
2016 R&D Strategy

To become “An Innovation Partner for the IoT Era”

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Chief Technology Officer

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1. Basic directions for 2018 Mid-term Management Plan
2. Creating service business by accelerating collaborative creation
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2015 Mid-term Management Plan - Achieve growth & Hitachi's transformation -

Innovation

Global

Transformation

Hitachi Gr. business policy: increase business income

From “product-out” to “market-in”
Shift to “customer-driven”



Realign R&D organization, enhance innovation strength

1. Assign researchers close to customers to expand collaborative creation
2. Create innovative technology that satisfy market needs

1-2 Events worldwide

- **Hitachi Social Innovation Forum**
London ['15/6]
Munich ['15/10]



- **Hitachi Social Innovation Forum**
Las Vegas ['15/4]
- **CSI-North America New facility**
Santa Clara ['16/1]



CSI-Europe

CSI-North America

CSI-Tokyo

CSI-China

- **Hitachi Technology Forum**
Beijing ['15/12]



- **Hitachi Social Innovation Forum**
Tokyo ['15/10]
- **Technology Community**
Tokyo ['15/11]



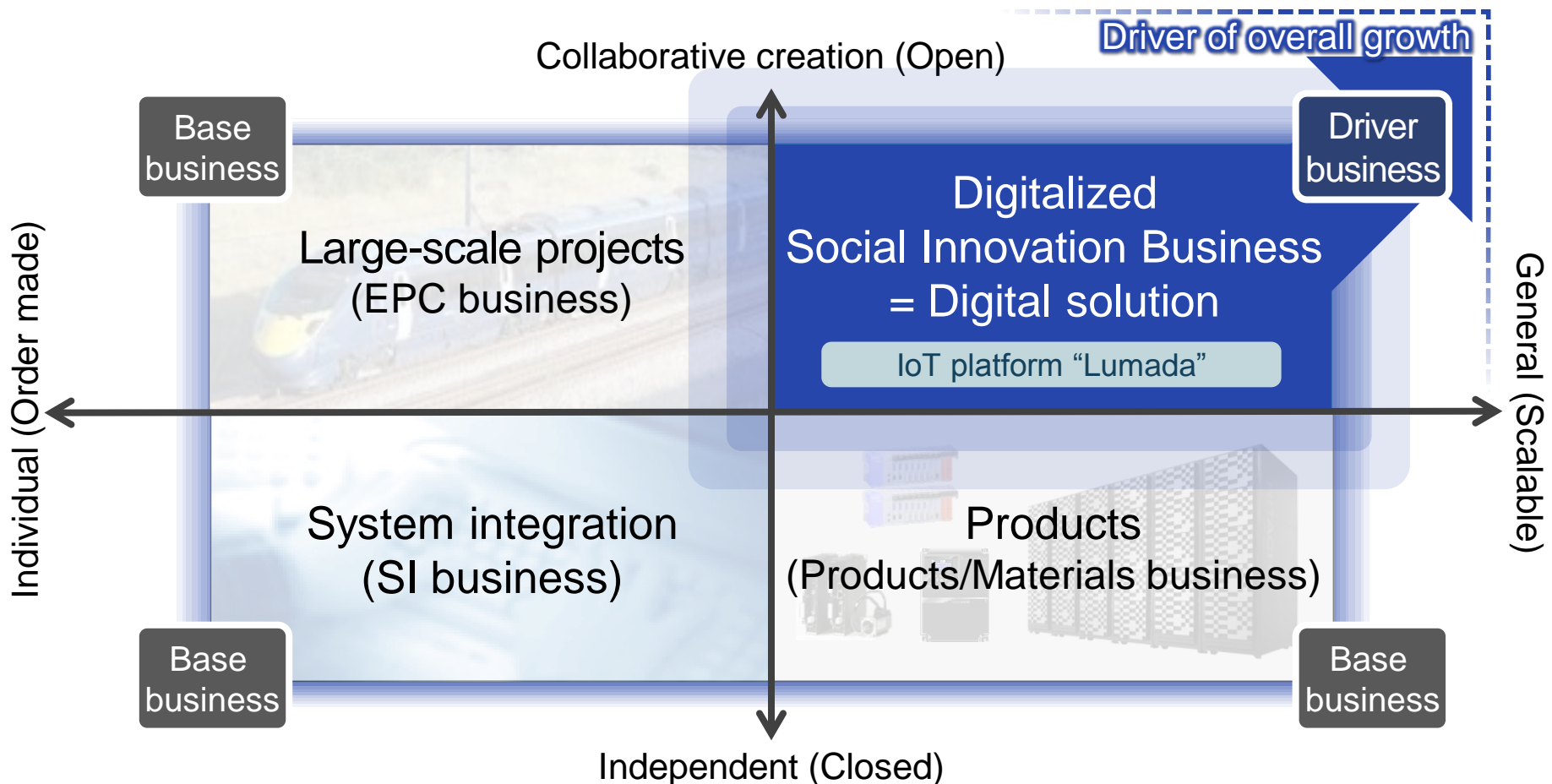
» Strengthening engagement with customers by holding events worldwide

1-3 Collaborative creation with customers



An Innovation Partner for the IoT Era

Accelerate collaborative creation with customers through advanced Social Innovation Business



2018 Mid-Term Management Plan: What Hitachi hopes to become **An Innovation Partner for the IoT Era**

Accelerate collaborative creation with customers
through advanced Social Innovation Business



Basic directives for the R&D Group

Create business innovation amidst uncertainty

- Create service business by accelerating collaborative creation
- Build-up technology platforms for Service & Product business growth
- Challenge future society issues through open innovation

Section 2

Section 3

Section 4

Driving R&D close to customer sites

Business structure from FY2016

Customers

Front

Regional bases

Customers' segments (12 BUs)

Platform

Core of Social Innovation

Products

Industrial products,
Automotive parts,
Materials, etc.

[R&D structure from FY2015]

● Global Center for Social Innovation

CSI

Developing services in keeping with the needs of customers in each region

North America 100

Europe 70

China 115

Asia 65

Japan 200

[Total: 550]



● Center for Technology Innovation

CTI

Establishing Global No. 1 technologies (Platforms, Products)

[Japan: 2,050]

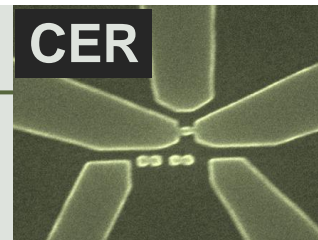


● Center for Exploratory Research

CER

Resolving future societal issues

[Japan: 100]



[Total: 2,700] (+100 from FY2015)

New research building @Kokubunji site to facilitate co-creation

Cutting-edge research equipment for rapid prototyping in accordance with customer needs, will be installed to promote collaborative research with customers worldwide

Construction to be completed in March 2019

Jinsō-tō

Rapid prototyping for materializing ideas

Kyōsō-tō

Environment to hold discussions with customers worldwide (Convention center & Collaboration space)

Odaira Memorial Building

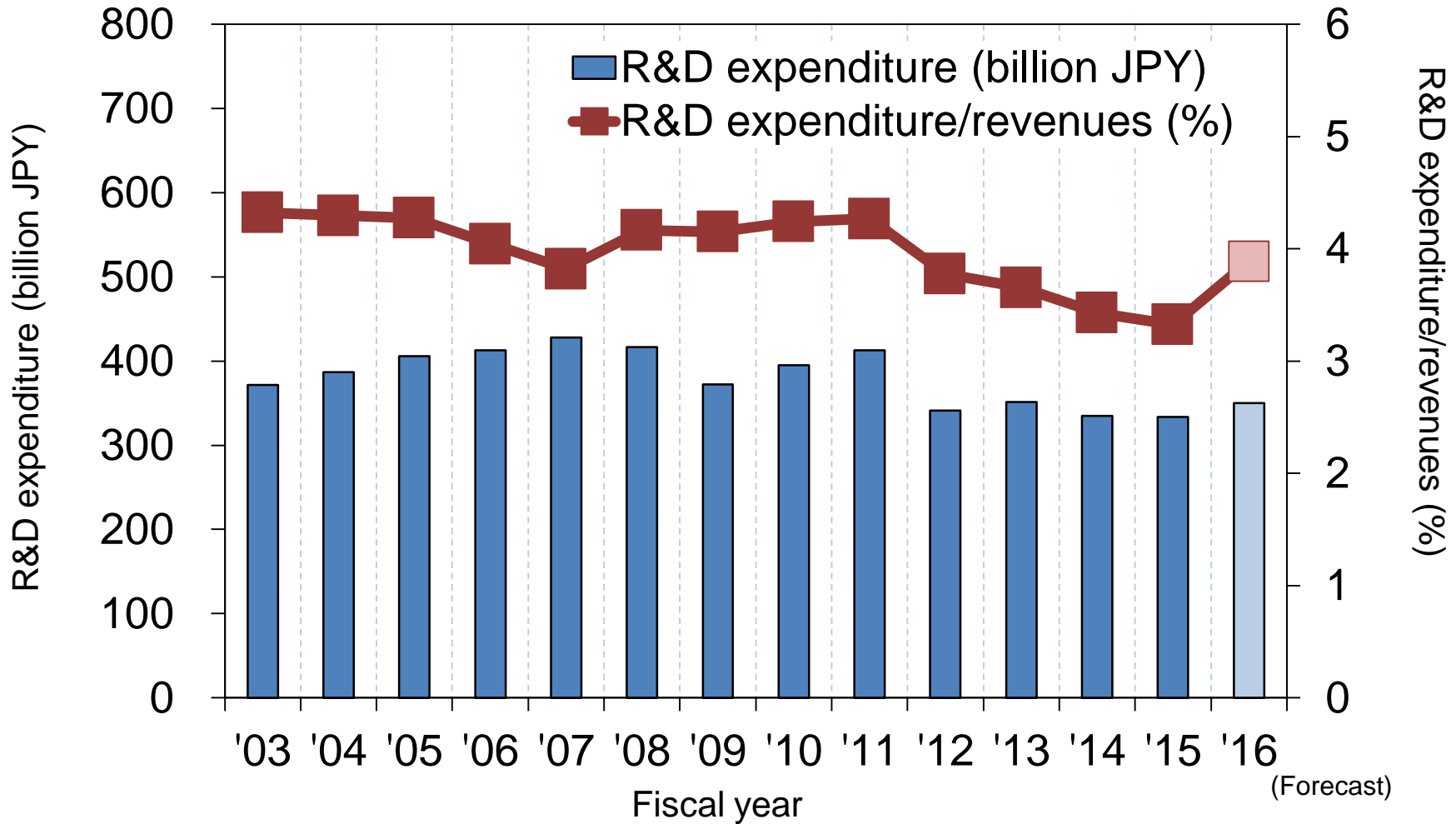
Entrance to welcome visitors

1-8 Global Research: Collaboration between sites

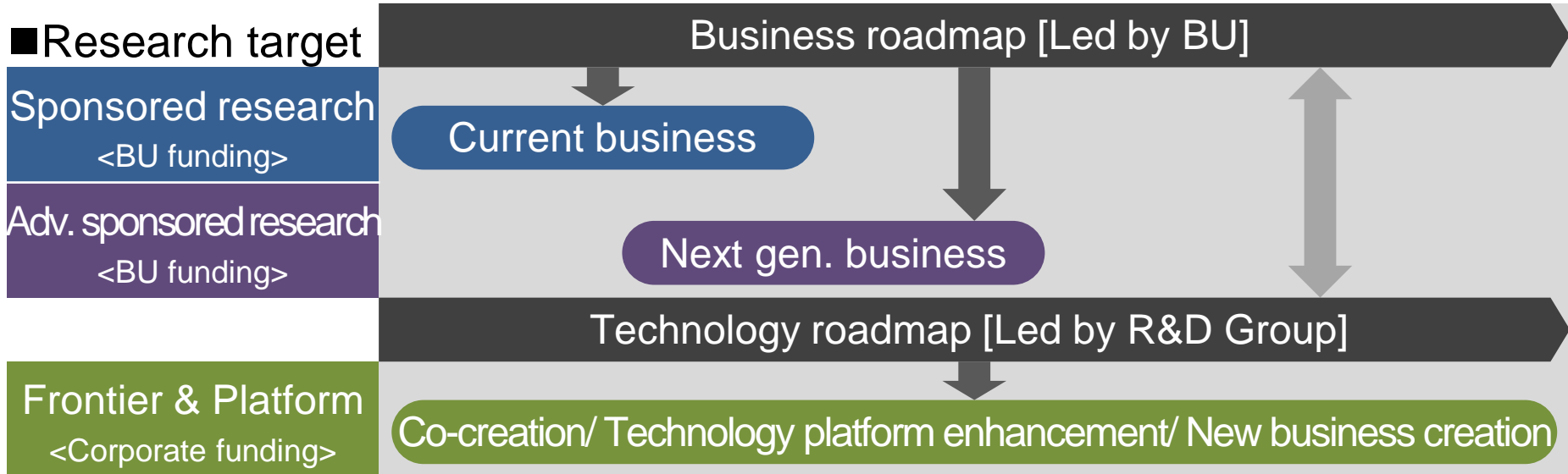


1-8 Total R&D expenditure for Hitachi Group

Approx. 4% of revenues is invested in Hitachi Group R&D



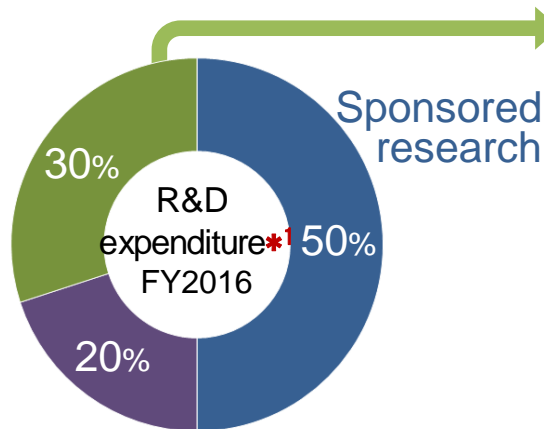
Frontier & Platform Research: Strengthening digital solutions research



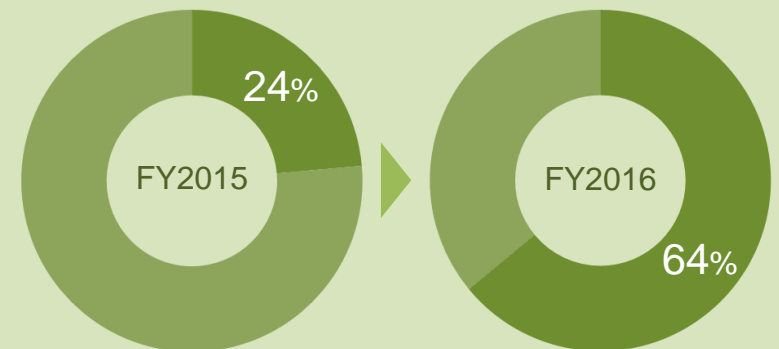
Portfolio

Frontier & Platform Research

Advanced sponsored research



% Change in digital solutions related research



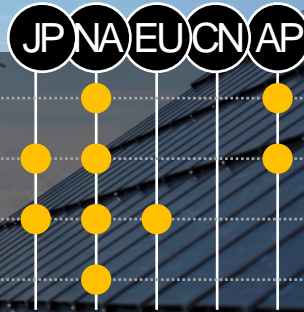
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Co-creating digital solutions using IoT/Big Data/AI

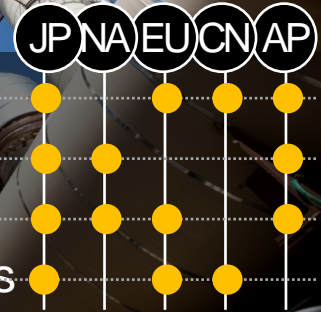
Power/Energy

- Microgrid
- Wide-area grid stabilization
- Decision support system
- Wind turbine gen. system



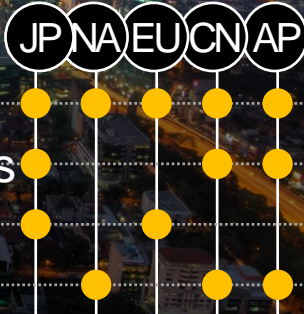
Industry/Distribution/Water

- Value chain optimization
- Demand forecasting
- Predictive diagnostics
- Smart manufacturing/Logistics



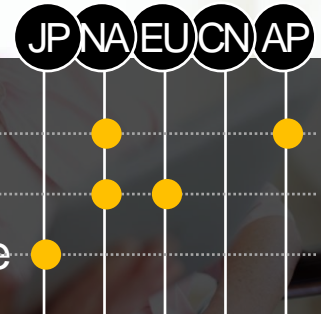
Urban

- Physical security
- Human behavior/flow analysis
- Train management system
- Video surveillance



Finance/Public/Healthcare

- Digital network payment
- Hospital mgmt. reforms
- Integrated community care



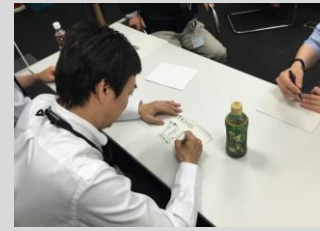
Derive business opportunities from *Kizashi* through joint workshops
& validate with prototype

Vision design

Analyze customer issues

Discover business opportunities

Create service ideas



Monozukuri-related *Kizashi*

Increased *Monozukuri* close to market (locally produced & consumed *Monozukuri*)

Increased quality from non-experts due to work support

Change in supply chain structure due to design data circulation and 3D printer manufacturing

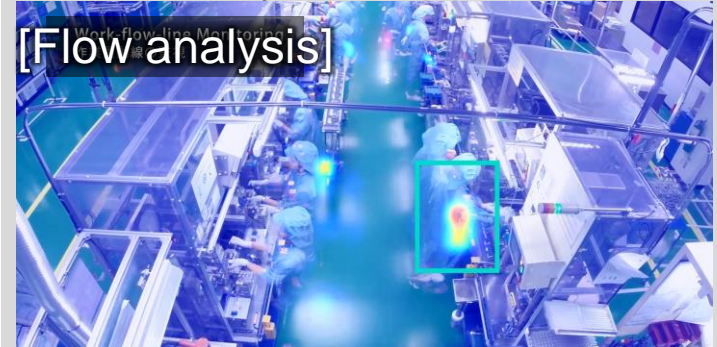
Increased automation of supporting tasks due to AI

Increased security risks

Service prototyping

Work analysis/support by IoT

[Flow analysis]



[Movement analysis]



PoC with several customers

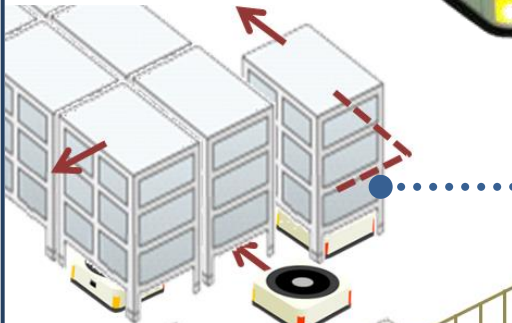
Improve warehouse efficiency by automated guided vehicle & AI-based demand prediction

Automated guided vehicle

OT

Challenge: Decreasing availability of workers

Automated guided vehicle (AGV) Racrew



3x more efficient than only manual labor

AI-based demand prediction

IT

Challenge: Dynamic demand-based work orders

Warehouse cart allocation system



AI*
(Lumada)

Picking order



AI predicts demand, optimizes the order of carts & issues work orders



8% efficiency increase due to AI

Optimization across the total value chain



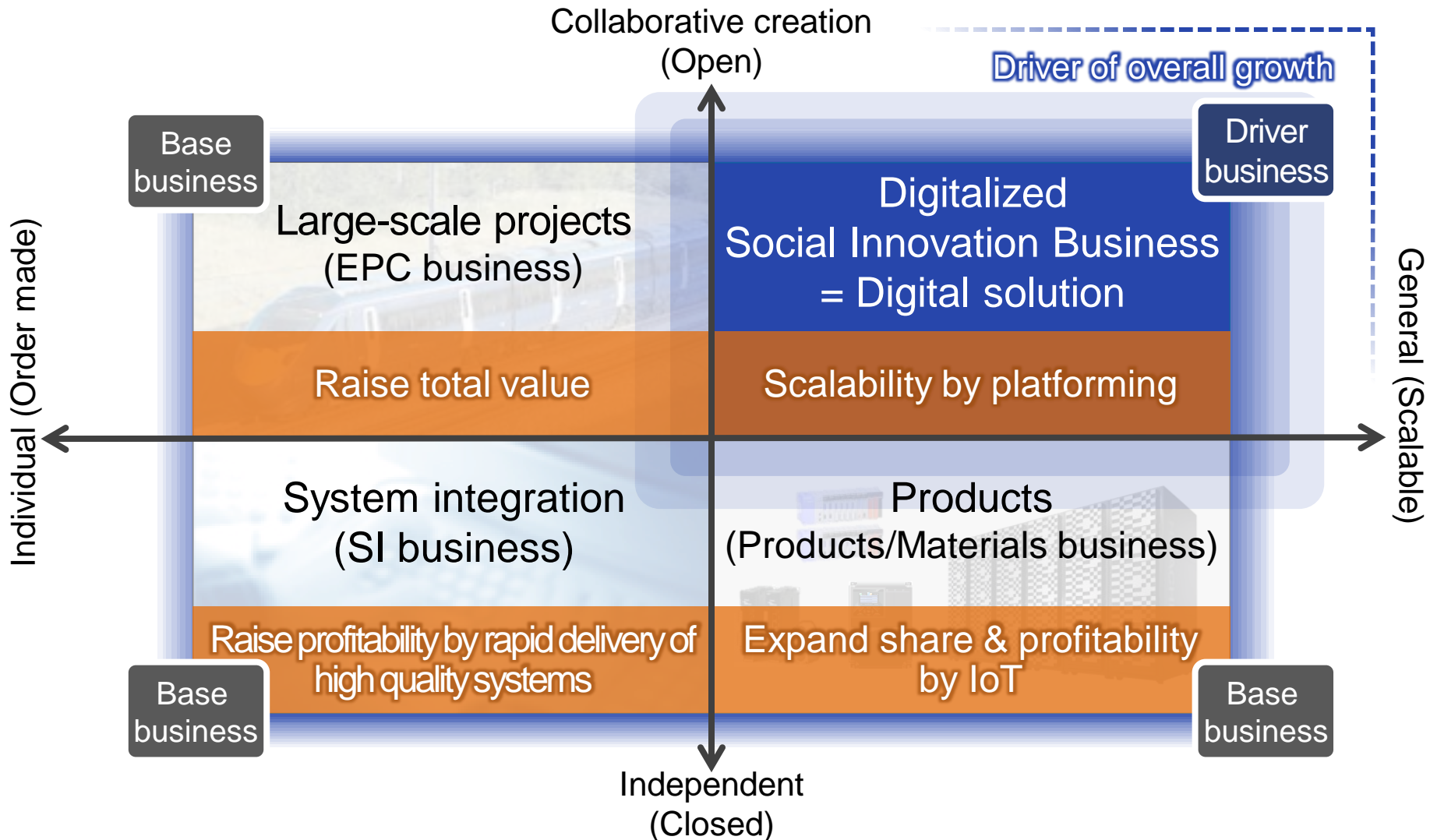
“Connecting” to create new value



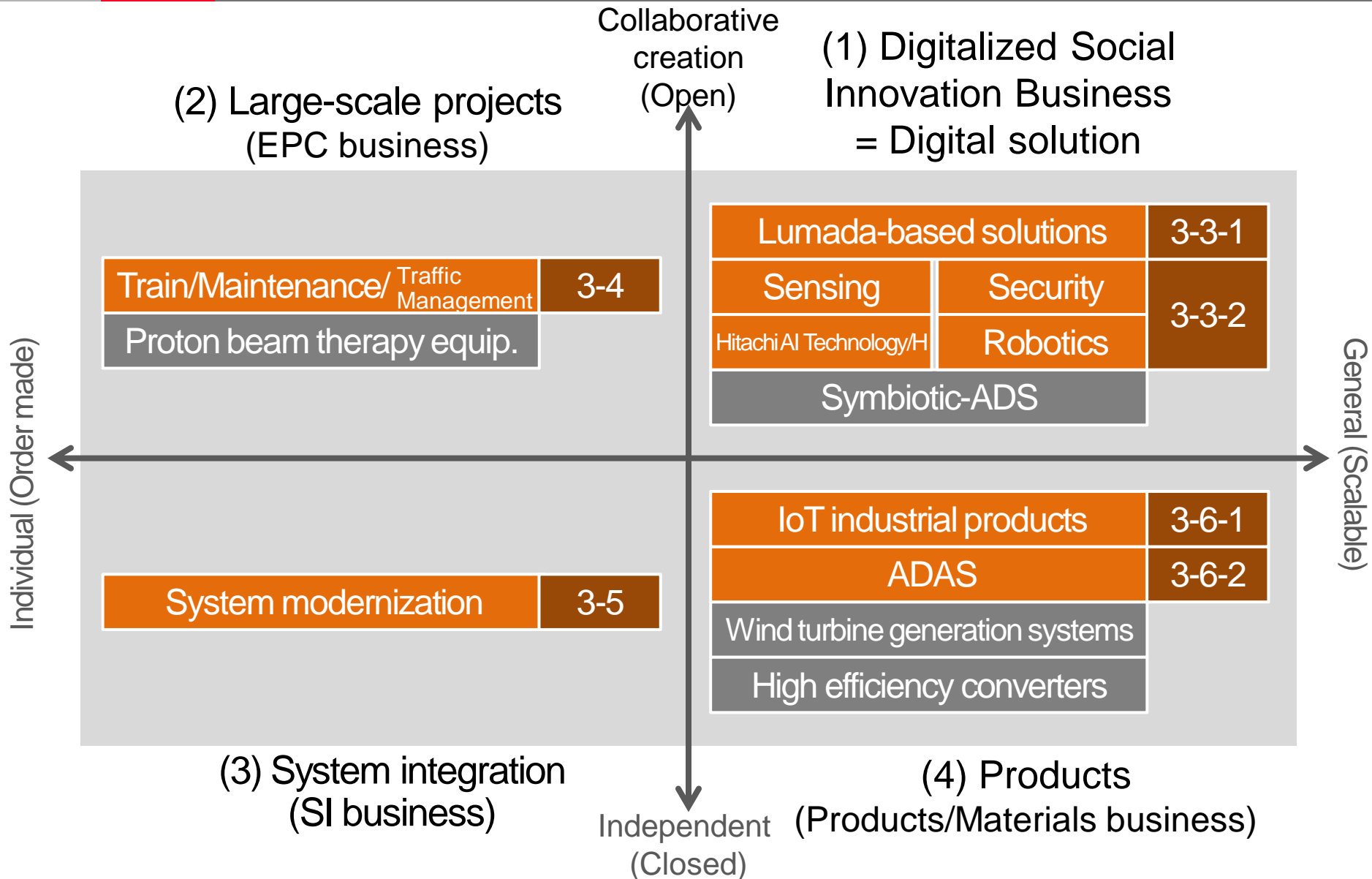
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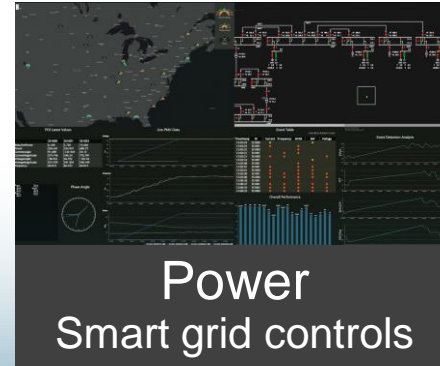
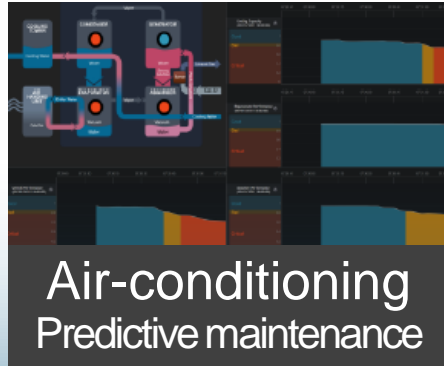
Contribute to Social Innovation Business by resolving challenges



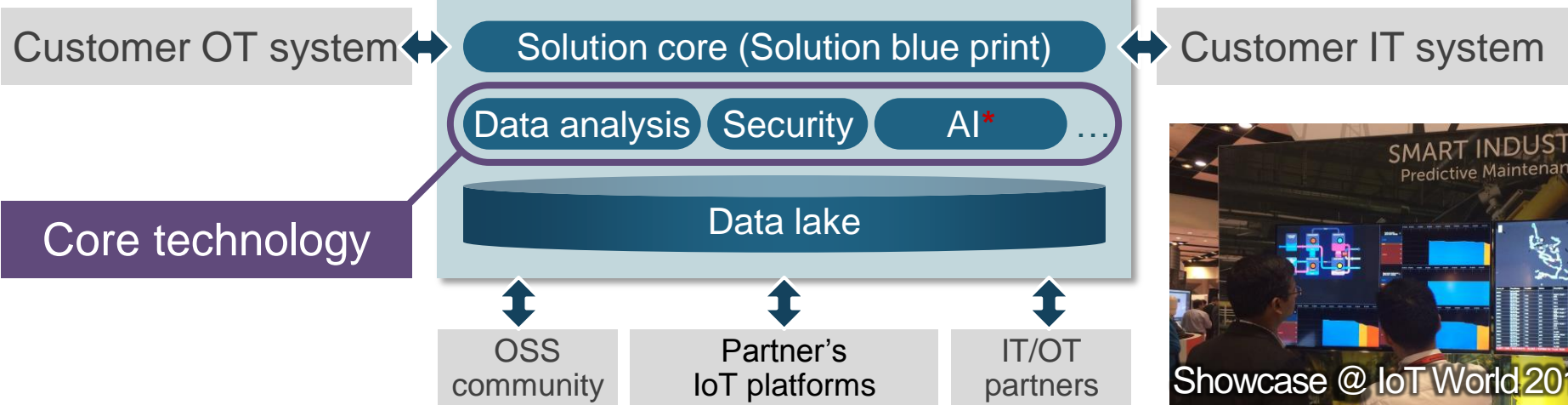
3-2 Technology platforms for business growth



Build-up multiple digital solutions on Lumada



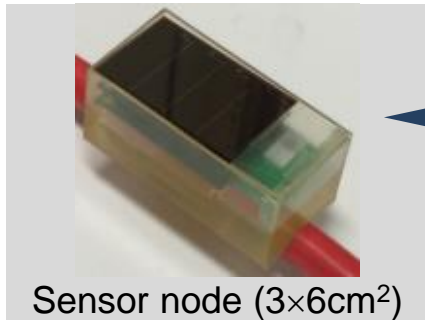
IoT platform "Lumada"



Strengthen technology forming the revenue stream in IoT

Sensing

Environmentally-powered sensing system



Sensor node (3×6cm²)

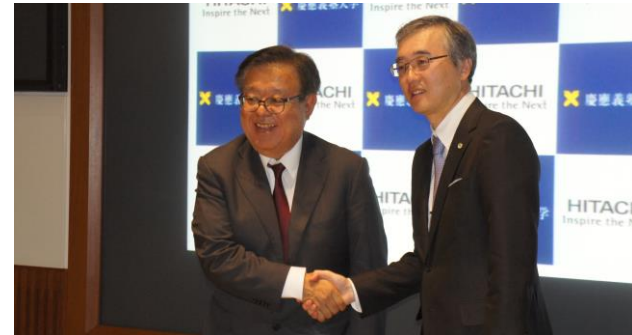


Efficiently collecting and storing energy from the environment

Field test @ internal factory ['16/6]

Security

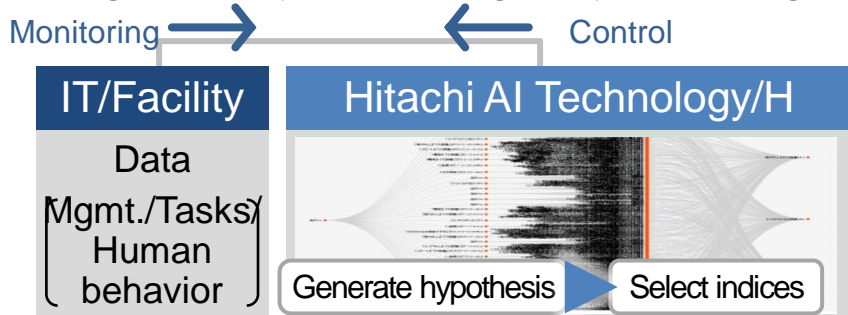
Control ramification of threats from the open market



Joint research with Keio University ['16/4]

AI

Making current systems intelligent by connecting to AI



Hitachi AI Technology/Business Improvement Service ['15/10]

Robotics

New human-symbiotic service robot EMIEW3



Press conference, Collaborative creation activity ['16/4]

Raise total value of railways by transforming rolling stock, maintenance & operations

Rolling stock / Maintenance

New orders received for
 U.K. Rolling stock/Maintenance for Abellio
 U.K. Rolling stock/Maintenance for First Great Western
 U.K. Rolling stock/Maintenance for TransPennine Express



Scalable carriage design

Reliability-centered maintenance (RCM)



Monitoring standard condition



Raising efficiency by RCM

Traffic Management

New order received for UK ThamesLink TMS



Energy efficient driving

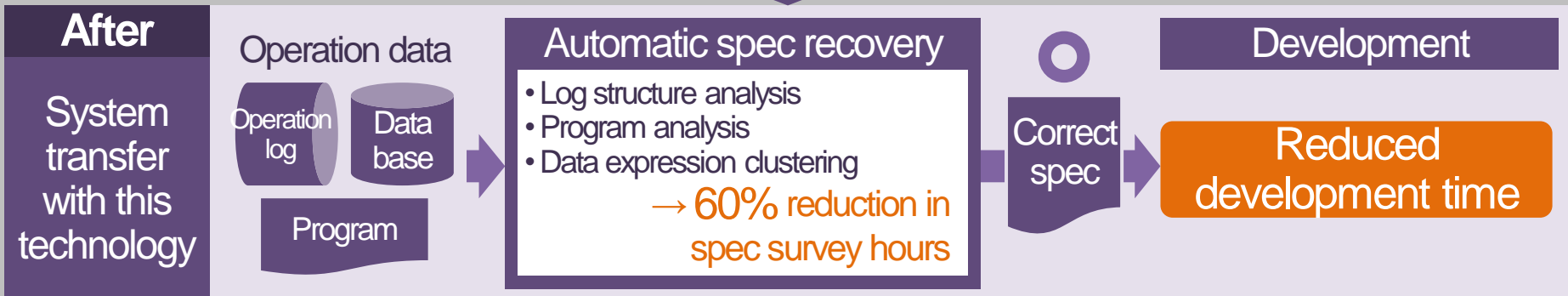
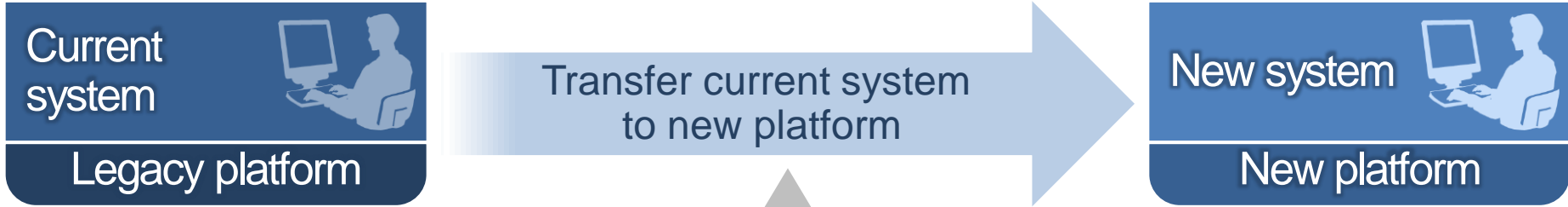


Efficient cars & crew operations

Coordinated cooperation with the field through TMS

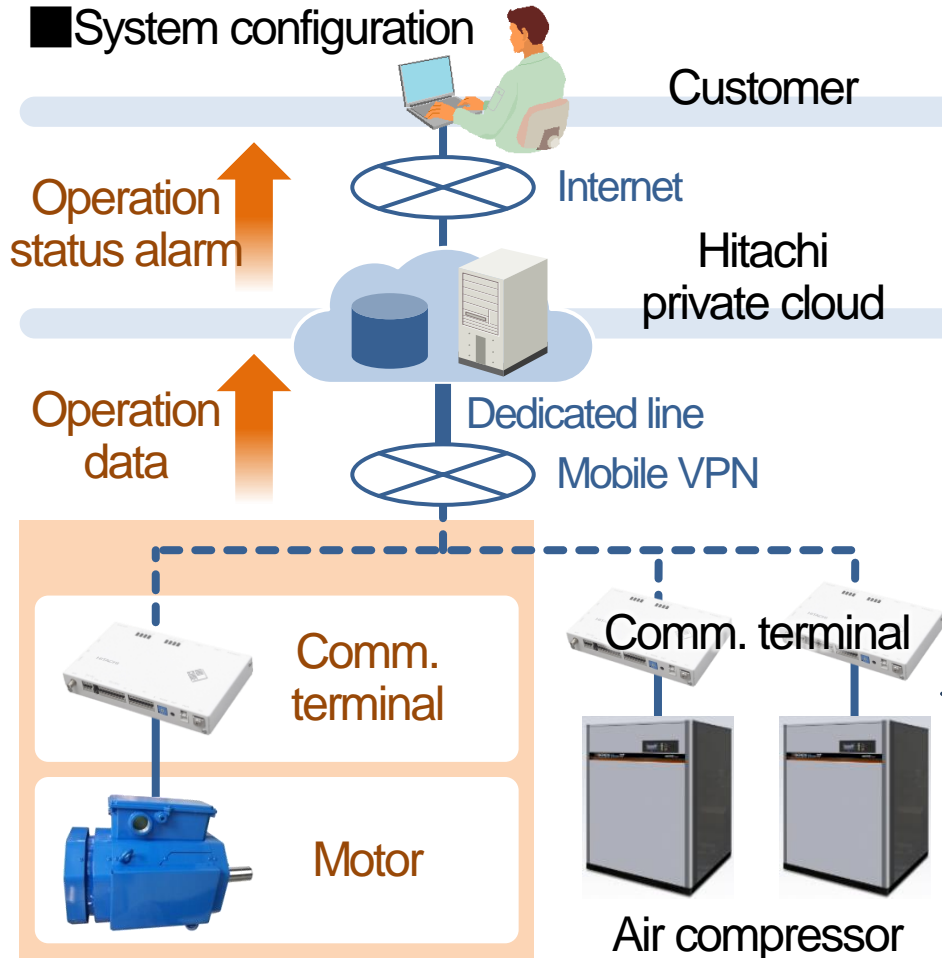
3-5 (3) SI business: System modernization



Recover business spec from legacy system, enabling rapid delivery of new systems




3-6-1 (4) Product business: IoT compatible industrial products

Visualization of operation status & optimization of maintenance by IoT of facility equipment



Wireless carrier terminal		
Exterior	Product	Comm.
	Ubicube-GW	3G
	CPTrans series	LTE

Product example

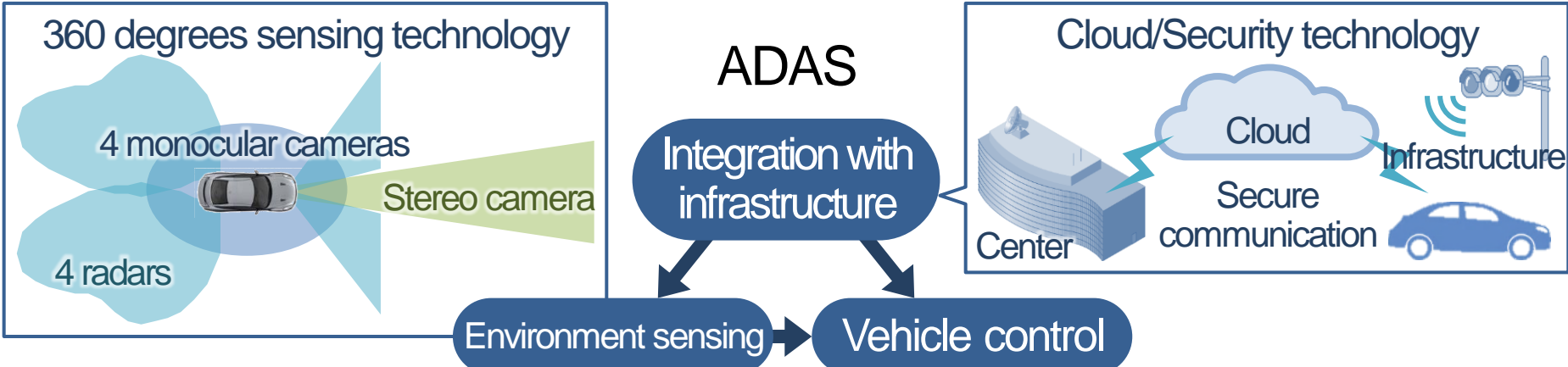


Controller integrated permanent magnet motor
Use case in Hitachi HE pump*

Sensor embedded IoT compatible products » In field-trial [‘15/11~]

3-6-2 (4) Product business: ADAS

Automated driving by integration with infrastructure, environmental sensing and vehicular control



Automated driving on highways/urban roads Begin public road tests ['16/2]

	Recognition	Decision	Operation
Highway	<p>Signs Vehicles Lanes</p>	<p>Integrate information</p>	<p>Safe driving</p>
Road	<p>Lights Bicycles Pedestrians</p>	<p>Prediction</p>	<p>Safe + Practical driving</p>

Complexity of obstacle behavior pattern

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4-1 Challenging future societal issues



Advanced road traffic systems

Energy value chains

New manufacturing systems

Integrated community care system

Smart food chain systems

Cabinet Office of Japan
5th Science and Technology Basic Plan

Super Smart Society Society 5.0

Infrastructure maintenance & renewal

Resilience against natural disasters

Smart production systems

Hospitality systems

Global environment information platform

Integrated materials development system

Incubating for a Super Smart Society

Information sciences

Physical sciences

Life sciences

Frontier

Build-up collaboration networks for rapid incubation

Life sciences Regenerative medicine

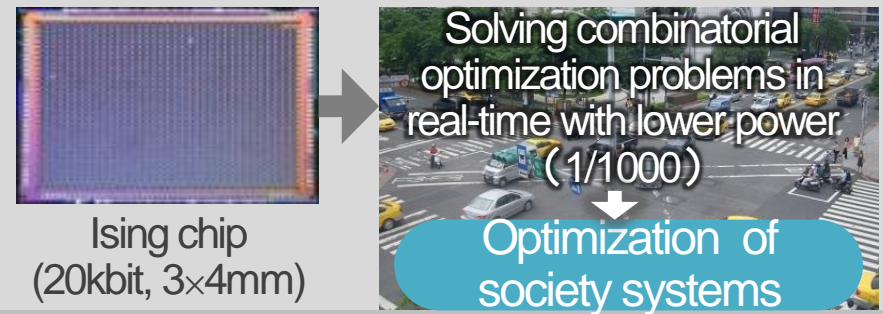
Low-cost cell production for proliferation of regenerative medicine(*1)



Partner: Kyoto University, Sumitomo Dainippon Pharma

Info. sciences New-paradigm computing

Optimization of complex society systems



Partner: Hokkaido University

Life sciences Breath-alcohol detection

Portable prototype for vehicle smart key



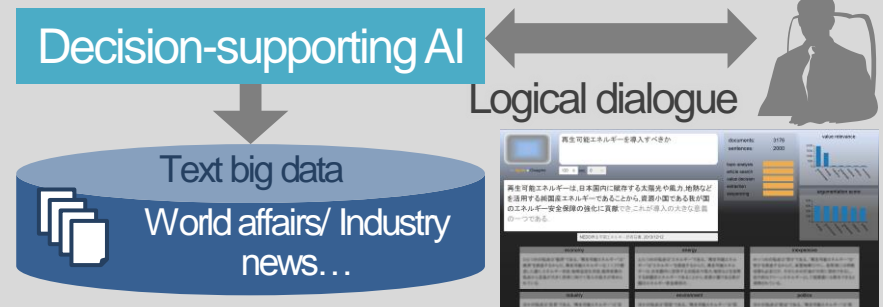
- Reacts only to human breath; tamper resistant
- Ignition interlock to prevent drink-driving

Eradication of drink-driving

Partner: Honda R&D Co.

Info. sciences Logical dialogue AI

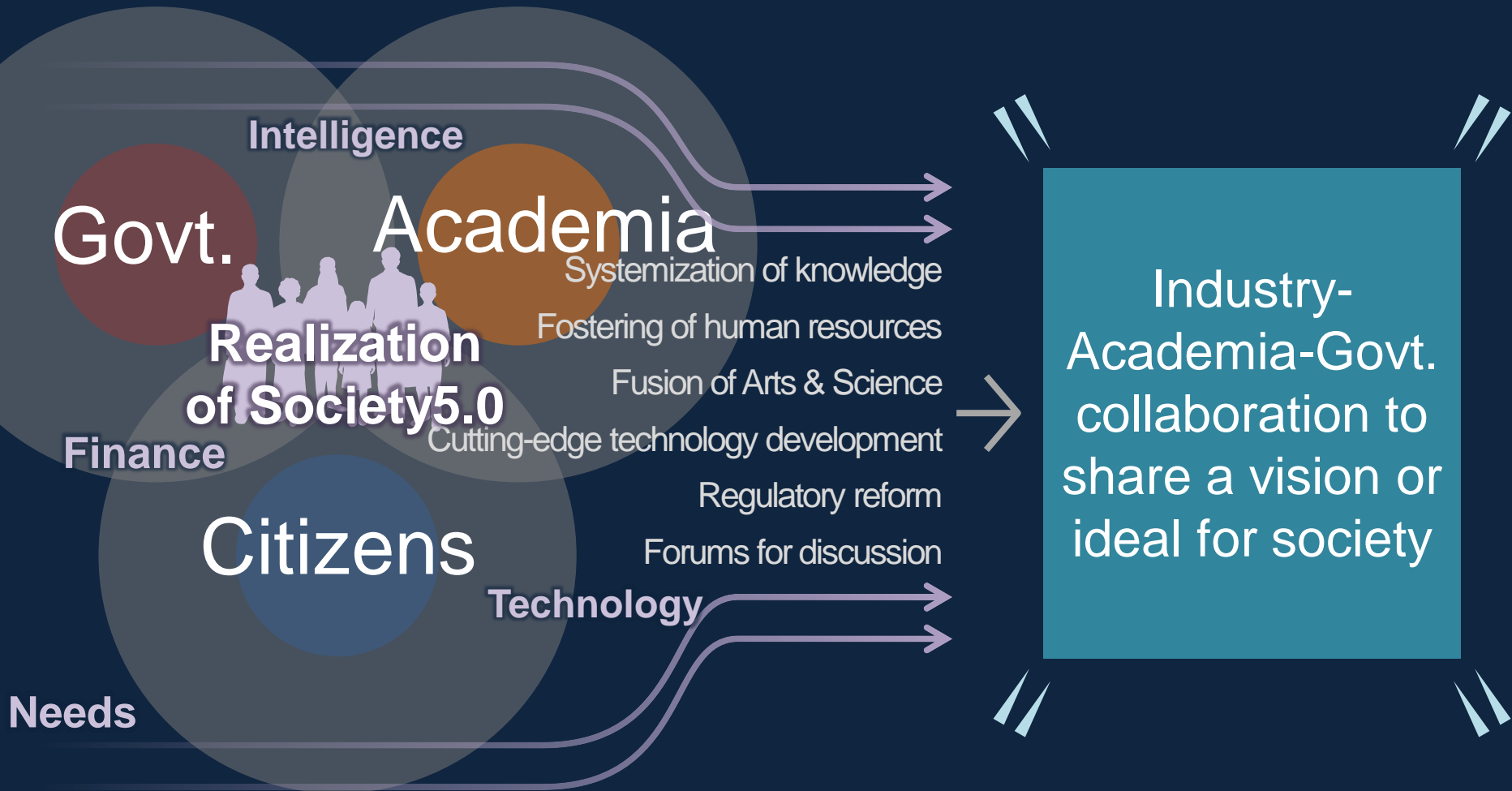
AI to support management decisions



Partner: Nat. Inst. of Adv. Industrial Science and Technology

*1: This research is partially supported by the Japan Agency for Medical Research and Development, AMED.

An comprehensive approach beyond the confines of industry-academia-govt., country or region will become indispensable



Joint research sites @ 3 universities in Japan to realize a Super Smart Society (Society 5.0)



Hitachi Kyoto University Lab ['16/6]

Explore future society issues

Explore future society issues up to 2050 on the basis of regional tradition and culture amassed through a history over 1,000 years

Hitachi The University of Tokyo Lab ['16/6]

Drafting national vision

Create a vision for government policy based on accumulated knowledge from government & society, propose policy/conduct joint research

Hitachi Hokkaido University Lab ['16/6]

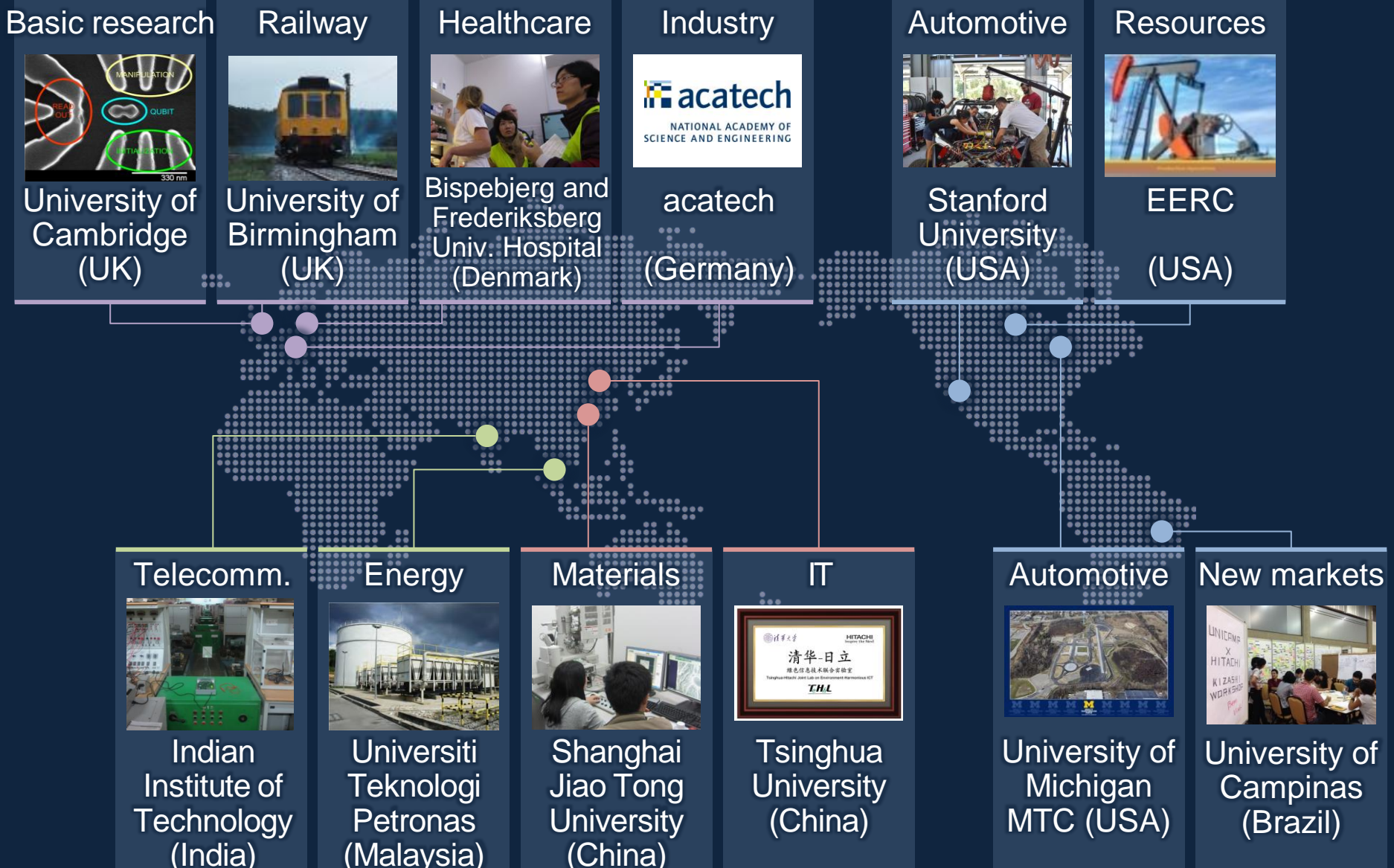
Solution for emerging regional challenges

Leverage regional attribute of scale representation of Japan to explore society issues and lead solution PoCs

13th Commendations for persons of distinguished achievement in Industry-Academia-Government collaborations - Connecting Innovation Grand Prize - Prize of the Minister of Education, Culture, Sports, Science and Technology

For the development and proliferation of "4D tumor tracking proton beam therapy system" (Joint research with Hokkaido University)

4-4-2 Open Innovation: Outside Japan



EERC: Energy and Environment Research Center

MTC: Mobility Transformation Center

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Create service business by accelerating collaborative creation

Build-up technology platforms for Service & Product business growth

Challenge future social issues through open innovation

THE FUTURE IS OPEN TO SUGGESTIONS

Hitachi Social Innovation

**Delivering new value to society through
collaborative creation with our customers and partners**

END

2016 R&D Strategy

To become “An Innovation Partner for the IoT Era”

2016/6/28

Norihiro Suzuki, Ph.D.

Vice President & Executive Officer

Chief Technology Officer

General Manager, R&D Group, Hitachi, Ltd.

HITACHI
Inspire the Next 