The Connected Industries
Achievements, Challenges and Next Steps in Japan

April 2017

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OUTLINE

1) Key Concept of the Connected Industries

2) Challenges and Key Policies in Japan

3) International Cooperation

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Connected Industries

METI

Concept
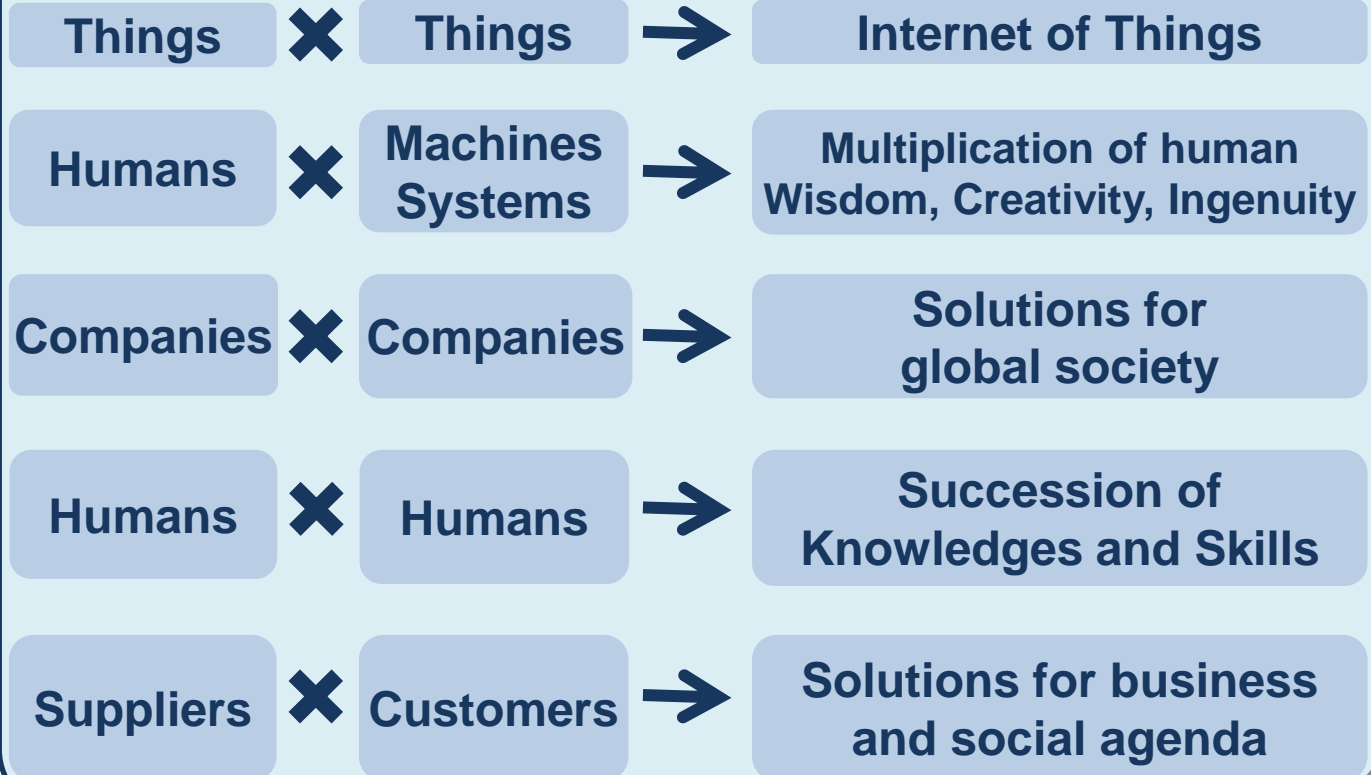
*Humans, Machines and Technologies are CONNECTED
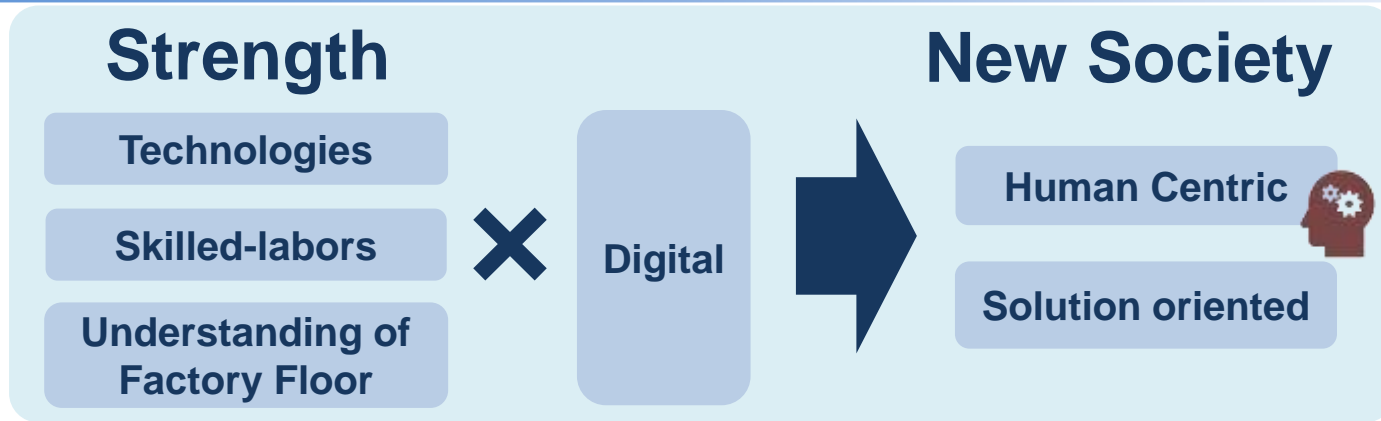Across borders and generations
and NEW VALUE is generated continuously*

Connected-ness

⬇

New Value

Examples

Things ✖ **Things** ➡		**Internet of Things**
Humans ✖ **Machines Systems** ➡		**Multiplication of human Wisdom, Creativity, Ingenuity**
Companies ✖ **Companies** ➡		**Solutions for global society**
Humans ✖ **Humans** ➡		**Succession of Knowledges and Skills**
Suppliers ✖ **Customers** ➡		**Solutions for business and social agenda**

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Connected Industries

Strength

- Technologies
- Skilled-labors
- Understanding of Factory Floor

× Digital →

New Society

- Human Centric
- Solution oriented

Pillars

1 — **New Digital Society**

-- Humans and Machines/Systems work together --

- New Technologies (e.g. AI & Robotics) are tools for solution.
- Utilize those technologies to maximize Humans abilities

2 — **Multilevel Cooperation**

-- Across Regions, Borders and Time --

- Cooperation among individuals, companies, industries and countries are essential for effective solutions
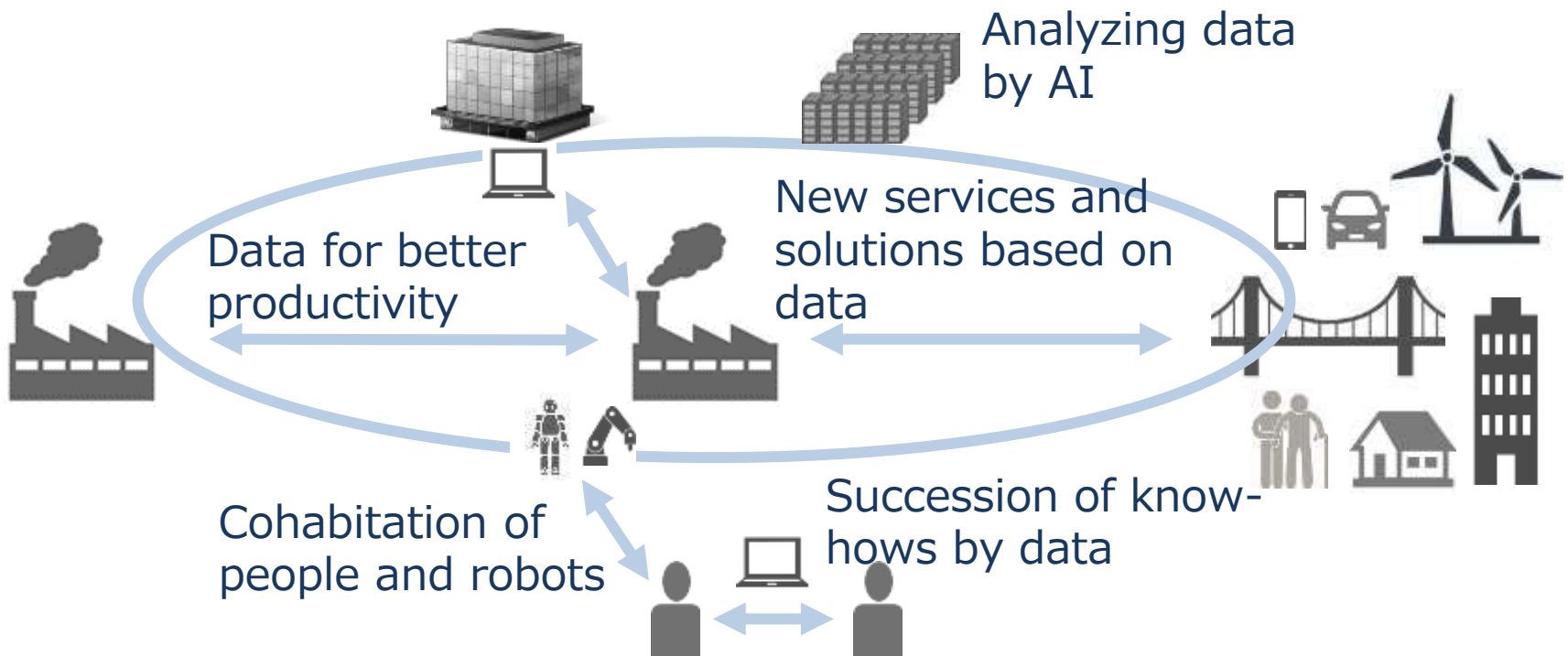
3 — **Human Resource Development**

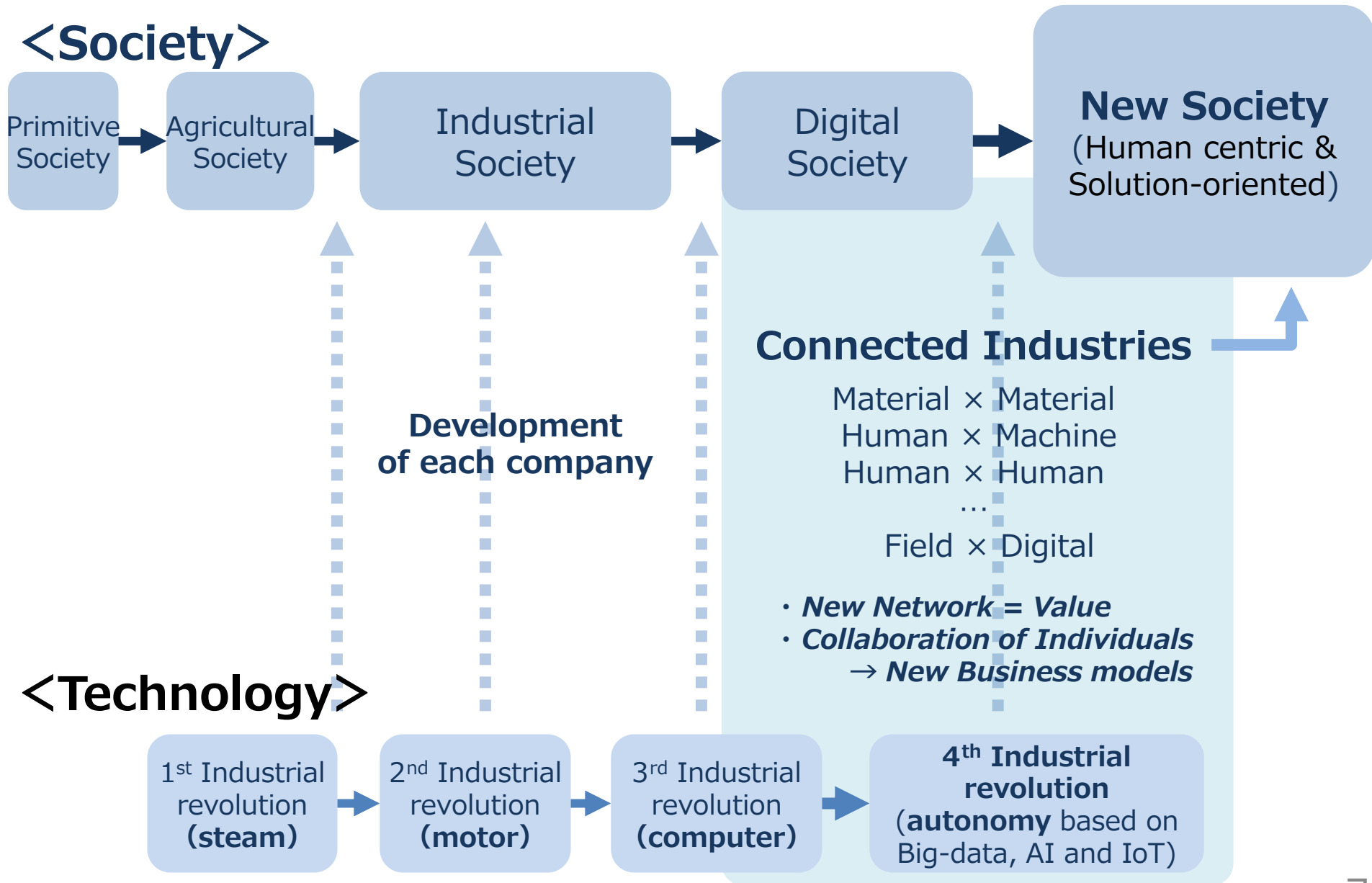*-- Knowledge and Skills for Digital Age --*

Why we focus on "Connected Industries" ?

- Using data efficiently will encourage innovation, better productivity and technology succession.

"Connected Industries" will become a big competence for Japanese industries, such as "Made in Japan", "Industrial Robots", "Kaizen", etc.

Analyzing data by AI

Data for better productivity

New services and solutions based on data

Cohabitation of people and robots

Succession of know-hows by data

"Connected Industries" and "New Society"

<Society>

Primitive Society → Agricultural Society → Industrial Society → Digital Society → **New Society** (Human centric & Solution-oriented)

Development of each company

Connected Industries

Material × Material
Human × Machine
Human × Human
...
Field × Digital

· *New Network = Value*
· *Collaboration of Individuals*
  → *New Business models*

<Technology>

1st Industrial revolution **(steam)** → 2nd Industrial revolution **(motor)** → 3rd Industrial revolution **(computer)** → **4th Industrial revolution** (**autonomy** based on Big-data, AI and IoT)

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- The "Connected Industries" is a comprehensive vision for the Japanese industrial economy. To promote the "Connected Industries", we facilitate plural political approaches.

１．Sectorial approach

（１）Smart manufacturing

（２）ITS (Intelligent Transport Systems)

（３）Robots and Drones

（４）Bio-technology and Health care

２．Common approach

（１）Data use

（２）IT-skills and training

（３）Cyber-security

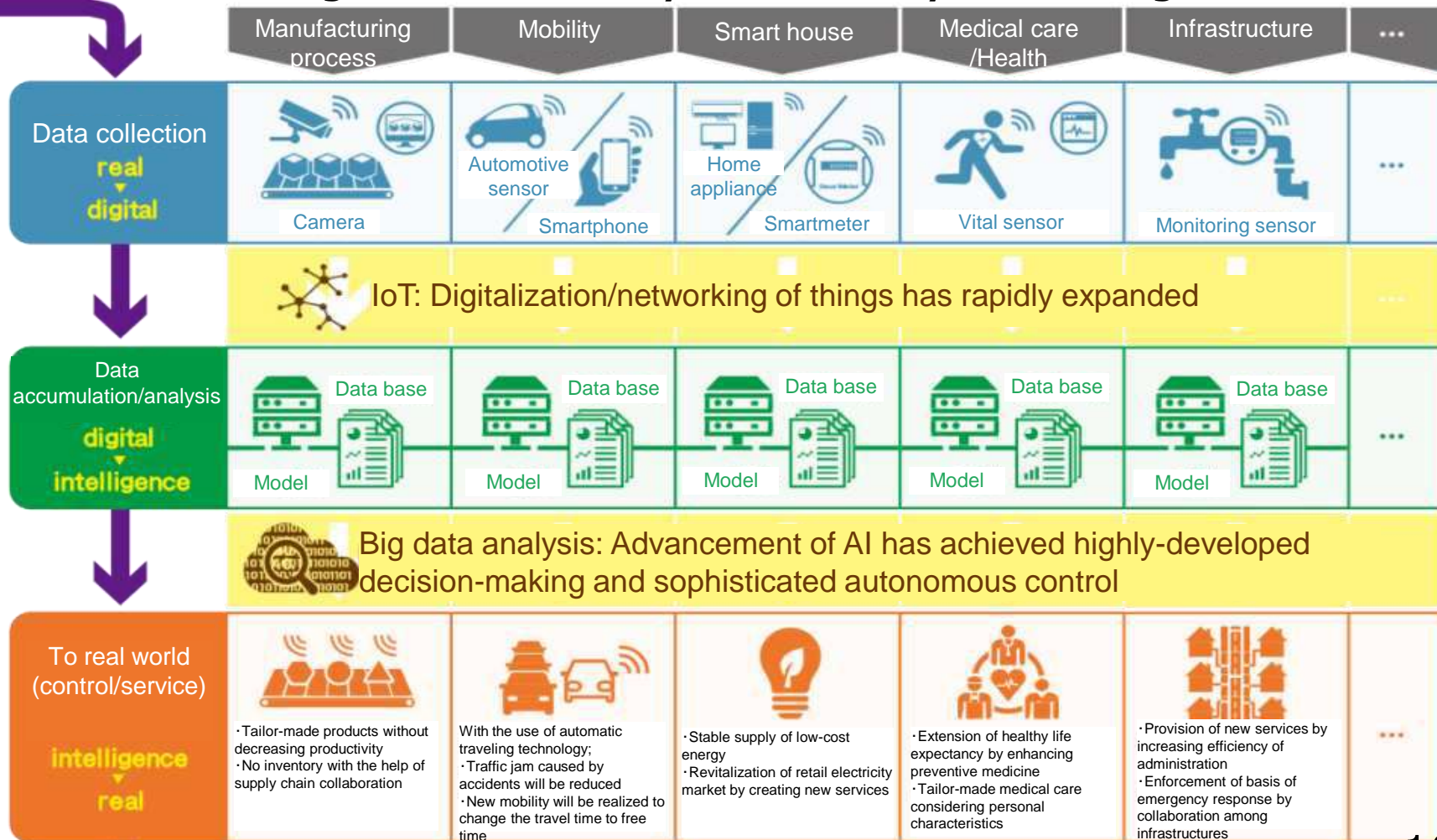（４）AI (Artificial Intelligence)

（５）Intellectual Property and Standardization

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Connected Industries in different sectors

- Data accumulation and expanded usage of data will create a new added-value in the data circles of diverse sectors.

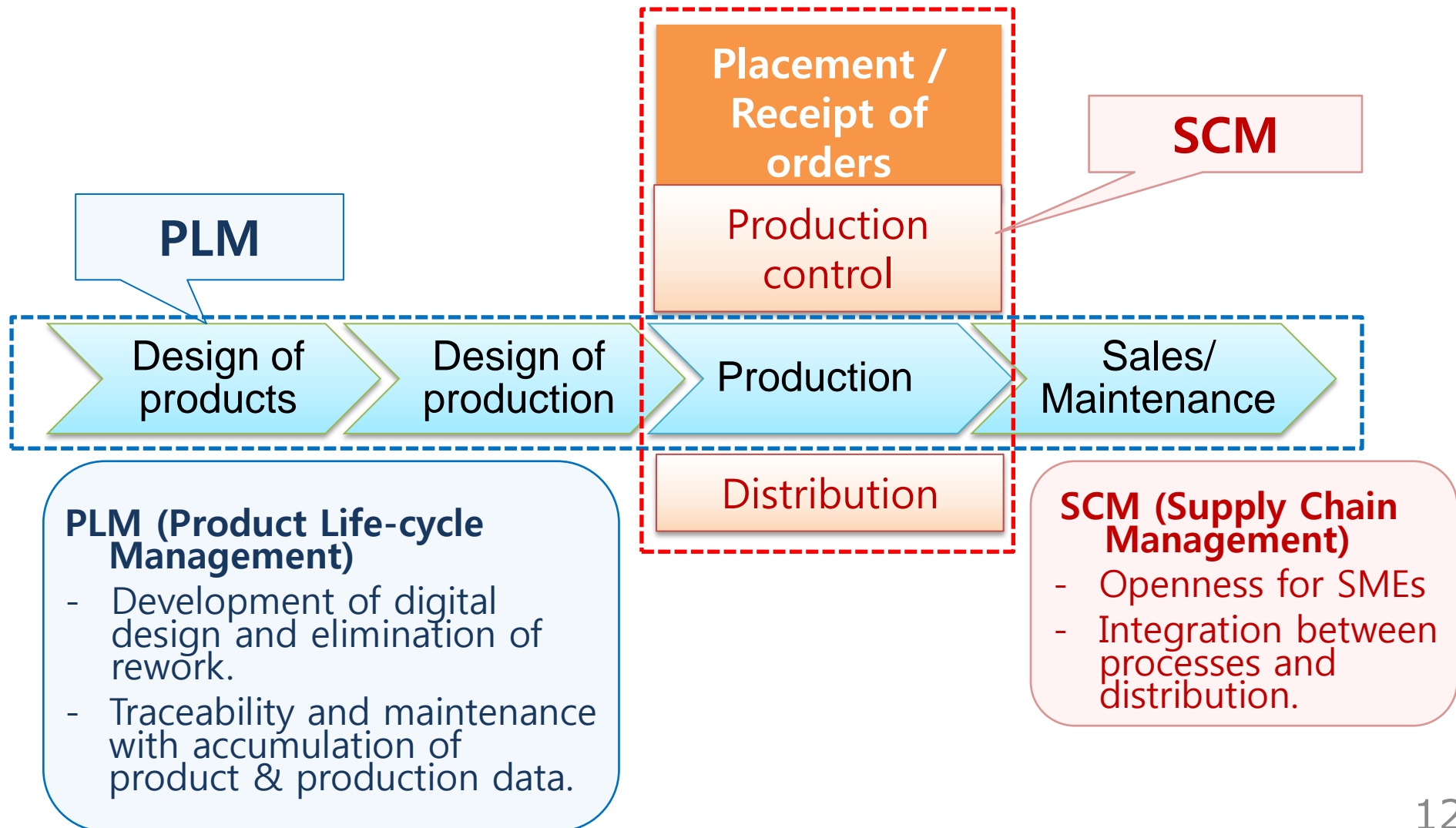**Fig. New business cycle created by IoT and big data**

	Manufacturing process	Mobility	Smart house	Medical care /Health	Infrastructure	...
Data collection real → digital	Camera	Automotive sensor / Smartphone	Home appliance / Smartmeter	Vital sensor	Monitoring sensor	...

IoT: Digitalization/networking of things has rapidly expanded

	Manufacturing process	Mobility	Smart house	Medical care /Health	Infrastructure	...
Data accumulation/analysis digital → intelligence	Data base / Model	Data base / Model	Data base / Model	Data base / Model	Data base / Model	...

Big data analysis: Advancement of AI has achieved highly-developed decision-making and sophisticated autonomous control

	Manufacturing process	Mobility	Smart house	Medical care /Health	Infrastructure	...
To real world (control/service) intelligence → real	·Tailor-made products without decreasing productivity ·No inventory with the help of supply chain collaboration	With the use of automatic traveling technology; ·Traffic jam caused by accidents will be reduced ·New mobility will be realized to change the travel time to free time	·Stable supply of low-cost energy ·Revitalization of retail electricity market by creating new services	·Extension of healthy life expectancy by enhancing preventive medicine ·Tailor-made medical care considering personal characteristics	·Provision of new services by increasing efficiency of administration ·Enforcement of basis of emergency response by collaboration among infrastructures	...

Focus points of Policies in Japan

- One of the most important fields of this concept is "Smart manufacturing Systems". We have been promoting policies from several different view-points.

- ✓ **Use Cases**

- ✓ **International Standardization (IEC/ISO)**

- ✓ **Cyber security**

- ✓ **Regulatory reform**

- ✓ **Support of SMEs**

- ✓ **Skill development and Training**

- ✓ **R&D**

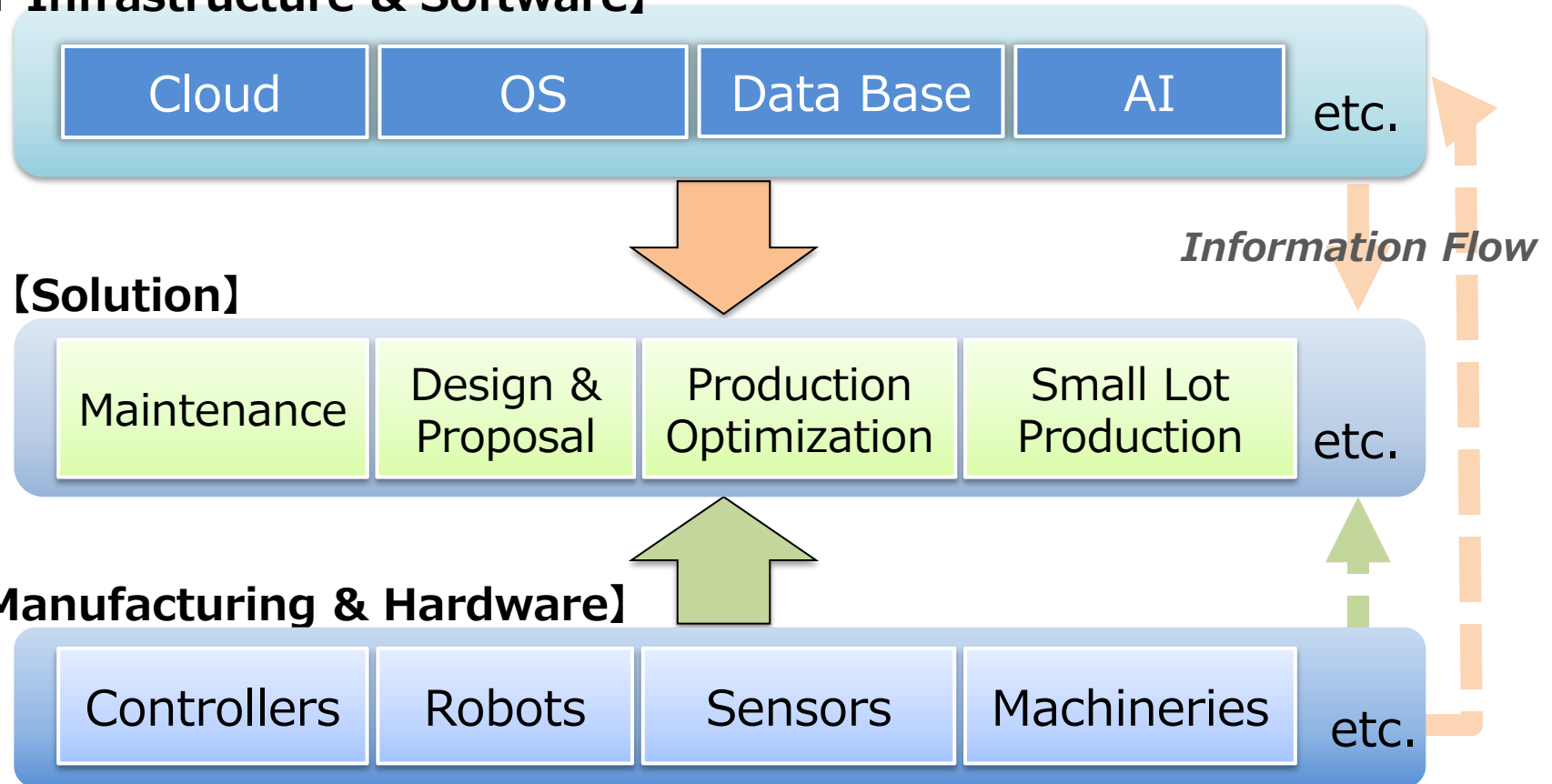- ✓ **International Cooperation**

Challenge in the Smart manufacturing

METI

- We underline that PLM and SCM will be the two key chains as the first step of the "Connected Industries".

PLM

SCM

Placement / Receipt of orders

Production control

Distribution

| Design of products | Design of production | Production | Sales/ Maintenance |

PLM (Product Life-cycle Management)

- Development of digital design and elimination of rework.
- Traceability and maintenance with accumulation of product & production data.

SCM (Supply Chain Management)

- Openness for SMEs
- Integration between processes and distribution.

Competition in the "Solution layer"

- More generally, three different layers should be connected, among which the most important will be "Solution & services".
- Companies of the other two layers have begun the competition to secure a seat in this "Solution layer".
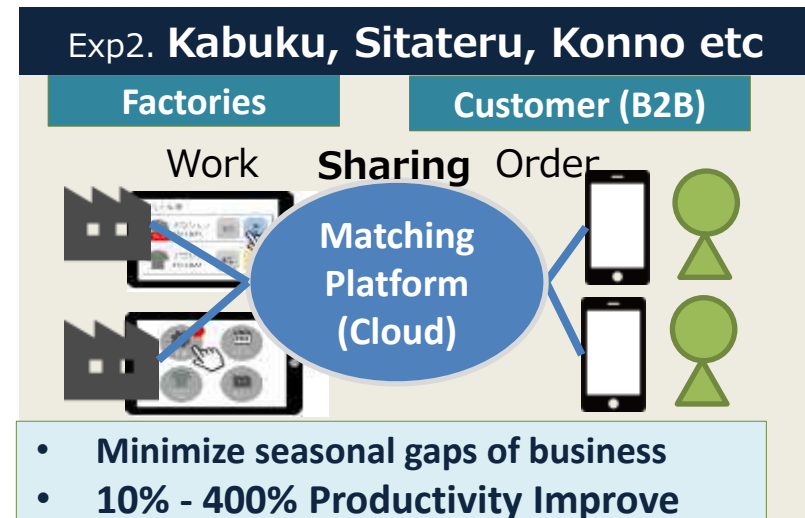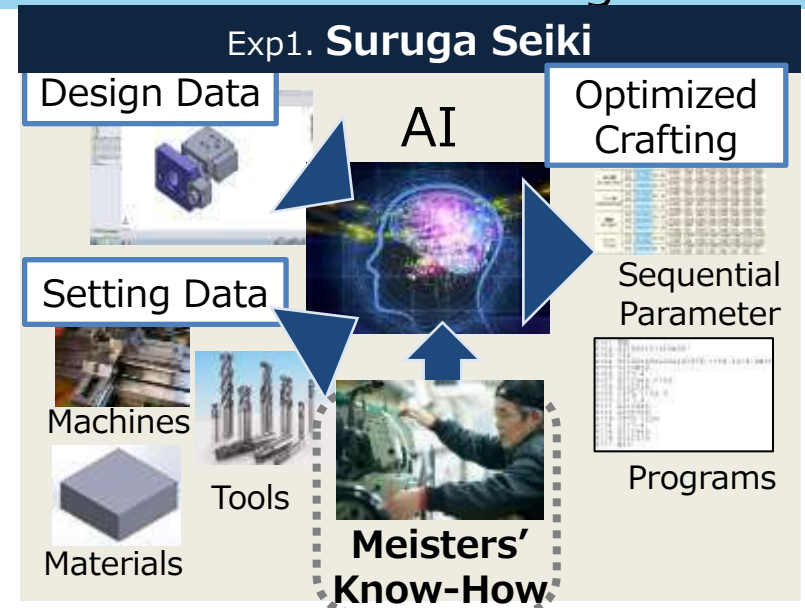
【IT Infrastructure & Software】

| Cloud | OS | Data Base | AI | etc. |

【Solution】

| Maintenance | Design & Proposal | Production Optimization | Small Lot Production | etc. |

Information Flow

【Manufacturing & Hardware】

| Controllers | Robots | Sensors | Machineries | etc. |

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Strategy in B-to-C Businesses

Network & Infrastructure

IoT platformers (ex. GAFA, etc.)

② Big Data analysis

① Data

Solution

High Value-added

③ Provide the best solutions, recommendations based on data analysis

Consumers

Purchase products and services

Use cases

- METI has been collecting and sharing "Use-cases" for a couple of years. This action is the start point for the future design.

Collected cases

About 200 cases (2016FY)
(Big companies : SMEs = 7:3)
-> **https://www.jmfrri.gr.jp/english/430.html**

Type of cases

(1) SCM
  ➤ Digitization of meisters' technics
  ➤ Predictive Maintenance
  ➤ Optimization of Production
  ➤ Co-Orders
(2) PLM
  ➤ Reciprocal Data circulation
  ➤ Design and Manufacturing
  ➤ Logistics
  ➤ Customer Services

Exp1. **Suruga Seiki**

Design Data

AI

Optimized Crafting

Setting Data

Sequential Parameter

Machines

Tools

Materials

Meisters' Know-How

Programs

Exp2. **Kabuku, Sitateru, Konno etc**

Factories	**Customer (B2B)**

Work **Sharing** Order

Matching Platform (Cloud)

- **Minimize seasonal gaps of business**
- **10% - 400% Productivity Improve**

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International standardization

- Japan would like to contribute actively on the international discussion of the standardization in IEC & ISO.

Related Committees

IEC : TC65, SG8, SMB, MSB
ISO : TC184, TMB

Main Topics

✓ Canvas / Models
✓ Use cases
✓ Functions
✓ Data

Associations

US : IIC, NIST
Germany : Platform Industrie 4.0
Japan : RRI, AIST, IVI

Models

US : IIRA, NIST-model
Germany : RAMI4.0
Japan : IVRA (URM-MM)

Cyber-Physical Modeling

Challenges of creating models in the cyber space concerning actions, directions, judgments, etc. in the physical space

Japan-Germany Cooperation

Face-to-face meeting : 4 times
Telephone-meeting : 3 times

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Regulatory Reform

Data Ownership

- **Publish a <u>Data-Contract Guideline</u> soon**
  - ✓ A right of data utilization should be clarified in B2B contract
  - ✓ List up elements to consider for deciding the right

  ▶ - **Promote making use of the Guideline**
  - **Further revision after demonstration with industries & discussion with other countries**

Intellectual Property Rights

- **Issued <u>policy recommendation reports in April</u>**
  - ✓ Necessary changes in Law and Adm system in near future
  - ✓ **<u>Patent, trade secret & standardization</u>** strategies in IoT era

Competition Policy

- **Hold policy advisory committee (on-going)**
  - ✓ Policy topics on data accumulation and competition law

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Support for SMEs

- METI encourages institutions in Japanese local areas that are supporting SMEs.

Where

21 cities or prefectures
(Osaka, Kita-Kyushu, Gifu, etc.)

Who

Local Institutions

To Whom

Local companies (mainly SMEs)

What

- ✓ Tools
- ✓ Sharing use-cases
- ✓ Training & education
- ✓ Consulting

Soft-pia Japan (Gifu pref.)

Activities

- For the SMEs located around this famous IT-area.
- Wide rang of student generation
- Team-work and hands-on support
- Any necessary advices

Directors

- IT-system engineer
- IT and Investment manager

OUTLINE

Hannover Declaration

- Japan and Germany cooperate closely, in order to contribute on solving social problems with new technologies.

Date

19 March, 2017 in CeBIT@Hannover

New fields of cooperation

（1）**Cyber security for IoT / Industry 4.0**

（2）**International standardization**

（3）**Regulatory reform**

（4）**Support for SMEs**

（5）**R&D**

（6）**Platforms**

（7）**Digital Skills and training**
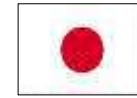
（8）**Automotive industry**

（9）**ICT Cooperation**

Signed by

Minister SEKO, Minister TAKAICHI   Minister Zypries

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Japan-Germany cooperation

Common Profit	Competence of Manufacturing Industry under he digitalization	
Current Strength	○ Industry 4.0 ○ Systematic Approach	○ Technology ○ On-site know-how

New Digital Society (Human centric society), under collaboration of each country's strength

Cooperation between Japan and Germany

Issues for mutual cooperation

Standardization	Cyber-Security
Regulatory reform	Training
	R&D
Support of SMEs	etc.

Japan-France Cooperation

- On 23 January 2017, METI (Japan) and BPI (France) agreed to establish "Industry of the Future/IoT WG" under the Japan-France Industrial Cooperation Committee and to accelerate their cooperation in the IoT sector.

Promotion of IoT joint projects

Founding bodies of each country, NEDO and bpi France, will take care of the support for Joint Projects.

【**examples of target sectors**】

Mechatronics and micro-machines, Connected car and driving assistance,

IoT Security and connectivity, Big Data/ algorithm/ Fog computing, M2M chips,

embedded software, digital simulation for industry, …..

Focus of Policies

- ➢ Support of SMEs & Start-up companies (business matching)
- ➢ Standardization
- ➢ IoT Security
- ➢ Opinion exchange (IoT policies, Training, Regulation, etc.)

Sharing Best Practices: use-case online Map

- **Objectives of online map cooperation**
  - ✓ Visualize achievements
  - ✓ Share best practices
  - ✓ Promote business cooperation

- Japan: https://www.jmfrri.gr.jp/english/430.html
- Germany: http://www.plattform-i40.de/I40/Navigation/EN/InPractice/UseCases/use-cases
- France: http://exemples-aif.industrie-dufutur.org/

Thank you very much for joining us.

Reference

RRI(Robot Revolution Initiative) WG1

METI

Robot Revolution Initiative

WG1: Manufacturing Business Revolution through IoT

report   propose

Advisory Board   strategy

Formulate a draft about overall activity policy and strategy
Members : experts(professors) 、Japanese and foreign company

Action Groups （AG)

①**International standardization AG**
②**Medium-sized enterprise and SME support AG**
③**Use Case Generation & Utilization AG**

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WG for Promotion of Robot Utilization in Society

WG for Robot Innovation