

# The future prospection of biotechnology research in Tsukuba ～Creation by the fusion of digital and biotechnology～

全世代の国民  
**Well-being!**  
サポート



つくばデジタルバイオ  
**国際拠点**  
Tsukuba Digital-Bio International Center



## Hiroyuki Nishiyama

Project Leader, Tsukuba International Center  
for Digital Biotechnology



- ◆ Chairman & Professor  
Department of Urology, Faculty of Medicine, Tsukuba Univ.
- ◆ Vice Director (Research Field), University of Tsukuba Hospital
- ◆ Director of Tsukuba Human&Tissue biobank center
- ◆ Director of Tsukuba Preventive Medicine Research Center
- ◆ Vice Director, Research and Development Center for Precision Medicine





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- ◆ **Member of German-Japanese Confederation of Urology meeting**



12<sup>th</sup> Triennial Meeting  
German-Japanese Confederation of Urology



## Strategy

### | The HAMAGUCHI Plan

Japan Science & Technology Agency (JST), an advanced network-based research institute that promotes the state-of-the-art R&D projects, will boldly lead the way for co-creation of innovation for tomorrow's world together with society.

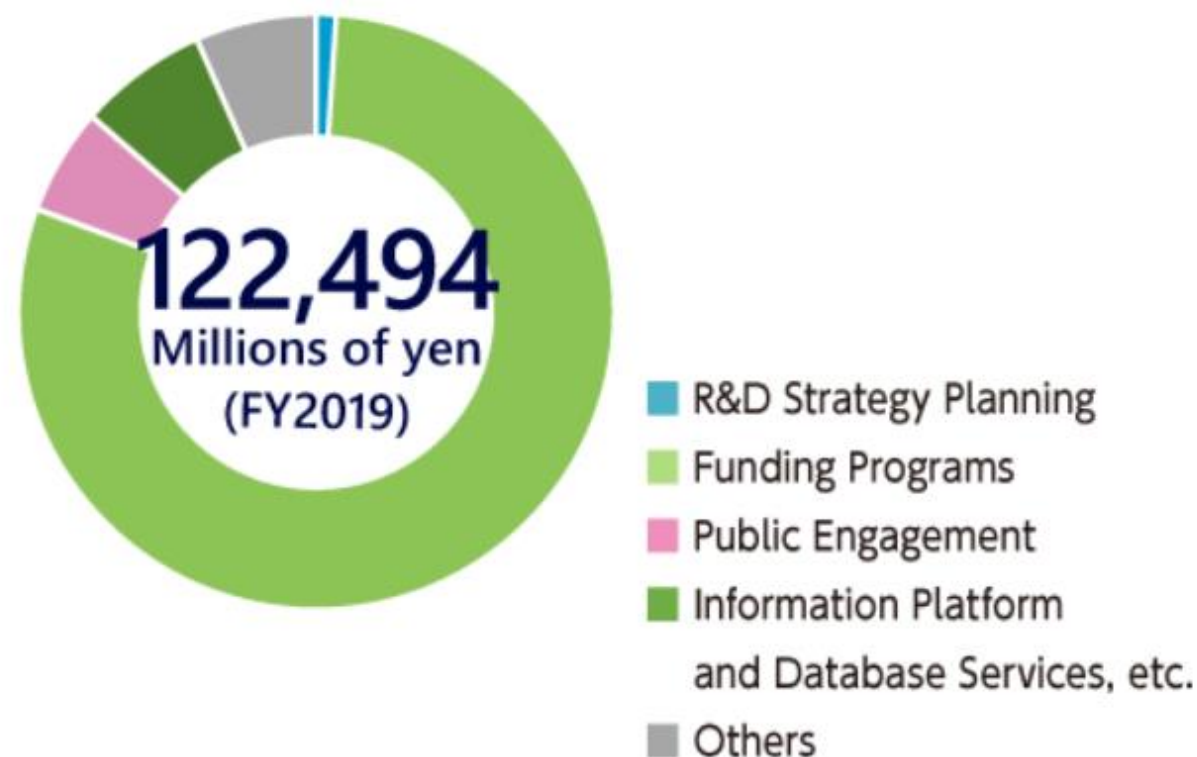
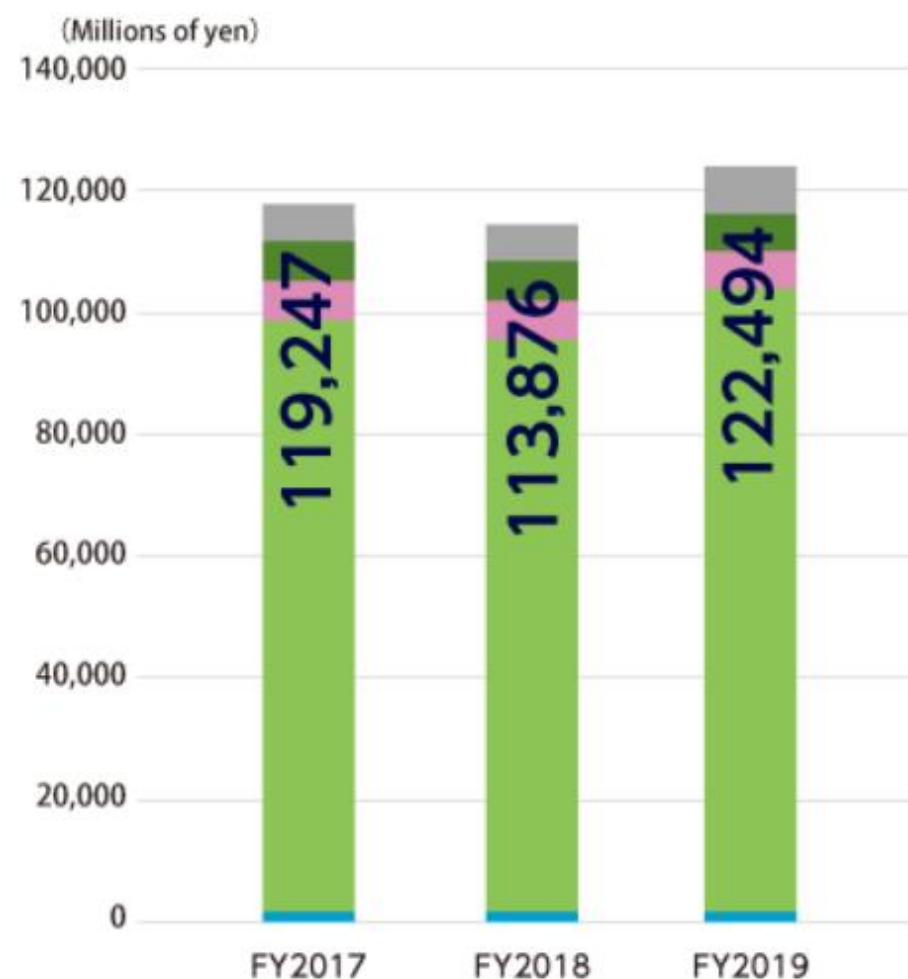
1. Advanced network-based research institute that promotes unique, challenging & high-impact R&D
2. Visionary R&D strategy for co-creation of the future with society
3. Cultivation of human resources for STI
4. Contribution to regional revitalization
5. More effective & efficient business implementation



# Budget

## Initial Budget (FY2017-FY2019)

### 4th Mid-to-Long term Plan (FY2017 - 2021)



# Outline of the open innovation platform for industrial-academic co-creation

## Three pillars

### **“People will change.”**

Sharing the vision of a society with/after Covid-19 × SDGs

### **“Our society will change.”**

Transforming economic and social systems by STI

### **“Universities will change.”**

Generating and sustainably managing the system of industrial-academic co-creation

## Blueprint for industrial-academic co-creation

National economic growth and regional revitalization



Realization of a sustainable society

Sharing the vision of a society with/after Covid-19 × SDGs.

Promoting R&D collaboration with industry

Open Innovation Platform

Generating and managing a self-sufficient system

Industrial-academic co-creation system

Science, Technology and Innovation (STI)





共 (kyo) — Co  
 創 (so) — Creation  
 の (no) — for  
 場 (ba) — Platform

COI-NEXT program aim to support  
**the open innovation platform for industrial-academic co-creation**  
 for digital transformation (Dx) era.

Project Budget:  
 400 million yen/y x 10years  
 = 3million Euro/y x 10ys

## Osaka City

 National Cerebral and  
 Cardiovascular Center

**Biotechnology Priority Areas  
 (Full-Scale)**

## Tsukuba City

 *University of Tsukuba*

**Biotechnology Priority Areas  
 (Full-Scale)**

Tsukuba International Center  
 for Digital Biotechnology

Narita airport

Tokyo

## Tsukuba: An Integrated Hub of Innovative Research institutes.

About 300 R&D institutions, including  
29 of ***Japan's national research institutes*** in Tsukuba Science City



More than 250 start-up companies are  
from Tsukuba University and other  
research institutions.

The global venture CYBERDYNE, robotics  
company, originated in Tsukuba City.

Medical Device HAL  
(Hybrid Assistive Limb)

HAL reads  
“bio-electric signals [BES]” onto the human skin.



The first international business partner of CYBERDYNE:  
Berufsgenossenschaft Rohstoffe und chemische Industrie in Germany



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筑波大学  
University of Tsukuba

National Institute of  
Advanced Industrial  
Science and Technology  
Tsukuba West



RIKEN BioResource Research Center

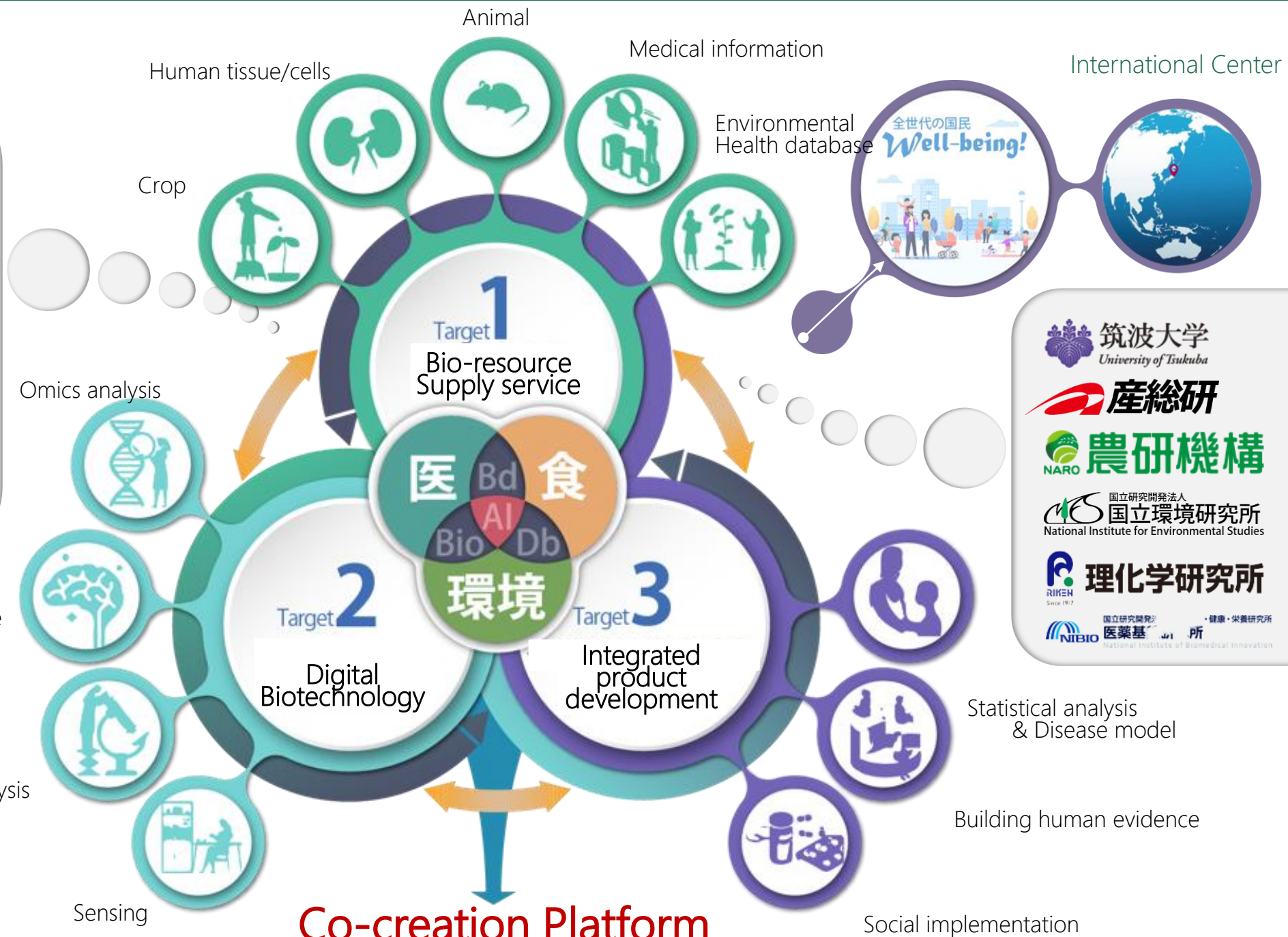


National Agriculture and Food Research Organization

### Vision of the Center

Tsukuba Digital-Bio International Center

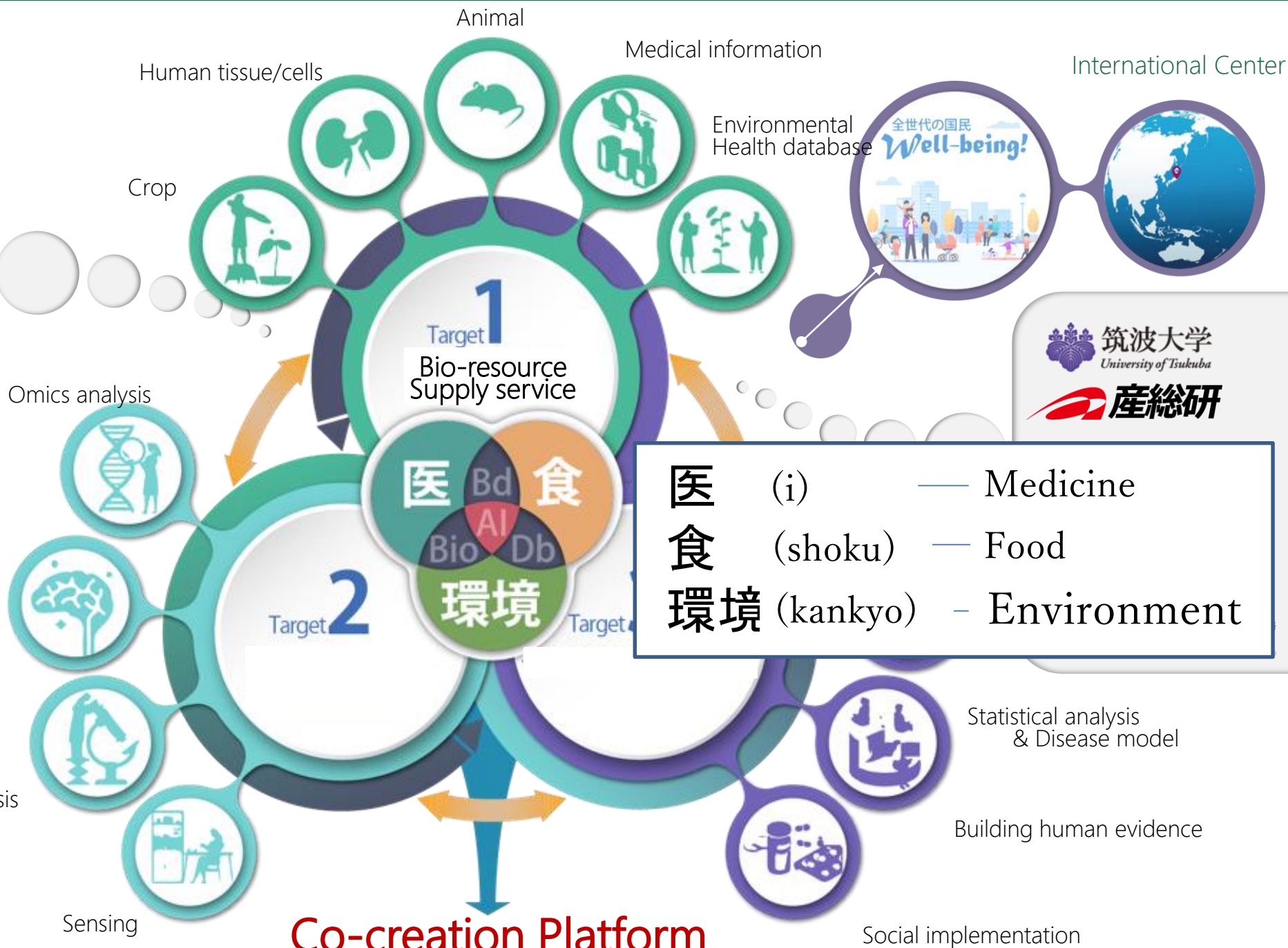
To create a society that supports the well-being of all citizens  
through interdisciplinary research utilizing  
a variety of bioresources and digital science technology at Tsukuba.



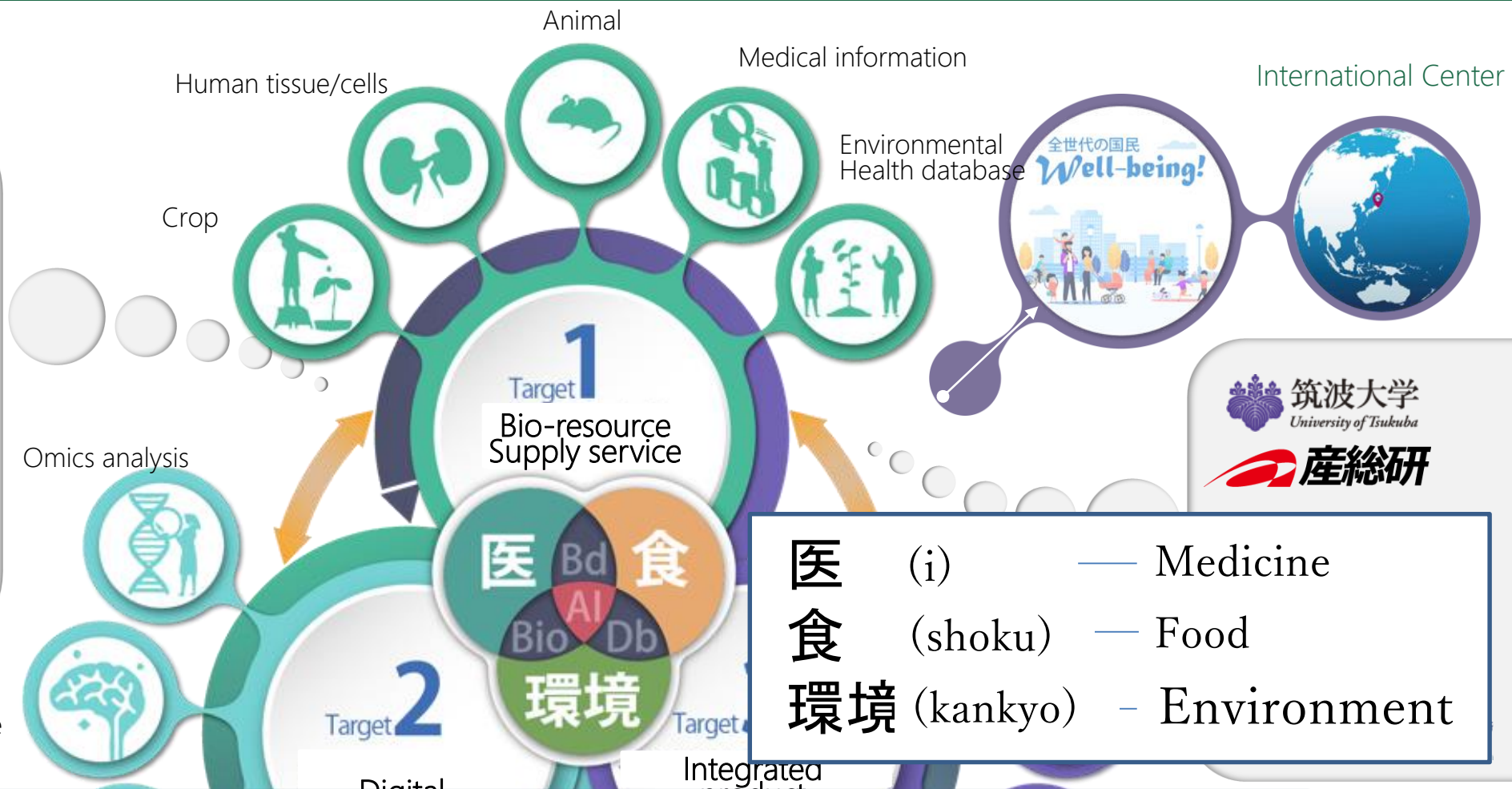
**Co-creation Platform**

**R&D Digital-Bio Economy**





**R&D Digital-Bio Economy**



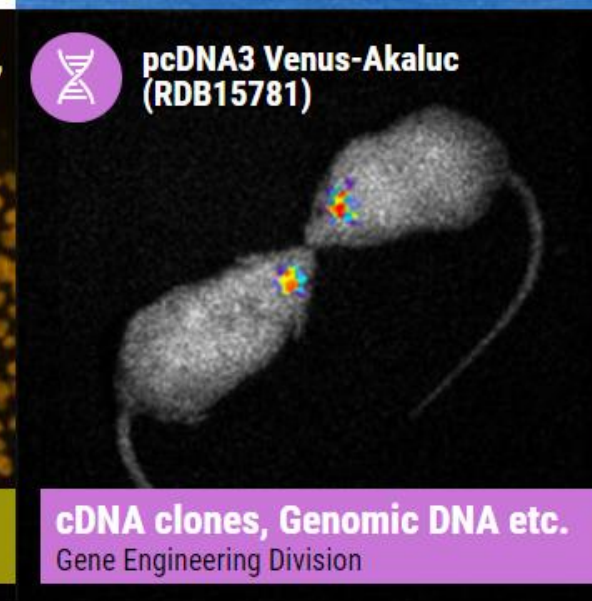
## R&D : Targets

- ✓ R & D using bioresources
- ✓ Bio-related information and communication industry
- ✓ Discovery of drug / Cell Therapy / Gene therapy
- ✓ Food and functional materials





RIKEN BRC, as one of the world leading scientific infrastructures, contributes to advancement of life science and human welfare in the 21st century.



Research Project: Construction of a bioindustry platform  
using biological resources and genome editing technology

## RIKEN BioResource Research Center



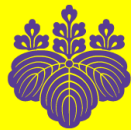
## National Agriculture and Food Research Organization



- One of the world's largest supply of bioresources

- Genetic modification using large animals
- Production of bioactive substances using chickens

### CRISPR-Cas9



## Tsukuba Univ. Laboratory Animal Resource Center



感染症実験施設



医科学実験施設

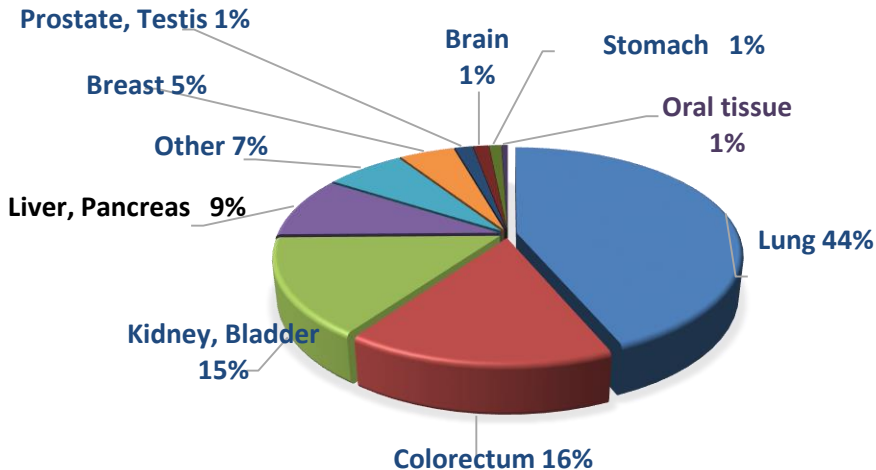
- Development of Genome editing Technology

- Preclinical study using crab-eating macaques

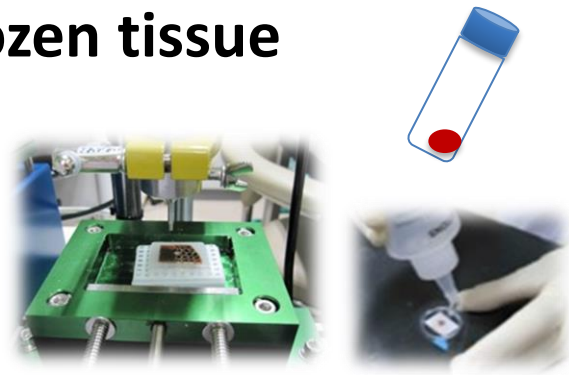




> 3,000 patients ~45,000 samples

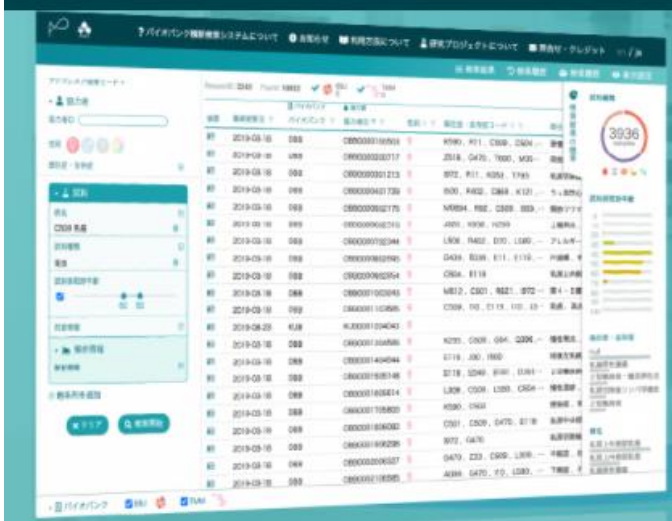


- snap frozen tissue
- OCT
- FFPE
- TMA



Fresh tissue ▪ prepared sample  
➤ Tissue culture / Organoids etc.

## Japanese Biobank Network for human materials



### Biobank Cross Search

Cross-search for samples and information from the Japanese biobank network



223,756 people

200,724 people

Total number of each gender

age at sampling

## University of Tsukuba Hospital



Patients with disease



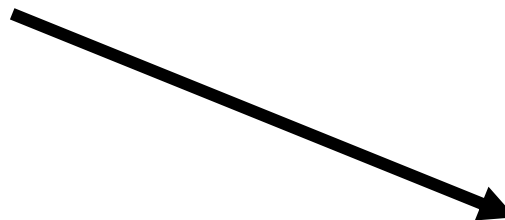
Vice director



Vice director

PMC

Research and Development Center for Precision Medicine



Tissue specimen  
Fresh frozen tissue,  
Stool, blood, etc..

Tsukuba Human Tissue  
Biobank Center

Joint research agreement



External  
research  
institution



Companies

Distribution by MTA  
(chargeable)



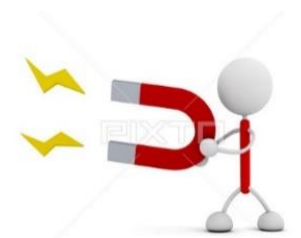
Director

Comprehensive  
medical examination  
Participants  
(healthy subjects)

Tsukuba Preventive  
Medicine Research Center



Director

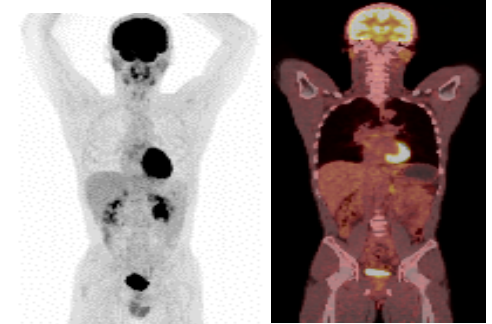


Supporting company research  
in Ibaraki prefecture



**Vision : Realization of a “society of health and longevity” by preventive medicine**

- 1, Health Check**
- 2, Cancer Screening**
- 3, Brain Dock**



- 4, High specialty menu (**Research**)**

**Genome check**

**Dementia check**

**Sleep disorder**

**Male function**

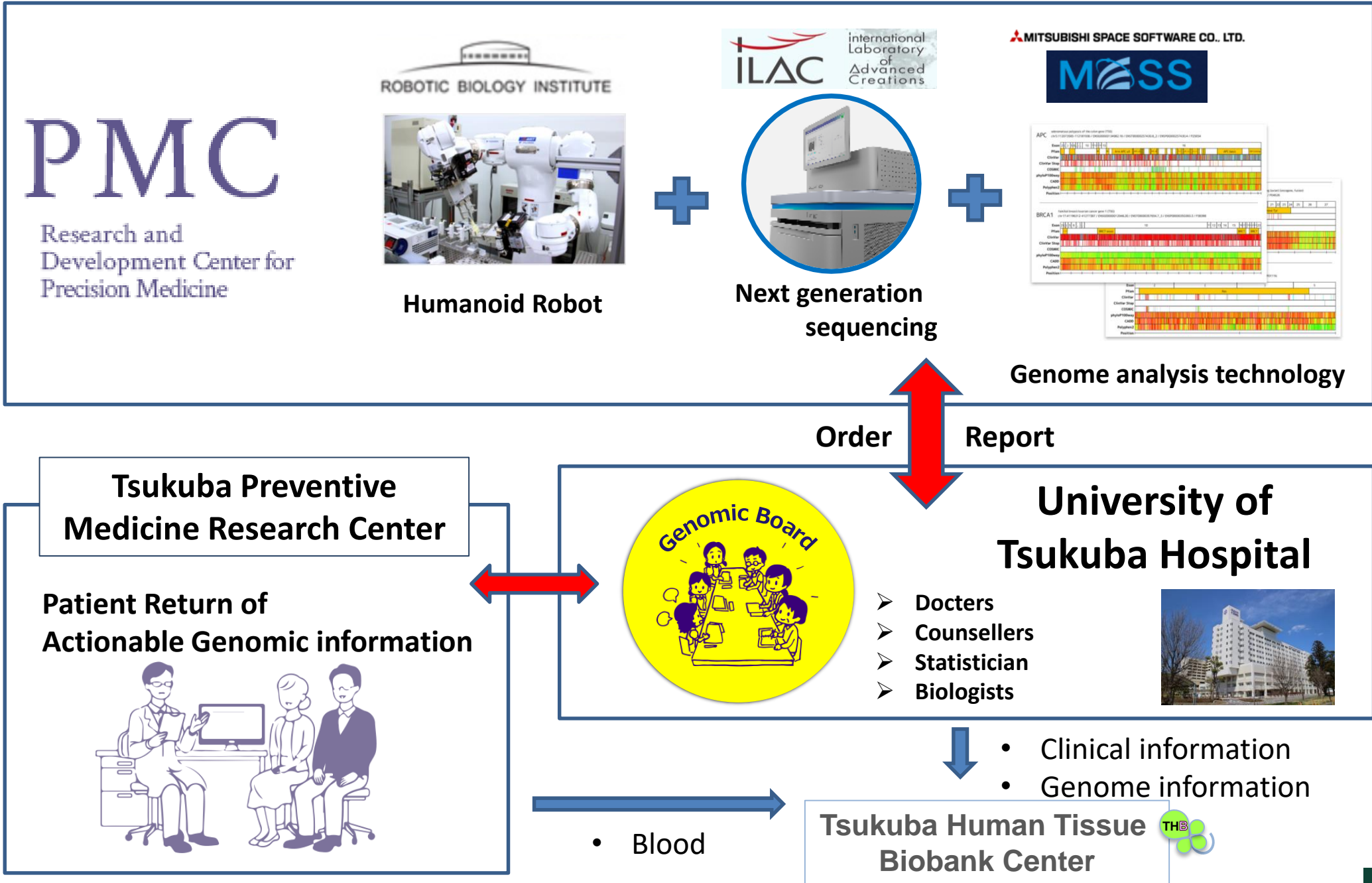
**Physical function evaluation etc...**

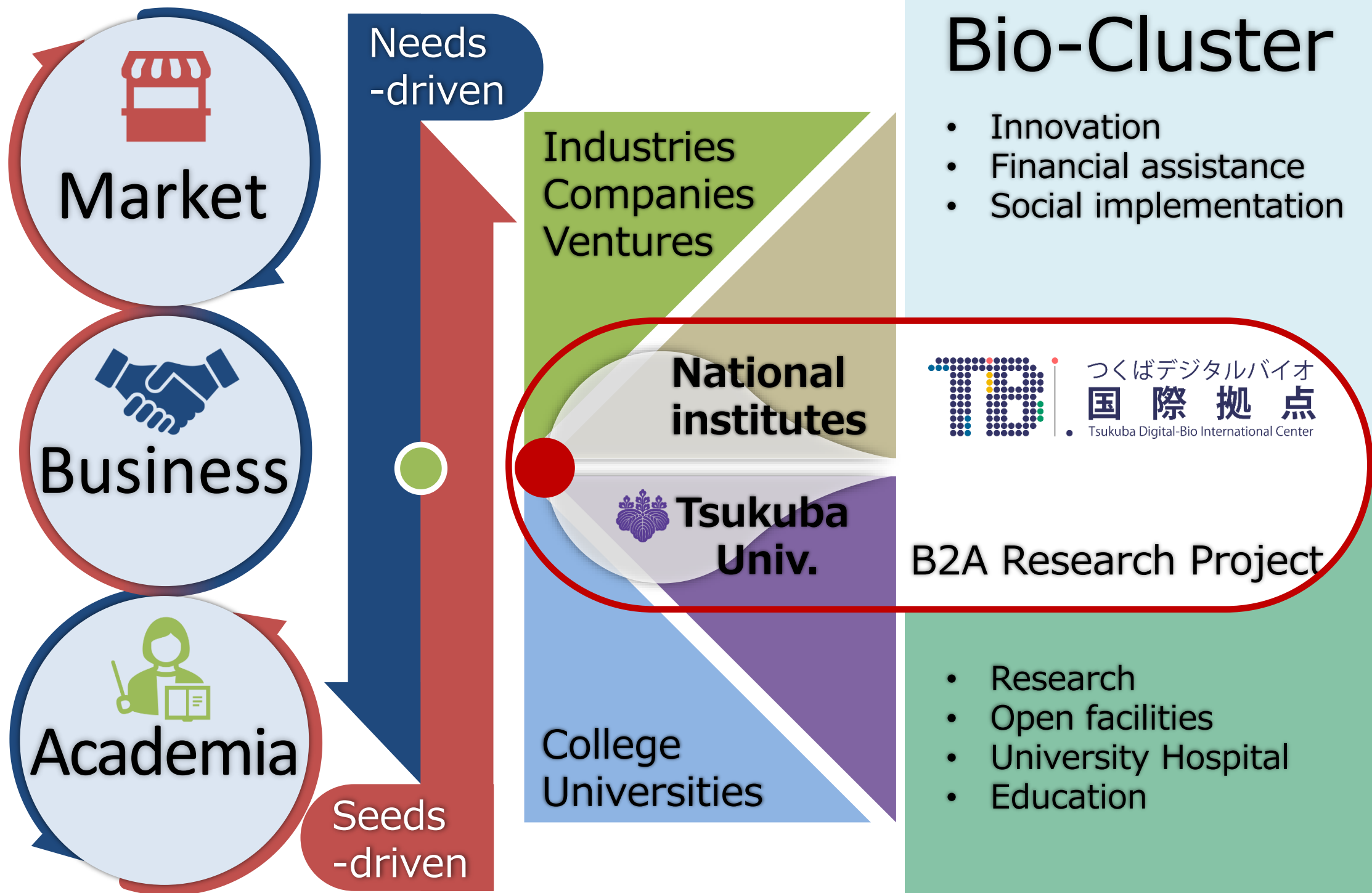
- **Research and Development for new sensing technology**
- **Development of new business model**





## Social Implementation of Whole Genome sequence (WGS) technology







**AIR5-ICU**

*Remote Medical Control*  
*Real Time Consultation*  
*Right Place Transportation*  
*Review Education*  
*Regional Communication*

## Tips for Co-creation

“Connection of researchers and companies”

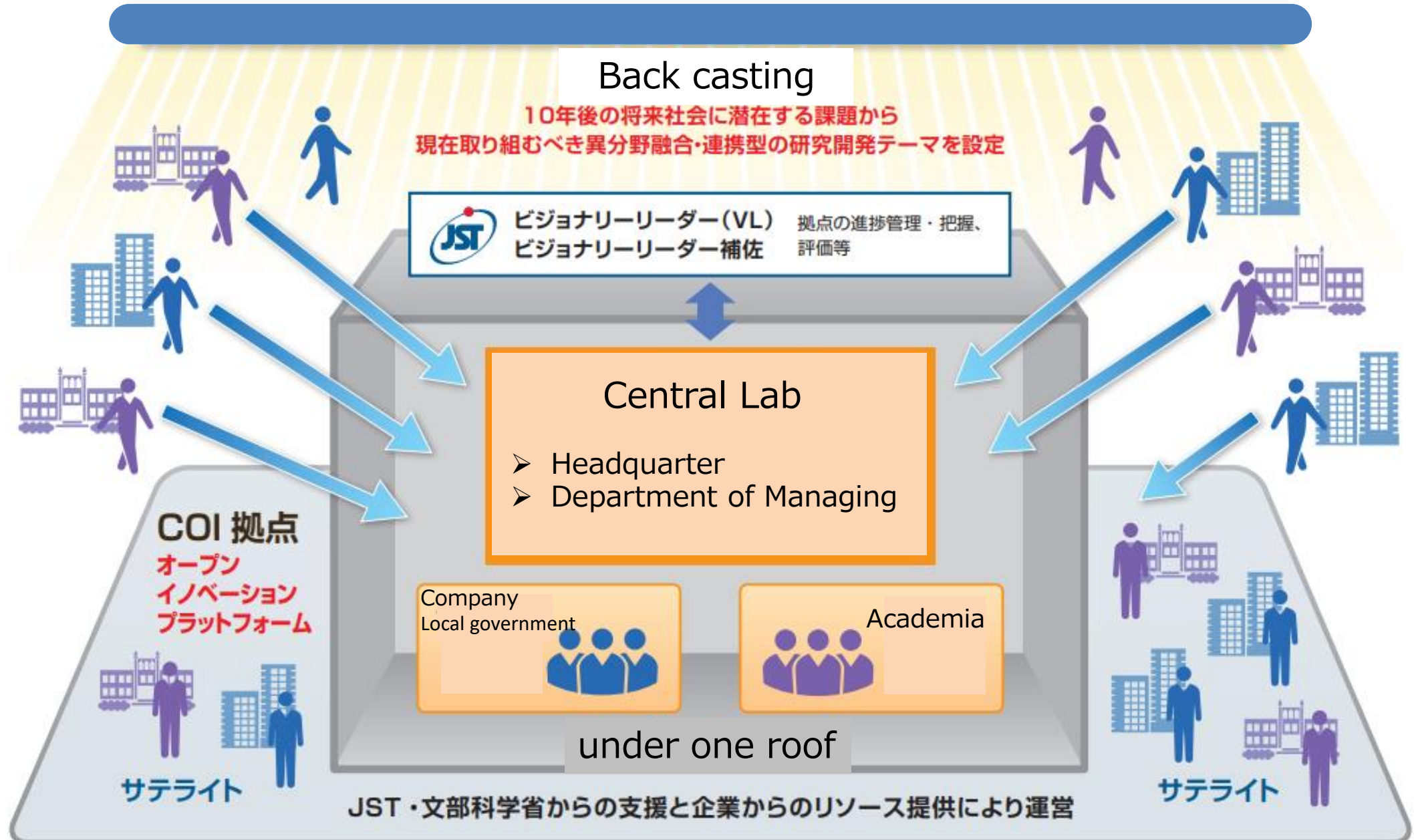
*Right Place*  
*Right Person*  
*Right timing*  
*Remote Control*  
*Regional Communication*



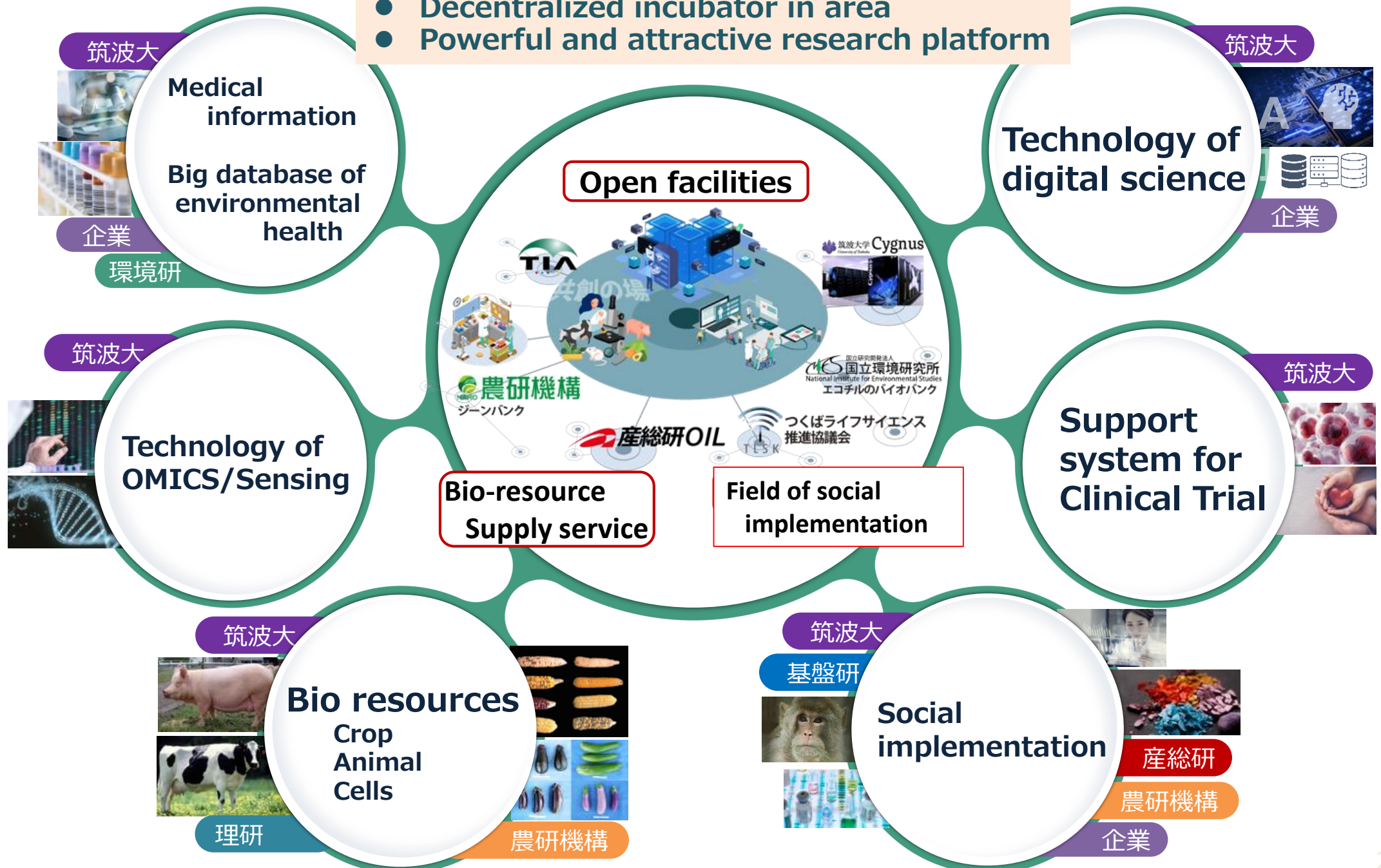


# How to organize the Central Lab

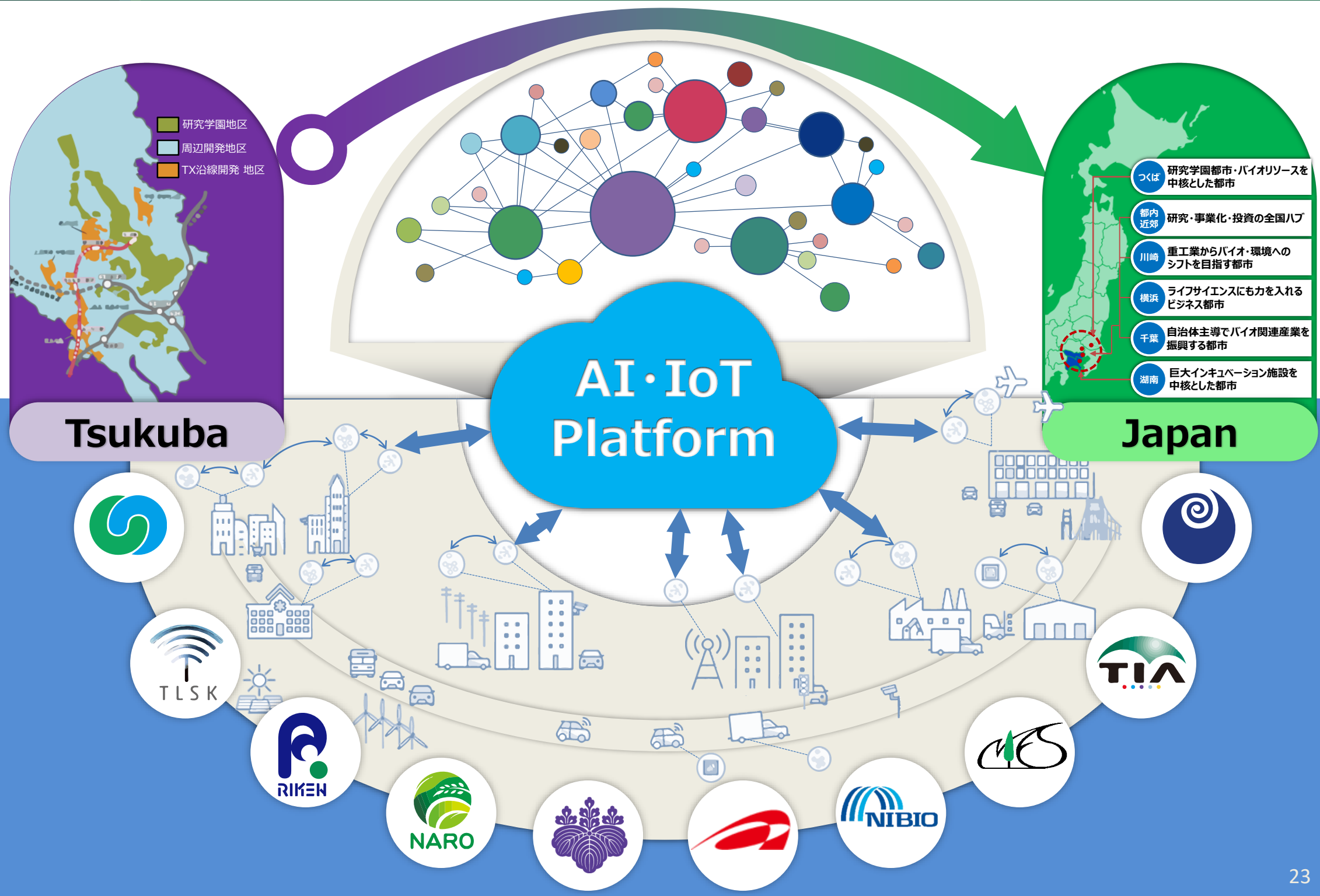
Innovation Hub: Central Lab under one roof



- Open lab/facilities
- Decentralized incubator in area
- Powerful and attractive research platform









## Strategy for international Hub

- Deepening International Collaboration
- Establishing an international presence



**Tetsuya Sakurai**

Vice Leader



**Director**  
**Center for Artificial Intelligence Reserch**



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Prof Tsukuba Univ.

**Prof. Jane Mellor**  
University of Oxford  
Dept. Biochemistry



**Hiroko Isoda**

Research Leader



**Vice director**  
**Alliance for Research on the Mediterranean and North Africa**

**OSCI** OXFORD STEM CELL INSTITUTE  
Breaking Barriers in Stem Cell Research

**université de BORDEAUX**



Prof Tsukuba Univ.

**Associate Prof. Francesca Buffa**  
Cancer Research UK  
Computational Biology and Integrative Genomics



**國立臺灣大學**  
National Taiwan University

つくばデジタルバイオ  
**国際拠点**

cic tokyo



**UC San Diego**  
SCHOOL OF MEDICINE

**cic** Cambridge Innovation Center

**Mount Sinai**



**Associate Prof. Patricia Kovatch**

Icahn School of Medicine at Mount Sinai  
SENIOR ASSOCIATE DEAN  
FOR SCIENTIFIC COMPUTING AND DATA SCIENCE







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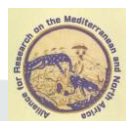
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*Who is a partner in Germany?*

**université de BORDEAUX**



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*Thank you for attention*

