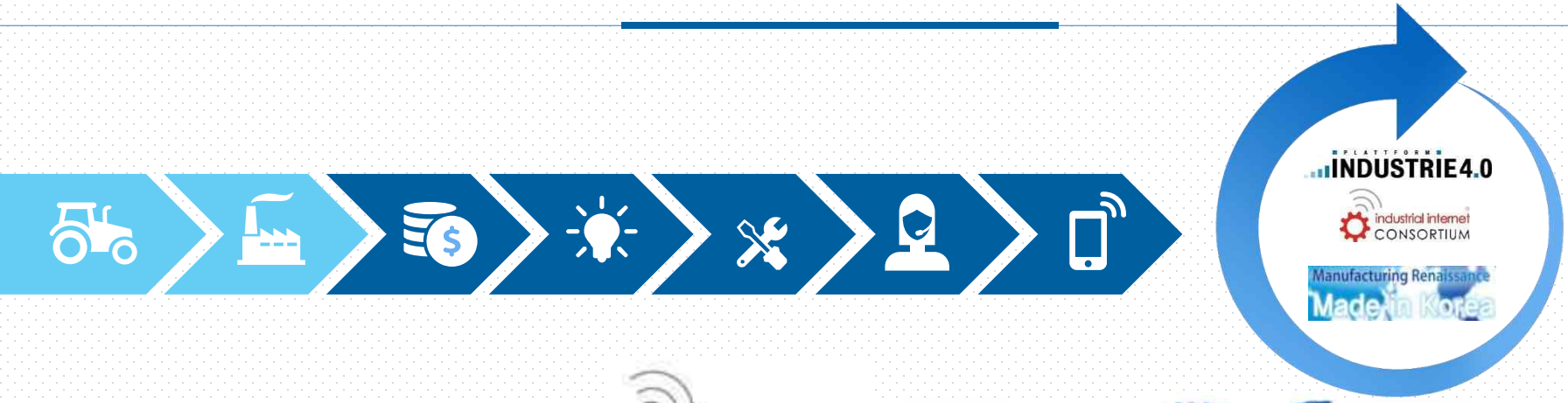
2 Process Automation Zone (C-Line, D-Line)

1 Discrete Automation Zone (A-Line, B-Line)

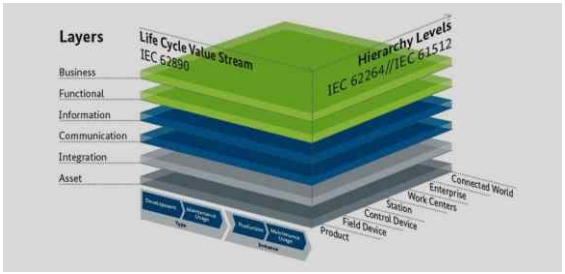
1 SMIC Introduction (4/4)

Membership

2 Collaboration between Germany, USA and Korea (1/2)

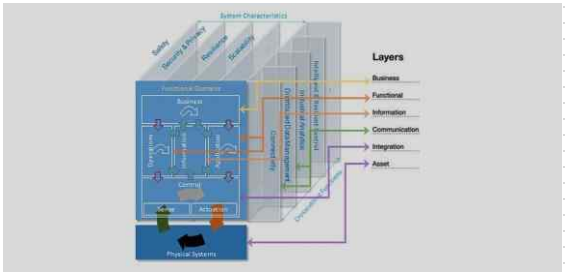


I4.0 Reference Architecture



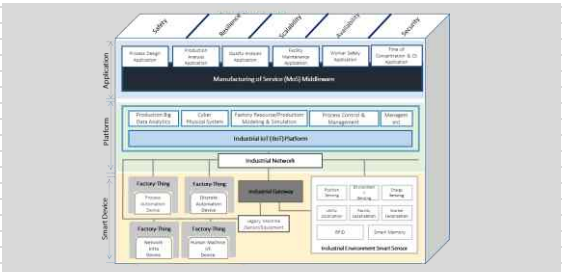
- Provides common language
- Maps physical to virtual world
- Covers product life cycle

IIC Reference Architecture



- Provides common language
- Reduces complexity
- Ensures scalability

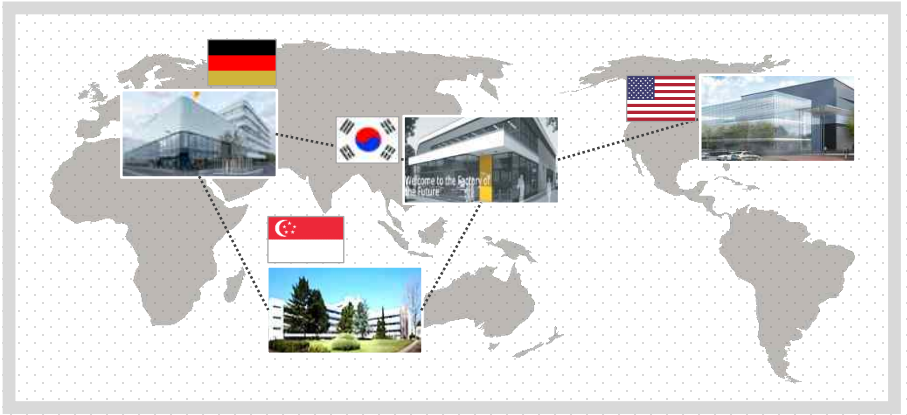
MIK Development Architecture



- Provides common language
- Reduces complexity
- Maps physical to virtual world

2 Collaboration between Germany, USA and Korea(2/2)

Promoting test-production connected among global model factories (Oct, 2017)



- The smart factory testbed approved by IIC (2016, 09, 21)
- Selected as IIC Best Testbed ('18.05.21)

Solutions from model factories are expected to serve as a foothold for securing national competitiveness

3 SMIC Key Achievements (1/3)

1. Make a Strong Connection Between Manufacturing Factories and Supply Companies

- Participate in a joint exhibition each year, holding a quarterly event for members to share trendy technologies
- Leverage Korea smart manufacturing's ecosystem of expertise, technologies, resources and best practices
  - ≫ Develop "Best Practices by Industry Types and Levels of SMEs" providing insights

3 SMIC Key Achievements (2/3)

2. Serve as a Network Hub for Global Collaboration

- Encourage global interaction by participating in major exhibitions and meetings
- Collaborate with international standard organizations

  ➠ Propose application plans of the IEC/ISO, Industry 4.0 and IIC standards and their linkage




3 SMIC Key Achievements (3/3)

3. Provide guidance (consulting) from industry & technical experts

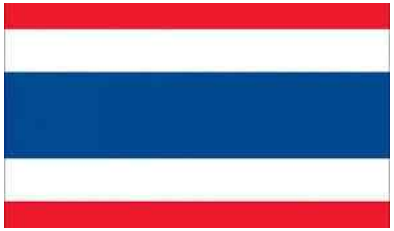
- About 2,000/year visitors at SMIC

4 Together, Collaboration

All leading experts and internal/external representative supply companies

Korea Smart Factory Program

Bring advanced smart features to overall manufacturing industry



Korea and Thailand agreed to expand and strengthen cooperation to prepare for the 4th Industrial Revolution.

[Korea-Thailand President Summit, Bangkok 2 October 2019]

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We will raise the competitiveness of SMEs through the proliferation of smart factories, and also proactively respond to the Fourth Industrial Revolution.