Action plan
to boost knowledge transfer

Prof. H. Kotera

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1. What have we learnt over the past two decades on what works and what does not work with regards to knowledge transfer?
2. How does the changing context (e.g. digital transformation, globalisation) impact on the effectiveness of existing policy instruments?
3. Should policy measures be revised in view of such changes?
4. What are future perspectives for knowledge transfer policies?

Devil river and Valley of the death are widen and deepen by crash of bubble from 1993

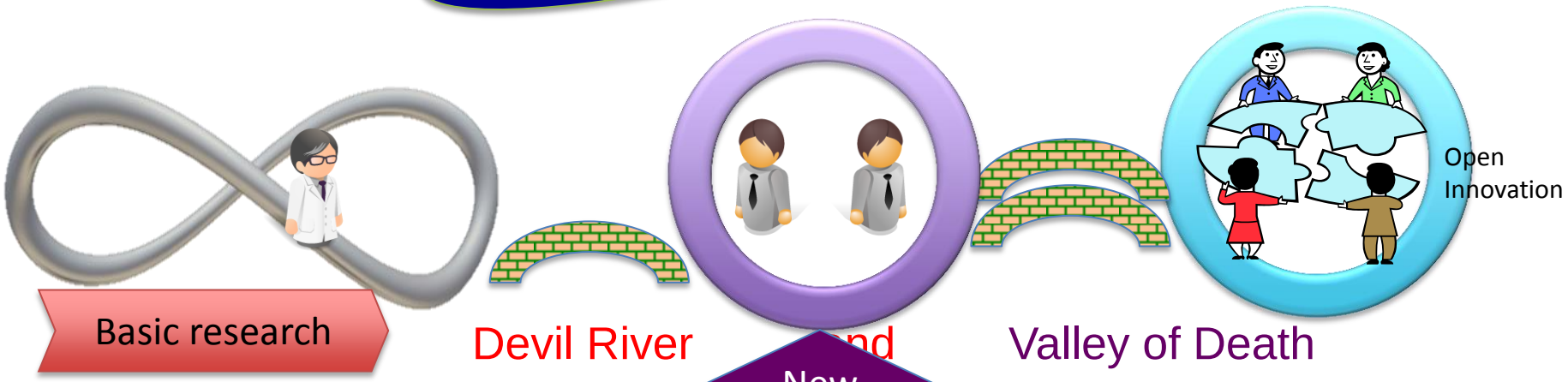
Devil River

Valley of Death

University

Basic research Lab. of Industry

Applied research and Development Lab.

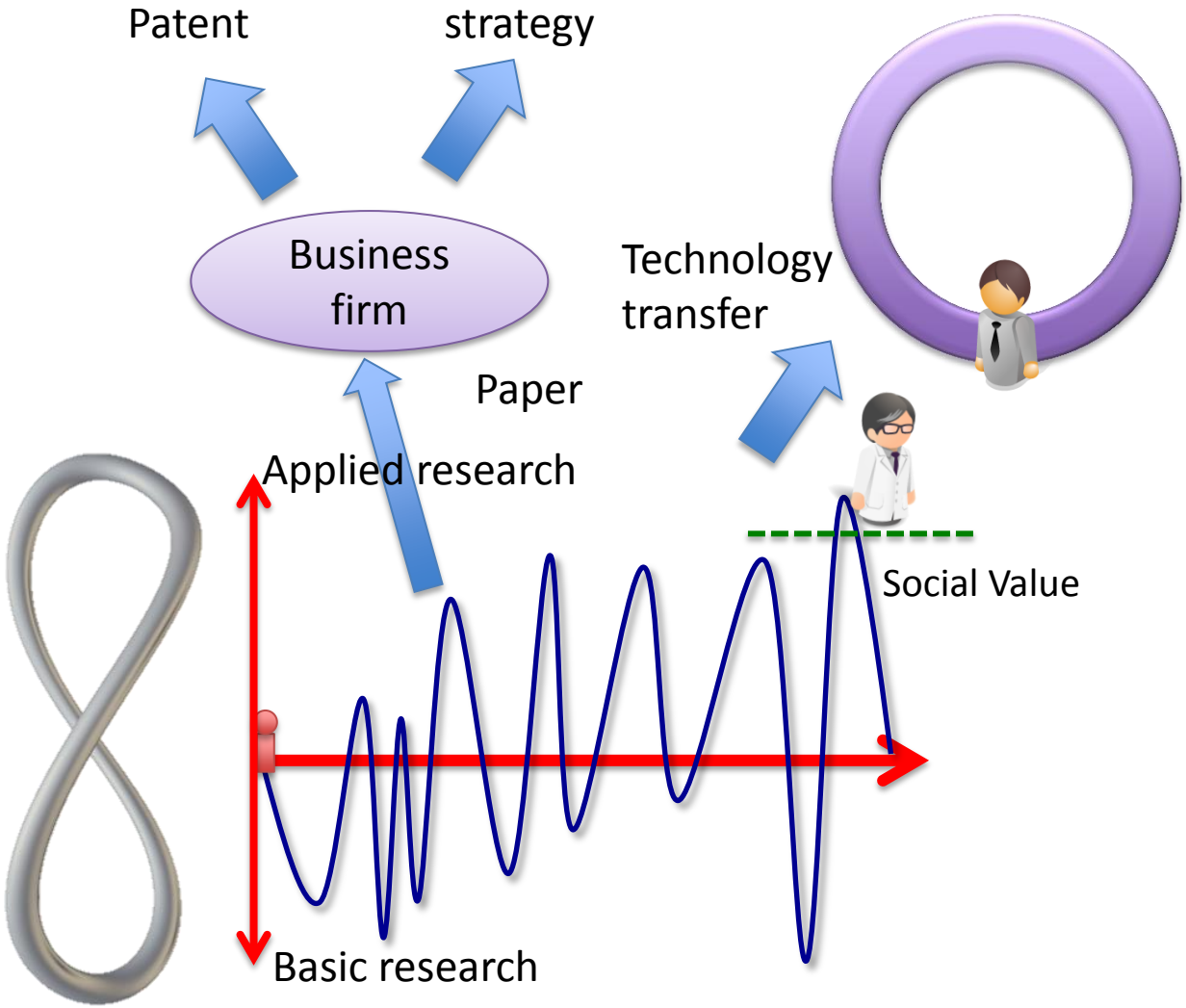


Devil River

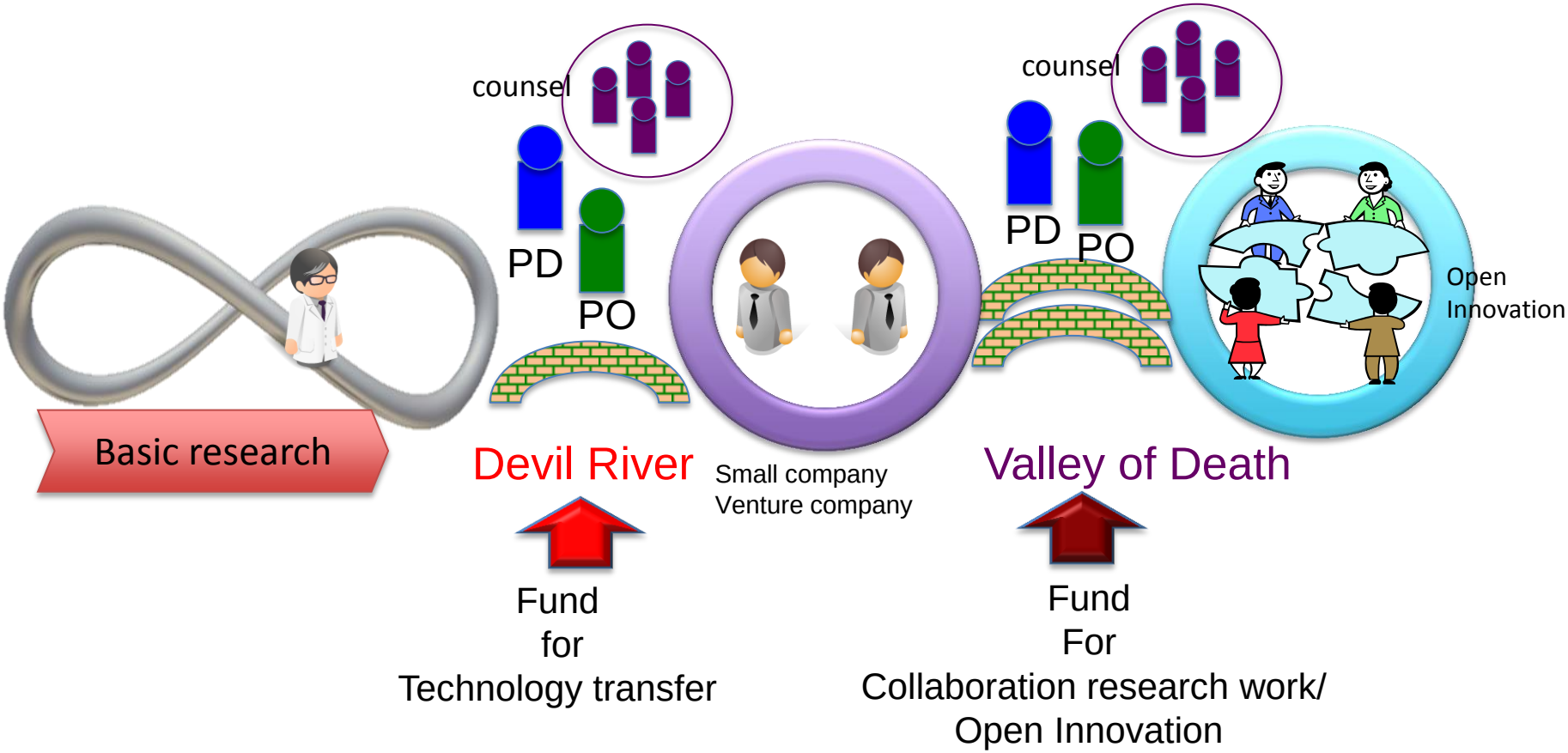
Valley of Death

STI Strategy including new research fund, venture fund and reformation of University

Basic research plays important role for business firm not only in technology transfer but patents



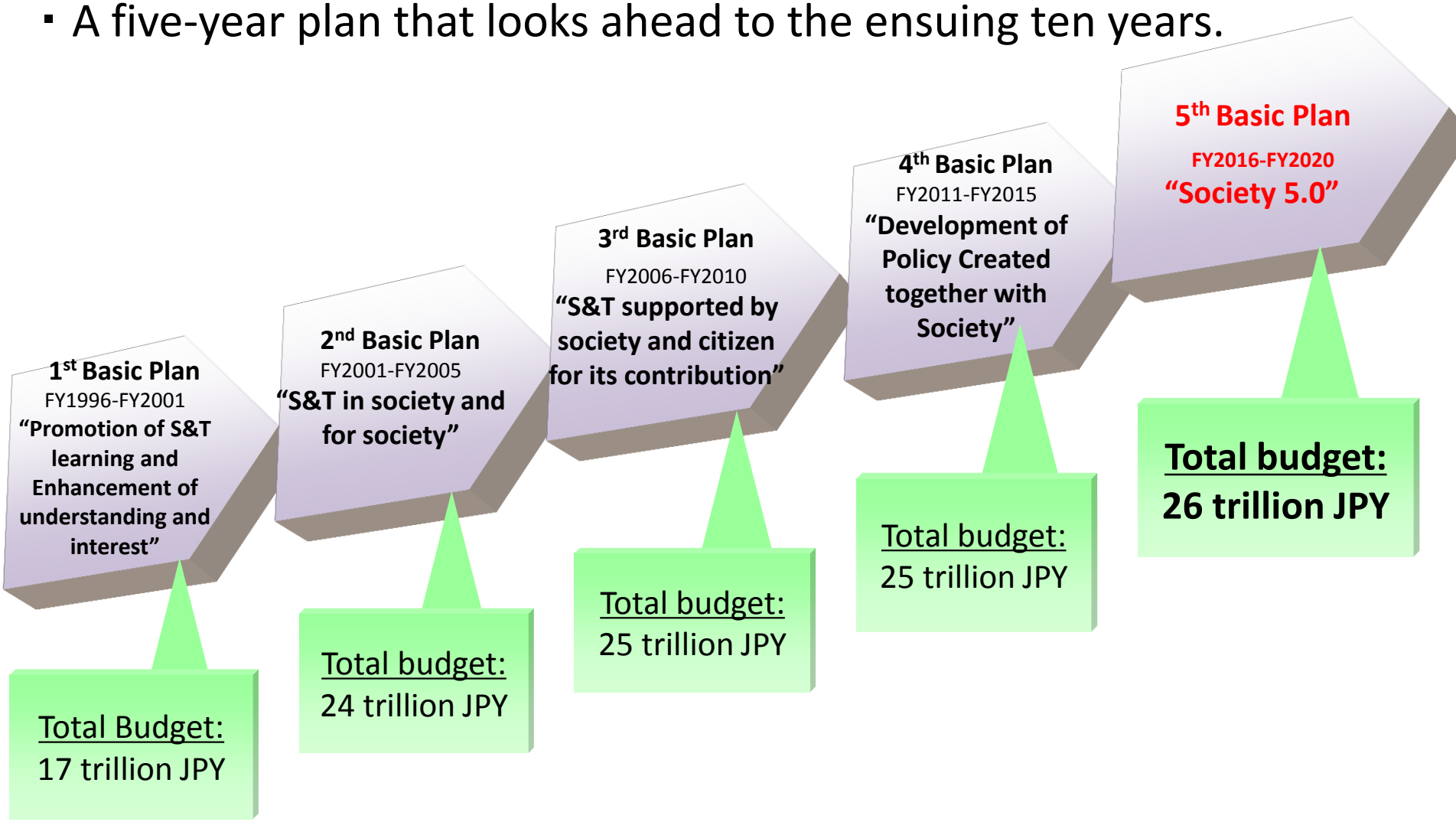
Fund for Technology transfer and Collaboration research work to pass the devil river and Valley of death



Program Director and Program Officer monitor and consult the project with counsel members

Science and Technology Basic Plans

- The government formulates a basic plan for promoting S&T.
- Enacted in 1995 and Started in 1996.
- A five-year plan that looks ahead to the ensuing ten years.



Digest of Japanese Science and Technology

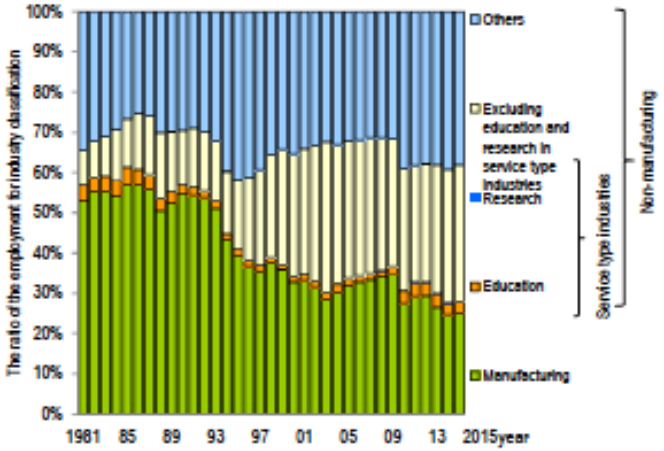
Indicators 2016

Aug. 2016

Research Unit for Science and Technology Analysis and Indicators
National Institute of Science and Technology Policy, MEXT

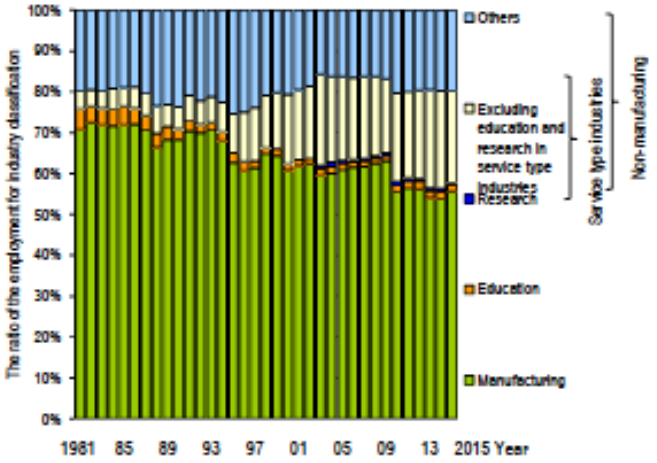
[Summary Chart 9] Employment status by industry classification of graduates in science and engineering

(A) Graduates of a bachelor's program in science and engineering



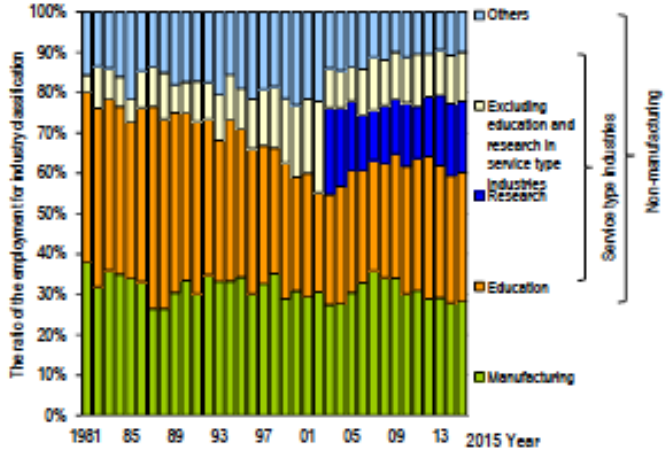
Reference: Chart 3-3-4, Japanese Science and Technology Indicators 2016 (in Japanese)

(B) Graduates of a master's program in science and engineering



Reference: Chart 3-3-5, Japanese Science and Technology Indicators 2016 (in Japanese)

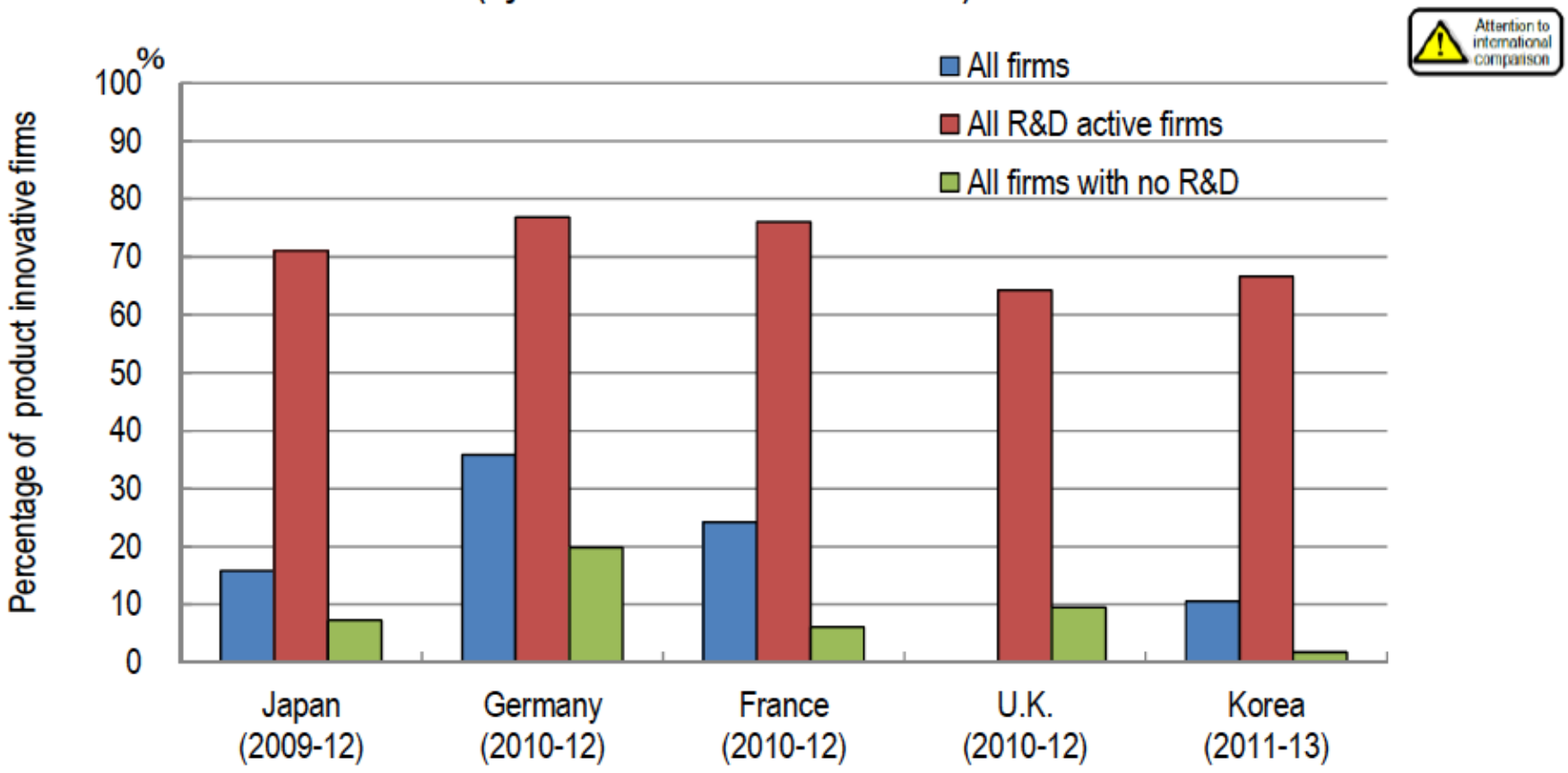
(C) Graduates of a doctor's program in science and engineering



Reference: Chart 3-3-6, Japanese Science and Technology Indicators 2016 (in Japanese)

Notes: 1) The number of graduates who found employment includes work-study students.
2) The following is the details of the service-related industries.
Education: Those who found employment at schools. For example, those who became faculties of universities fall under this category.
Research: Those who found employment at academic or R&D institutions (of which data have been collected since 2003).
Others: Information and communication, medical welfare, etc.
3) "Others" in the non-manufacturing industry include construction, wholesale and retail, finance, and insurance, public services, etc.

[Summary Chart 15] Percentage of firms that achieved product innovation in the selected countries (by involvement in R&D activities)



Circumstances in Japan and the selected countries in terms of R&D output

The number of Japanese scientific publications remains at the same level as it was ten years ago. However the position of Japan in the global rank moved down due to a growth of other countries.

[Summary Chart 11] Top 10 countries/regions in terms of the number of papers, the number of adjusted top 10% papers, and the number of adjusted top 1% papers (based on the fractional counting method)

All fields	1992 — 1994		
	The number of papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	179,568	32.1	1
Japan	45,598	8.2	2
U.K.	41,028	7.3	3
Germany	37,377	6.7	4
France	29,154	5.2	5
Canada	22,987	4.1	6
Russia	22,469	4.0	7
Italy	17,097	3.1	8
India	11,441	2.0	9
Australia	11,309	2.0	10

All fields	2002 — 2004(PY) (Average)		
	The number of papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	213,319	26.5	1
Japan	67,475	8.4	2
Germany	51,205	6.3	3
U.K.	49,984	6.2	4
China	42,236	5.2	5
France	36,825	4.6	6
Italy	28,926	3.6	7
Canada	26,019	3.2	8
Spain	20,373	2.5	9
Russia	20,022	2.5	10

All fields	2012 — 2014(PY) (Average)		
	The number of papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	269,016	20.5	1
China	191,043	14.5	2
Japan	64,730	4.9	3
Germany	64,072	4.9	4
U.K.	58,208	4.4	5
India	46,426	3.5	6
France	44,973	3.4	7
Korea	42,747	3.3	8
Italy	42,513	3.2	9
Canada	38,852	3.0	10

All fields	1992 — 1994(PY) (Average)		
	The number of adjusted top 10% papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	27,434	49.2	1
U.K.	4,628	8.3	2
Japan	3,240	5.8	3
Germany	3,220	5.8	4
France	2,586	4.6	5
Canada	2,553	4.6	6
Netherlands	1,393	2.5	7
Italy	1,278	2.3	8
Australia	1,110	2.0	9
Sweden	997	1.8	10

All fields	2002 — 2004(PY) (Average)		
	The number of adjusted top 10% papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	32,239	40.1	1
U.K.	6,144	7.6	2
Germany	5,297	6.6	3
Japan	4,593	5.7	4
France	3,569	4.4	5
Canada	2,959	3.7	6
China	2,909	3.6	7
Italy	2,479	3.1	8
Netherlands	1,944	2.4	9
Australia	1,802	2.2	10

All fields	2012 — 2014(PY) (Average)		
	The number of adjusted top 10% papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	38,964	29.7	1
China	18,052	13.8	2
U.K.	8,196	6.2	3
Germany	7,827	6.0	4
France	4,924	3.8	5
Italy	4,528	3.4	6
Japan	4,331	3.3	7
Canada	4,296	3.3	8
Australia	3,929	3.0	9
Spain	3,665	2.8	10

All fields	1992 — 1994(PY) (Average)		
	The number of adjusted top 1% papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	3,136	56.2	1
U.K.	457	8.2	2
Germany	304	5.4	3
Japan	264	4.7	4
Canada	230	4.1	5
France	215	3.8	6
Netherlands	132	2.4	7
Switzerland	107	1.9	8
Italy	101	1.8	9
Australia	101	1.8	10

All fields	2002 — 2004(PY) (Average)		
	The number of adjusted top 1% papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	3,897	48.5	1
U.K.	647	8.0	2
Germany	484	6.0	3
Japan	364	4.5	4
France	292	3.6	5
Canada	270	3.4	6
China	234	2.9	7
Netherlands	191	2.4	8
Italy	186	2.3	9
Switzerland	169	2.1	10

All fields	2012 — 2014(PY) (Average)		
	The number of adjusted top 1% papers		
Country/Region	Fractional counting		
	Papers	Share	World rank
U.S.	4,691	35.7	1
China	1,643	12.5	2
U.K.	932	7.1	3
Germany	759	5.8	4
France	459	3.5	5
Canada	408	3.1	6
Australia	405	3.1	7
Italy	353	2.7	8
Japan	340	2.6	9
Spain	303	2.3	10

Note: The number of articles and reviews was counted. Papers were sorted by publication year (PY). The number of citations are as of end of 2015.
Reference: Chart 4-1-6, Japanese Science and Technology Indicators 2016 (in Japanese)

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Characteristics of the Japanese Science and Technology Indicators

The Japanese Science and Technology Indicators is published annually to present the most recent statistics/indicators at the time of publication. Items that allow time-series comparisons as well as comparisons among the selected countries based on data that are updated each year in principle are collected.

1. Use of original statistical data published by authorities in each country

Wherever possible, statistical data published by authorities in each country are used as the sources of data for indicators appearing in Japanese Science and Technology Indicators. Every effort has been made to clarify each country's method of collecting statistics and how it differs from other countries' methods.

2. NISTEP conducted analysis of paper and patent databases

Paper data were aggregated and analyzed by NISTEP using Thomson Reuters Web of Science. Patents family data were aggregated and analyzed by NISTEP using PATSTAT (the patent database of the European Patent Office).

3. Use of "reminder marks" for international comparisons and time-series comparisons

The reminder marks "**attention to international comparison**" and "**attention to trend**" have been attached to graphs where they are required. Generally, the data for each country conform to OECD manuals and other materials. However, differences in methods of collecting data or scope of focus do in fact exist, and therefore attention is necessary when making comparisons in some cases. Such cases are marked "attention to international comparison." Likewise, for some time series data, data could not be continuously collected under the same conditions due to changes in statistical standards. Cases where special attention is required when reading chronological trends are marked "attention to trend." Specifics for such points requiring attention are provided in the notes of individual charts.

Current situation and Prescription

1) Expansion and deepening of collaborative research (industry-academia collaboration between "organization" versus "organization")

【Current situation 】

· Large-scale industry-academia collaboration with "organization" vs. "organization" is increasing, but the case is still insignificant.

· It is difficult for universities to respond to large-scale collaborative research with management system.

【Prescription】

· A large-scale collaborative research between university and company from viewpoint of open innovation.

· Construction of a system for centralized management.

· Strengthening regional hub functions in the National Research Institute.

2) Increase in private capital investment (virtuous circulation of funds)

【Current situation 】

· Although the investment amount from companies and the number of large-scale collaborative research has steadily increased。But the joint research expenditure per case is still small.

【Prescription】

· Expansion of matching fund type system to induce industry-academia collaboration

Current situation and Prescription

3) Increase in license income (virtuous circle of knowledge)

【Current situation】

· Although the number of patents and other revenues in universities are increasing, the amount of license revenue is still small.

【Prescription】

· Building an appropriate intellectual property management system.

4) Utilization of cross-appointment system (virtuous cycle of human resources)

【Current situation】

· Although the number of applications of the cross appointment system is increasing, cases of utilization from universities to the industry are still few.

【Prescription】

· Development of successful cases.

5) Support and utilization of university-originated ventures

【Current situation】

· The number of ventures is small.

【Prescription】

· Promote matching between research seeds of universities and a good accelerator (VC).

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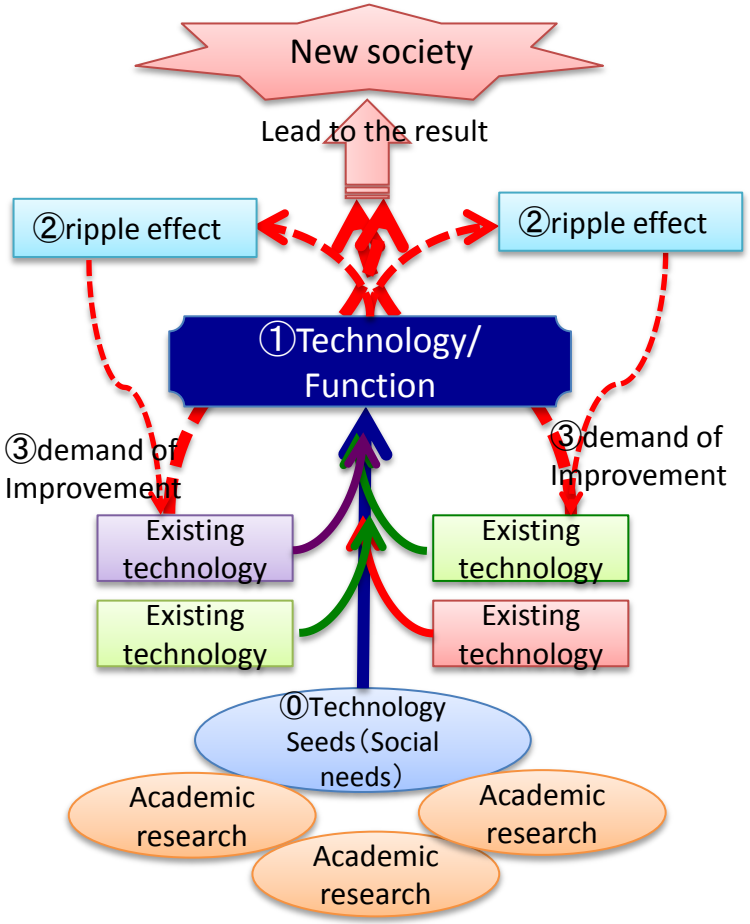
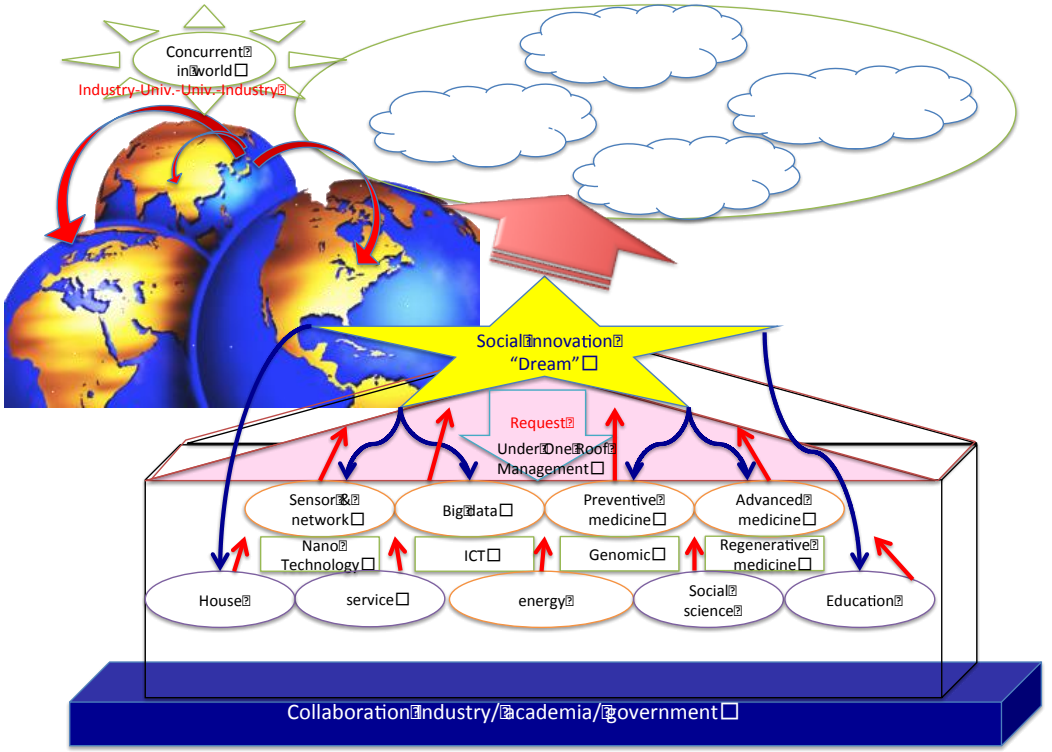
New Type of collaboration system between organization and organization

New Collaboration network（Concurrent：Multi disciplinary and Multi Phase (Fundamental research work, Application research work, Development and social research）

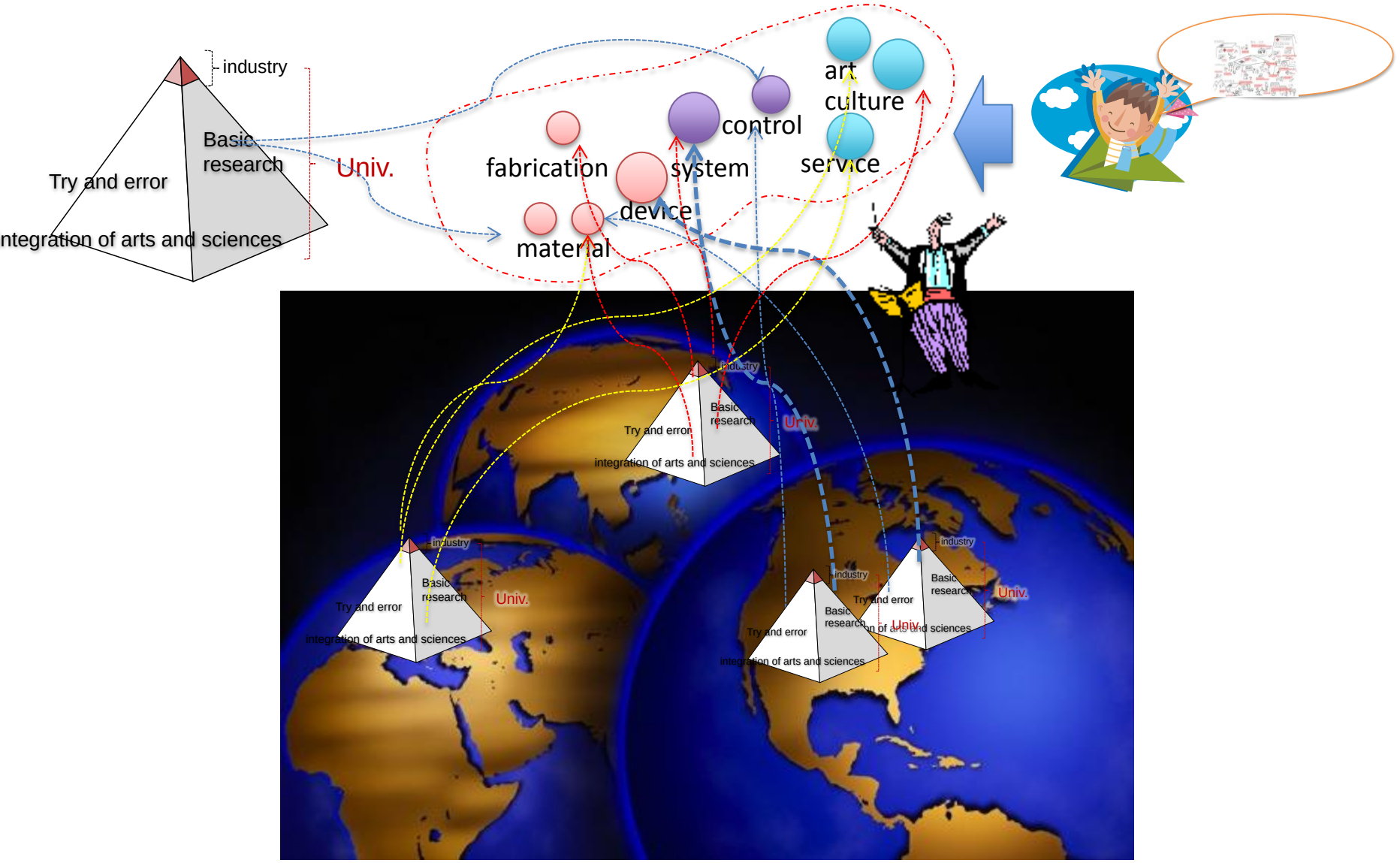
Conventional Innovation Model



To realize a dream society



Collaboration between industry and university/ Research institute network to realize a DREAM



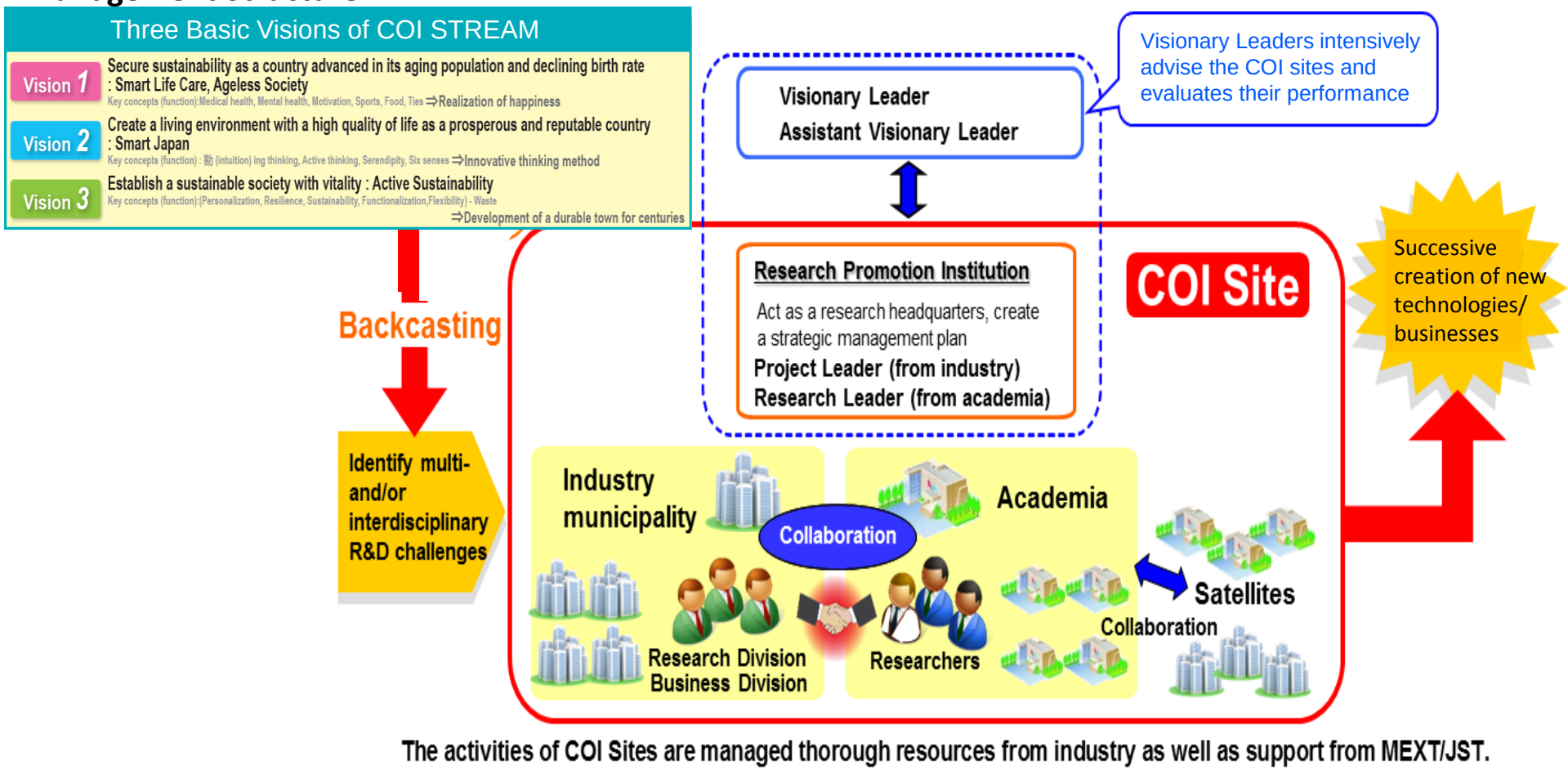
Example

Center of Innovation (COI) Program

<Outline>

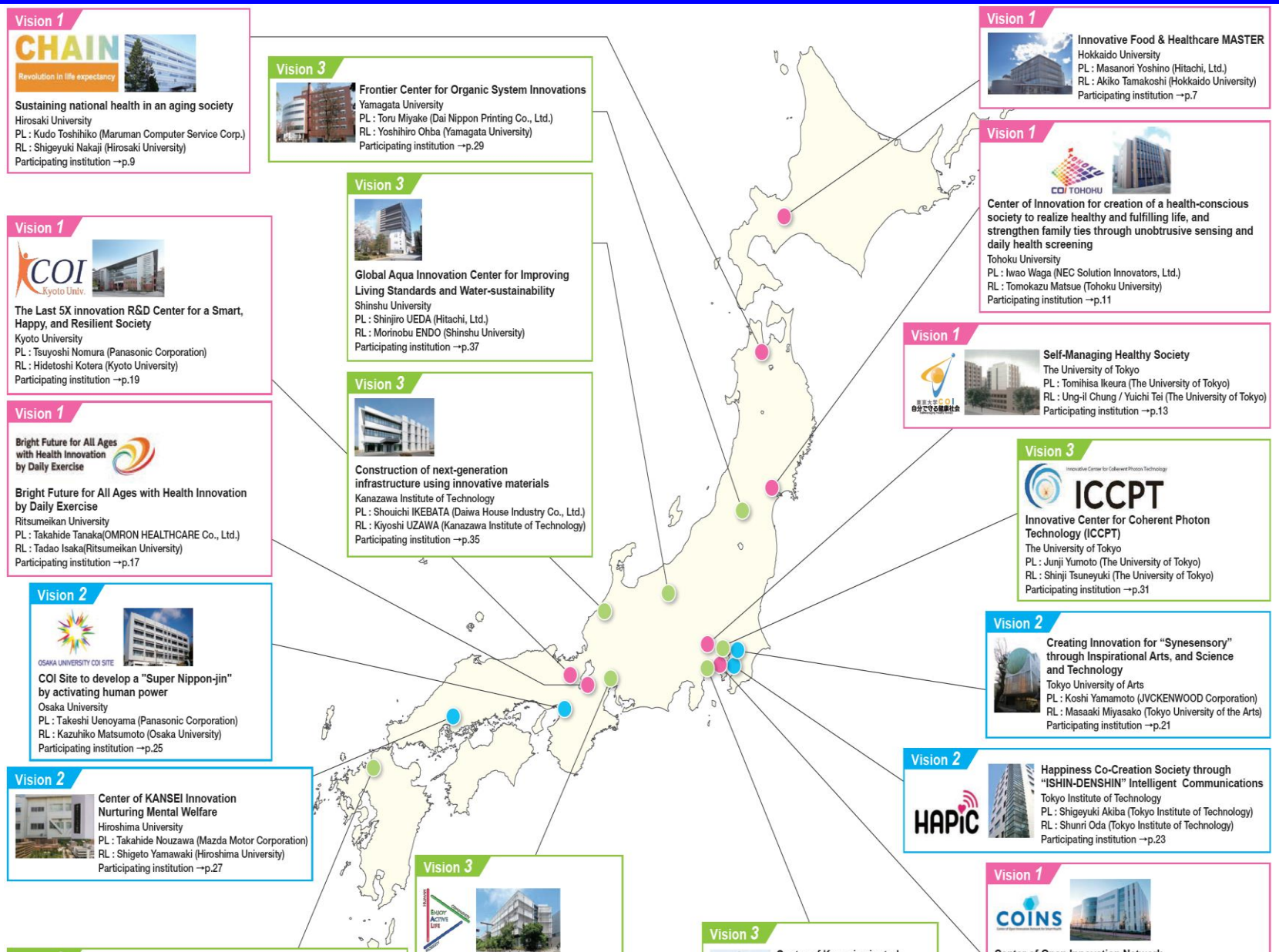
- Establish innovation centers (COI Sites) where universities and companies can conduct under-one-roof type large-scale research activities.
- Employ, in the planning stage, the "back casting approach", which visualizes challenging societal matters and goals after 10 years and subsequently identifying key technologies, setting R&D plans to provide solutions.
- 18 sites have been established with government support for 9 years (until 2021)

<Management Structure>



The activities of COI Sites are managed thorough resources from industry as well as support from MEXT/JST.

Center of Innovation (COI) Program



Vision 1
CHAIN
Revolution in life expectancy
Sustaining national health in an aging society
Hirosaki University
PL : Kudo Toshihiko (Maruman Computer Service Corp.)
RL : Shigeyuki Nakaji (Hirosaki University)
Participating institution →p.9

Vision 3
Frontier Center for Organic System Innovations
Yamagata University
PL : Toru Miyake (Dai Nippon Printing Co., Ltd.)
RL : Yoshihiro Ohba (Yamagata University)
Participating institution →p.29

Vision 3
Global Aqua Innovation Center for Improving Living Standards and Water-sustainability
Shinshu University
PL : Shinjiro UEDA (Hitachi, Ltd.)
RL : Morinobu ENDO (Shinshu University)
Participating institution →p.37

Vision 1
COI Kyoto Univ.
The Last 5X innovation R&D Center for a Smart, Happy, and Resilient Society
Kyoto University
PL : Tsuyoshi Nomura (Panasonic Corporation)
RL : Hidetoshi Kotera (Kyoto University)
Participating institution →p.19

Vision 3
Construction of next-generation infrastructure using innovative materials
Kanazawa Institute of Technology
PL : Shouichi IKEBATA (Daiwa House Industry Co., Ltd.)
RL : Kiyoshi UZAWA (Kanazawa Institute of Technology)
Participating institution →p.35

Vision 1
Bright Future for All Ages with Health Innovation by Daily Exercise
Bright Future for All Ages with Health Innovation by Daily Exercise
Ritsumeikan University
PL : Takahide Tanaka(OMRON HEALTHCARE Co., Ltd.)
RL : Tadao Isaka(Ritsumeikan University)
Participating institution →p.17

Vision 2
OSAKA UNIVERSITY COI SITE
COI Site to develop a "Super Nippon-jin" by activating human power
Osaka University
PL : Takeshi Uenoyama (Panasonic Corporation)
RL : Kazuhiko Matsumoto (Osaka University)
Participating institution →p.25

Vision 2
Center of KANSEI Innovation Nurturing Mental Welfare
Hiroshima University
PL : Takahide Nouzawa (Mazda Motor Corporation)
RL : Shigeto Yamawaki (Hiroshima University)
Participating institution →p.27

Vision 3
CESS
Center for Co-Evolutional Social Systems
Center for Co-Evolutional Social Systems
Kyushu University
PL : Yoichi Korehisa (Kyushu University)
RL : Masato Wakayama (Kyushu University)
Participating institution →p.41

Vision 3
Enjoy Active Life
Mobility Innovation Center
Nagoya University
PL : Shigeru Kuroyanagi (Toyota Motor Corporation)
RL : Takayuki Morikawa (Nagoya University)
Participating institution →p.39

Vision 3
Center of Kansei-oriented Digital Fabrication
Keio Univesity
PL : Kenji Matsubara (Longfellow Inc.)
RL : Jun Murai (Keio University)
Participating institution →p.33

Vision 1
Innovative Food & Healthcare MASTER
Hokkaido University
PL : Masanori Yoshino (Hitachi, Ltd.)
RL : Akiko Tamakoshi (Hokkaido University)
Participating institution →p.7

Vision 1
COI TOHOKU
Center of Innovation for creation of a health-conscious society to realize healthy and fulfilling life, and strengthen family ties through unobtrusive sensing and daily health screening
Tohoku University
PL : Iwao Waga (NEC Solution Innovators, Ltd.)
RL : Tomokazu Matsue (Tohoku University)
Participating institution →p.11

Vision 1
Self-Managing Healthy Society
The University of Tokyo
PL : Tomihisa Ikeura (The University of Tokyo)
RL : Ung-il Chung / Yuichi Tei (The University of Tokyo)
Participating institution →p.13

Vision 3
ICCPT
Innovative Center for Coherent Photon Technology (ICCPT)
The University of Tokyo
PL : Junji Yumoto (The University of Tokyo)
RL : Shinji Tsuneyuki (The University of Tokyo)
Participating institution →p.31

Vision 2
Creating Innovation for "Synesensory" through Inspirational Arts, and Science and Technology
Tokyo University of Arts
PL : Koshi Yamamoto (JVCKENWOOD Corporation)
RL : Masaaki Miyasako (Tokyo University of the Arts)
Participating institution →p.21

Vision 2
HAPIC
Happiness Co-Creation Society through "ISHIN-DENSHIN" Intelligent Communications
Tokyo Institute of Technology
PL : Shigeyuki Akiba (Tokyo Institute of Technology)
RL : Shunri Oda (Tokyo Institute of Technology)
Participating institution →p.23

Vision 1
COINS
Center of Open Innovation Network for Smart Health (COINS)
Kawasaki Institute of Industrial Promotion
PL : Hiromichi Kimura (Kawasaki Institute of Industrial Promotion)
RL : Kazunori Kataoka (Kawasaki Institute of Industrial Promotion)
Participating institution →p.15

Center of Innovation (COI) Program

COI STREAM Governing Committee

【Set the visions and design fundamental policies】

Chairman

Hiroshi Komiyama
Chairman of the Mitsubishi Research Institute, Inc.

Joichi Ito
Director of the MIT Media Lab.

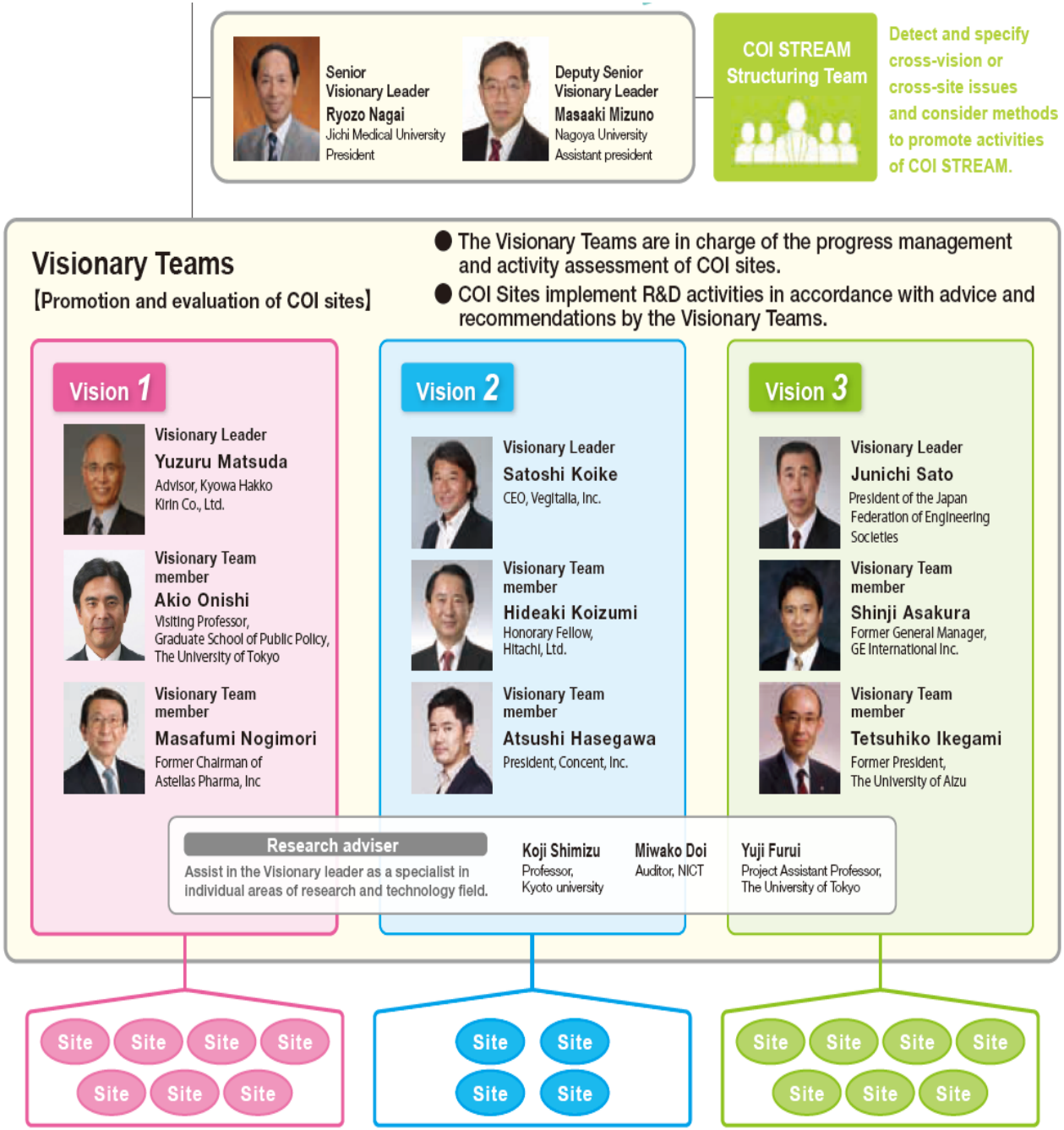
Atsushi Horiba
Chairman, President & CEO, Horiba Ltd.

Hiroshi Matsumoto
President, RIKEN

Hiroshi Mikitani
Chairman and CEO, Rakuten, Inc.

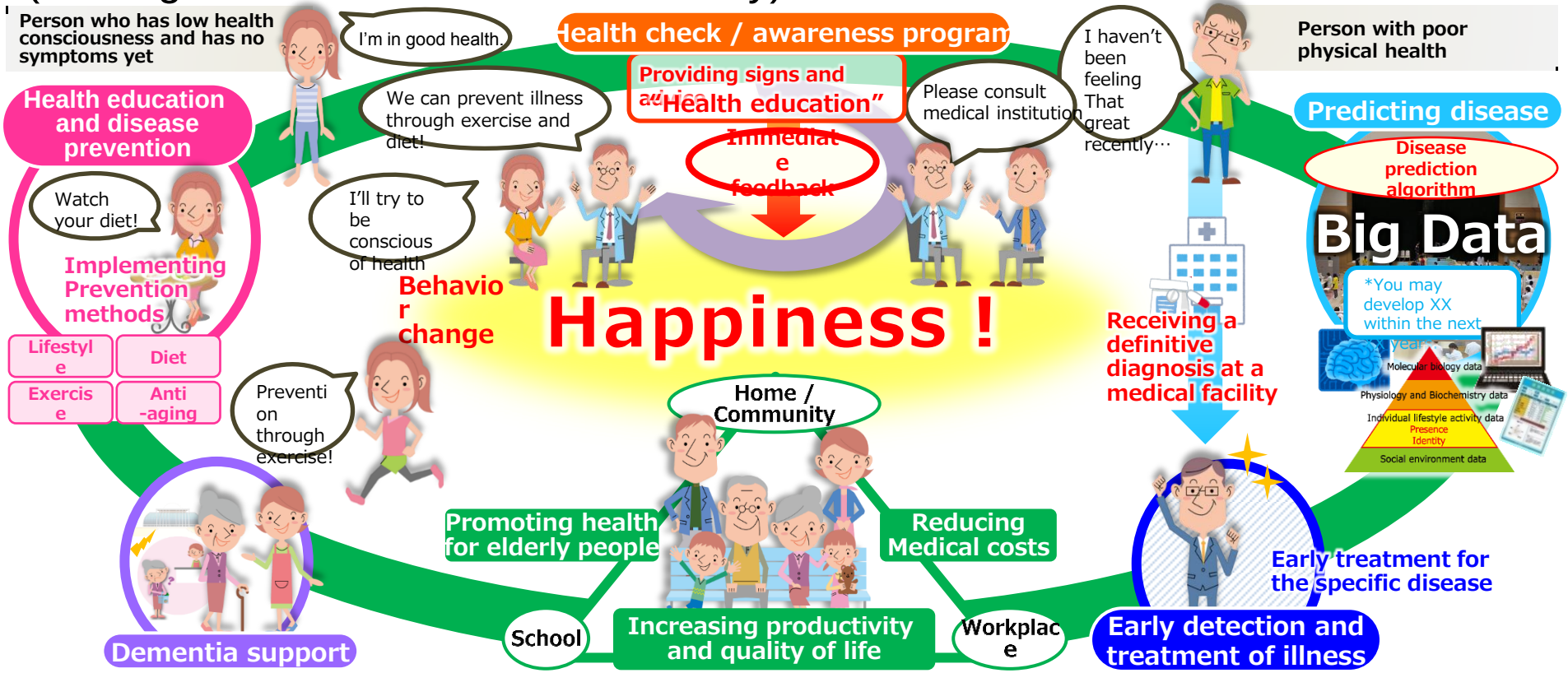
Katsuaki Watanabe
Corporate Advisor, Toyota Motor Corporation

Center of Innovation (COI) Program



Overview of “Center of Healthy Aging Innovation (CHAIN)”

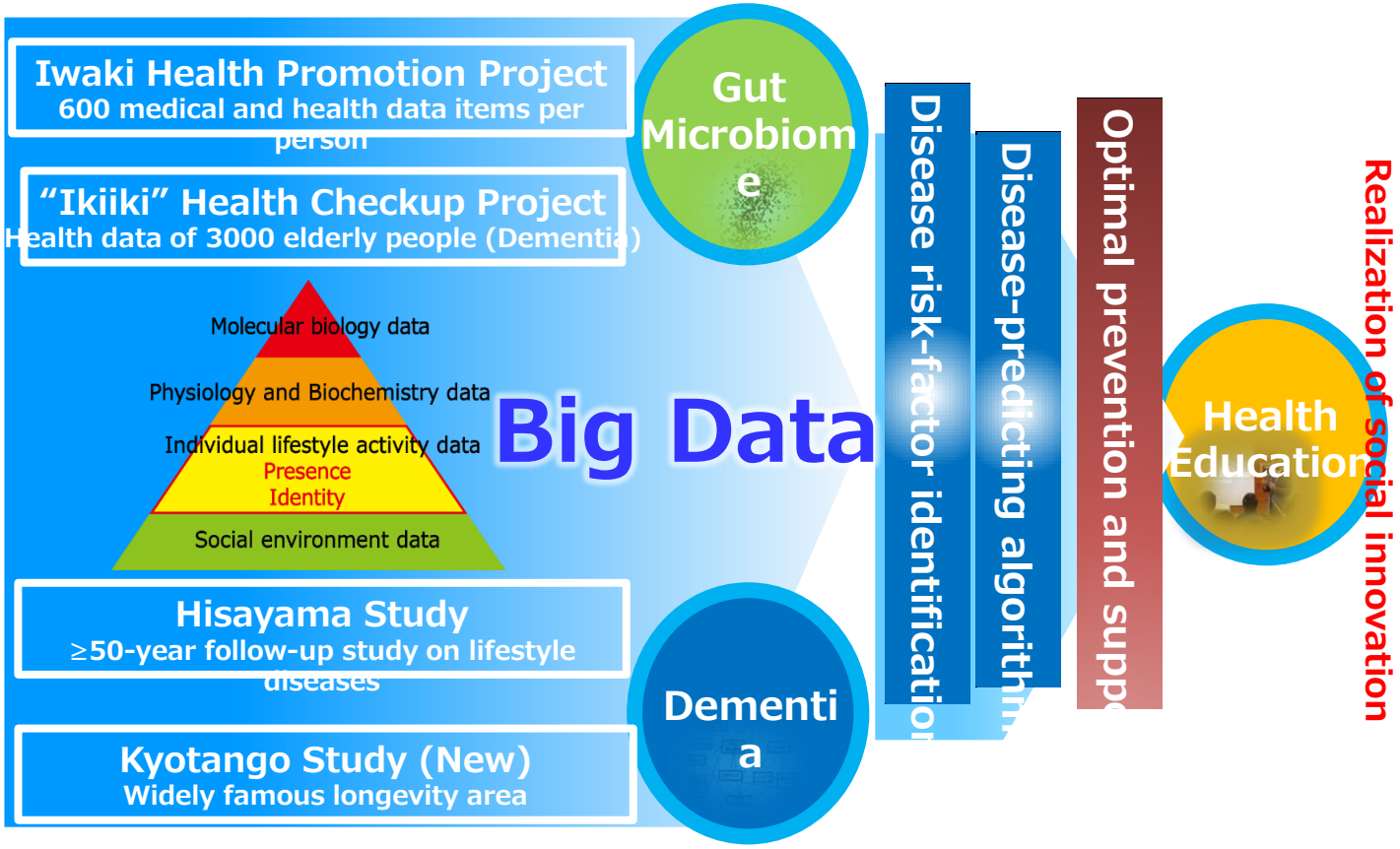
The center is aimed at creating a system for predicting future health conditions and providing optimal intervention with exploiting large scale cohort database and advanced medical/information technology
(leading Institution: Hirosaki University)



Aomori Prefecture is tackling healthcare issues to improve public health conditions with cutting-edge technologies, hoping for getting out of the problematic situation of its shortest life expectancy in Japan.

Overview of “Center of Healthy Aging Innovation (CHAIN)”

- **Compile and analyze a large amount of high quality cohort data to identify correlation between diseases and health conditions.**
- **Realize effective approach to public health interventions.**



Creation of social innovation

Health maintenance, Extension of “healthy life expectancy”, and Community development

Overview of “Center of Healthy Aging Innovation (CHAIN)”

Core organization of social implementation "Center for Promoting Healthy Aging" started

Purpose | **Human resource development (Lecture, Workshop)** | **Health promotion activity support**

The feature of the center is that it demonstrates practical activities on real fields.
<Stakeholders in health and medical fields get together>

Council of the Center for Promoting Healthy Aging

Hirosaki University, Centre for Health Sciences, Sports and Exercise Medicine

[Headquarter] Aomori Medical Association

《Core organization of social implementation》
Center for Promoting Healthy Aging
Human resource development (Lecture, Workshop)
Health promotion activity support

Hirosaki | Aomori | Prefecture · municipality | Hachinohe

・Shingo Mimura
Governor of Aomori prefecture
・Kazushige Ichinohe
Head of the Aomori prefecture health and welfare department
・Masaru Saito
Chief of the Aomori Medical Associate
・Shigeyuki Nakaji
Head of the Center for Promoting Healthy Aging
Specially-appointed Professor, Department of Social Medicine, Hirosaki University Graduate School of Medicine

Council of the Center for Promoting Healthy Aging

Aomori Medical Association, Pharmacist Association, Dentist Association, Nursing Association, Dietetic Association	Aomori Association of Occupational Therapists	Aomoriken Sougou Kenshin Center	JAPAN HEALTHINSURANCE ASSOCIATION
	Aomori Physical Therapy Association	Aomori National Health Insurance Organization	Japan Health Fitness Programmers' Association
			Health-related Association

【Training health staff +

2016 ‘Health Member’:Approx. **1,000** peopl


Health education | Health measurement | Health statistics | Health Movement | Diet

Occupation field
・Company’s occupational field
・Training ‘Health Member’

School
・Health education at elementary and junior high school
・Training health education leaders
・Curriculum
・Teaching material production


Region
・85% of municipalities in Aomori prefecture completed health declaration
・Training ‘Health Member’
・Extraction of regional issues
・Regional health support

※Correspond to Aomori prefecture health management certification system

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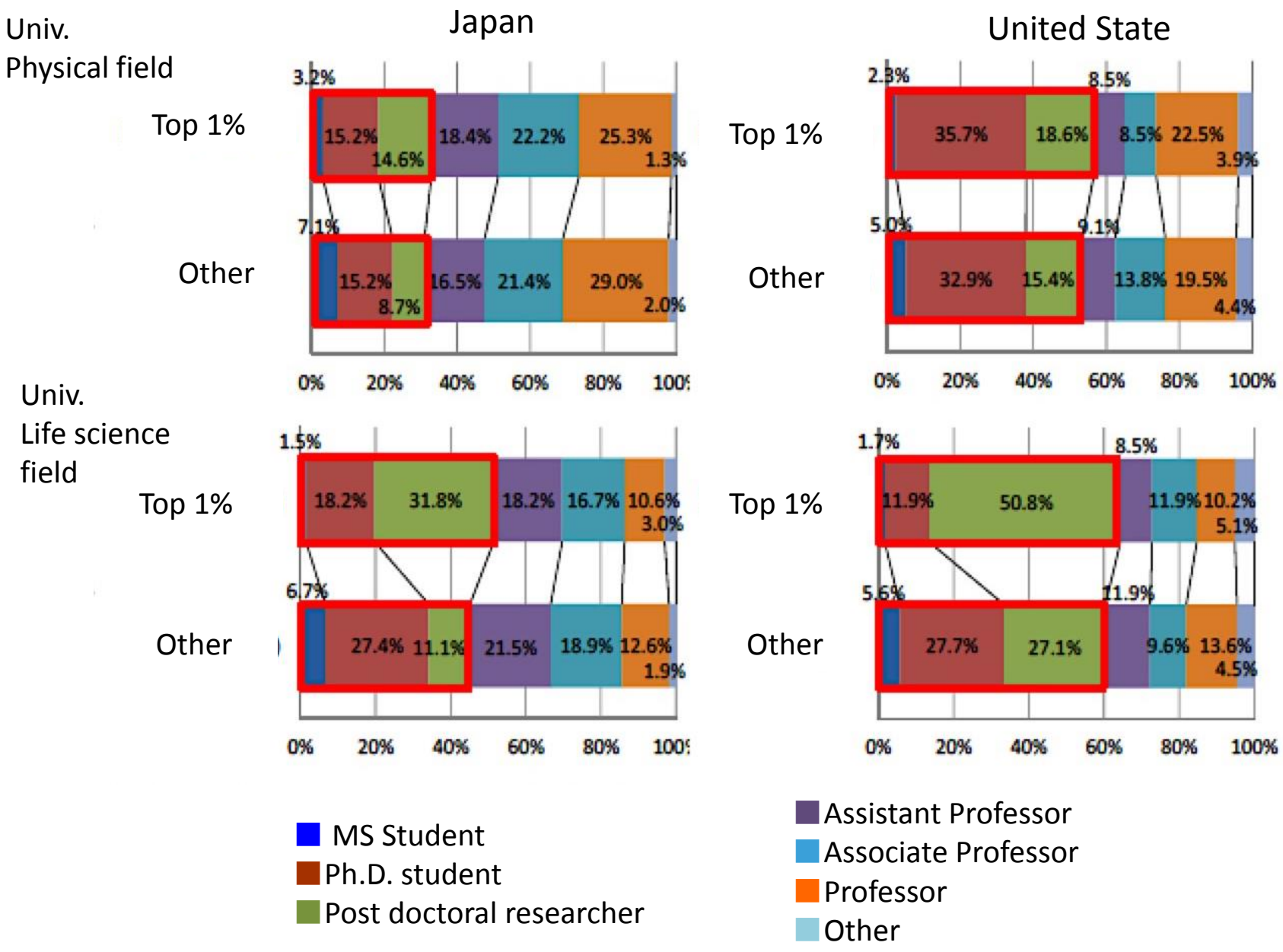
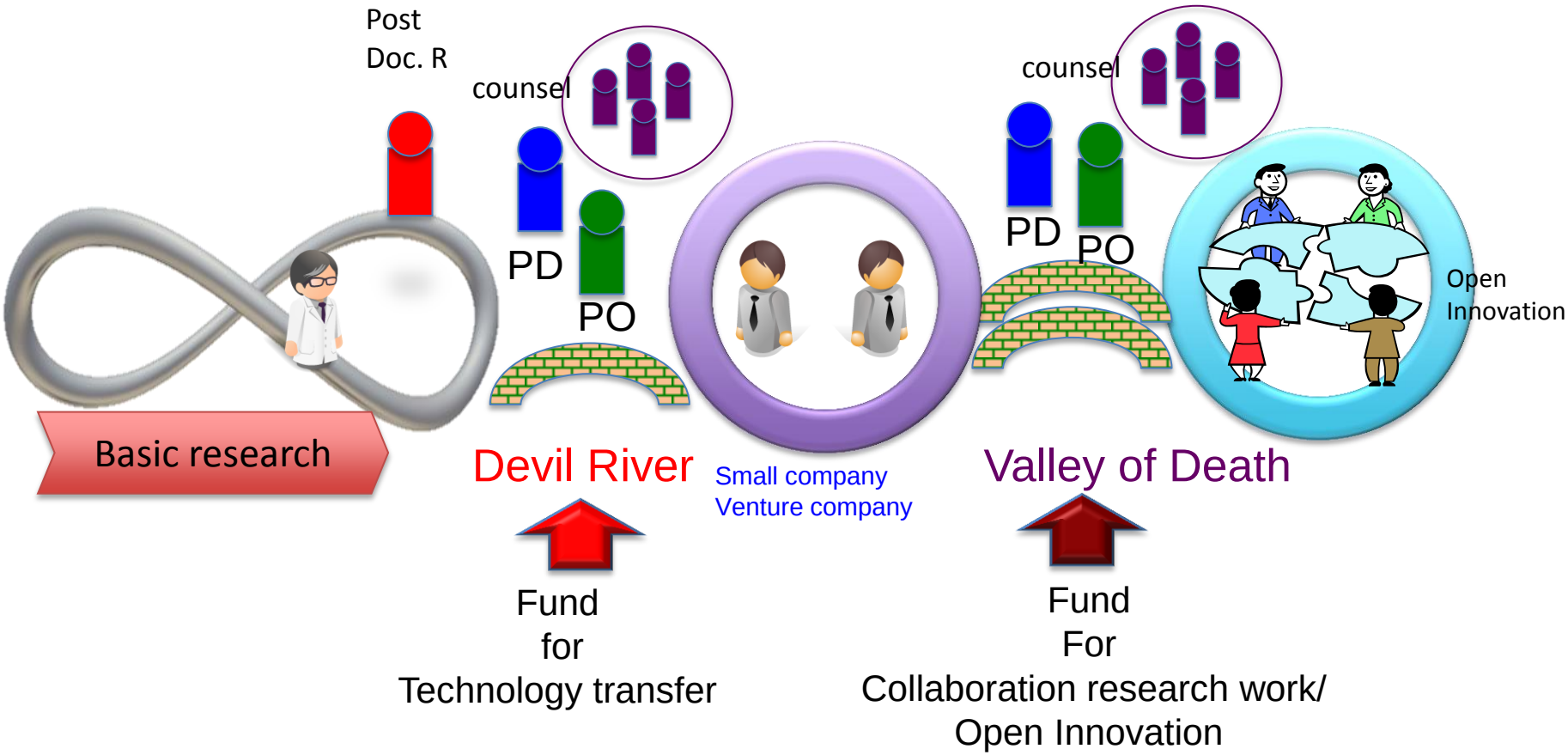
First author of paper



Who is key man in research and technology transfer



Program Director and Program Officer monitor and consult the project with counsel members

Summary

1. Funding system for basic and applied research
2. Management system for funding project
3. **Expansion and deepening of collaborative research (industry-academia collaboration between "organization" versus "organization")**
4. **Increase in private capital investment (virtuous circulation of funds)**
5. **Increase in license income (virtuous circle of knowledge)**
6. **Utilization of cross-appointment system (virtuous cycle of human resources)**
7. **Support and utilization of university-originated ventures**
8. Opportunities for young researchers and formation of career paths including Ph.D. students
9. **PDCA cycle including indicator for long term**