Collaboration between Universities and Society, Business & Industry in Research and Innovation

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1. Introduction
Despite the multiple challenges we face, the world is dramatically changing with accelerating ever in history.

We are enforced to reshape the future beyond the multiple challenges.

Universities have a huge role to play on creating a brighter future by collaboration with society, business & industry.
Collaboration between Universities and Society, Business & Industry

University

Society

Business Industry

Government National Inst.
2. What We Are Challenged
Revolutionary Challenges

Digital Revolution
*Altering the Way We Live, Work, and Relate to Others in the Entire Domains*

Connectivity  AI  Convergence

Disruptions in 2007!

- iPhone (Apple)
- GitHub: Open Source Platform
- Android (Google): Open-standards Platform
- Kindle (Amazon): e-Book
- Watson (IBM): Artificial Intelligence (AI)
- Hadoop: Big Data
- Twitter: Social Networking
- Airbnb: Uber, Alibaba
R&D Investment Challenge

Referring 100 in year 2000

GDP % of R&D Investment

Government % of Total R&D Investment

Data from MEXT
World Share of Top 1% S&T Articles

<table>
<thead>
<tr>
<th>Country</th>
<th>World Share of Top 1% Articles (%)</th>
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<tbody>
<tr>
<td>US</td>
<td>21.6%</td>
</tr>
<tr>
<td>Korea</td>
<td>3.2%</td>
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<tr>
<td>Spain</td>
<td>3.2%</td>
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<tr>
<td>Australia</td>
<td>3.4%</td>
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<td>Italy</td>
<td>3.3%</td>
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<tr>
<td>Japan</td>
<td>5.4%</td>
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<tr>
<td>Canada</td>
<td>5.4%</td>
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<tr>
<td>France</td>
<td>3.7%</td>
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<tr>
<td>Germany</td>
<td>5.2%</td>
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<tr>
<td>UK</td>
<td>4.7%</td>
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<tr>
<td>China</td>
<td>11.8%</td>
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<td>Taiwan</td>
<td>1.8%</td>
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<td>Other Countries</td>
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<td>UK</td>
<td>4.7%</td>
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<td>France</td>
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<td>Spain</td>
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<td>India</td>
<td>3.4%</td>
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<tr>
<td>Korea</td>
<td>3.2%</td>
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| Data from NISTEP (2014)

Significant Increase in Asian Share of S&T Articles

International Collaboration Becomes the Norm in S&T Research.

Despite Asian Rise, Japan suffers from declining!
## Innovation Challenges

### Global Innovation Index (GII) 2016  INSEAD

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
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<tbody>
<tr>
<td>1</td>
<td>Switzerland</td>
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<td>Sweden</td>
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<td>3</td>
<td>UK</td>
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<td>4</td>
<td>USA</td>
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<td>5</td>
<td>Finland</td>
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<td>6</td>
<td>Singapore</td>
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<td>7</td>
<td>Ireland</td>
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<td>8</td>
<td>Denmark</td>
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<td>9</td>
<td>Netherland</td>
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<td>10</td>
<td>Germany</td>
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<td>11</td>
<td>Korea</td>
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<td>12</td>
<td>Luxemburg</td>
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<td>13</td>
<td>Iceland</td>
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<td>14</td>
<td>Hong Kong (China)</td>
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<tr>
<td>15</td>
<td>Canada</td>
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<td>16</td>
<td>Japan</td>
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<td>New Zealand</td>
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<td>Estonia</td>
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<td>25</td>
<td>China</td>
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<td>26</td>
<td>Malta</td>
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</tbody>
</table>

- **New Innovation Power with Global Connectivity**
- **Tremendous Increase in R&D Investment by China and Korea**
- **Asian Rise in Innovation, while Japan Is Declining.**
The world shifted to commit SDGs toward building a brighter future.

World Economic Forum promotes the Fourth Industrial Revolution with balance of SDGs.
Government Funding Challenges

Government Funding for S&T and Innovation

FIRST, NEXT (CSTI) (2009-2013)

WPI (JSPS)

Strategic Basic Research (JST) (ERATO, CREST, PREST)

Basic Research (JSPS) (Science Grant-in-Aide)

ImPACT (CSTI/JST) (2014-2018)

SIP (CSTI/JST, etc) (2014-2018)

MEXT/JST Initiatives

METI/NEDO Initiative

AMED Initiatives

MEXT/JST Initiatives for System Reform

University Operational Grants

Research Institute Operational Grants
3. Transforming University to Enhance Core Competence
Core Competence of University Why?

- Toward a Brighter Future, Define the University Role for Collaboration with Society, Business & Industry in Education, Research, and Innovation.

- For Taking a Leadership in Collaboration, Enhance University Core Competence to Attract Society, Business & Industry in Education and Research.

- Transform University to Empower Research and Innovation over the Silo Effects that Diversity and Convergence are hindered.
Transforming University Beyond the Silo Effects

◆ Open to the World
◆ Enrich Diversity
◆ Encourage Transdisciplinary Research
◆ Enhance Connectivity and Convergence
Explore the Frontier Science
World Premier International Research Center Initiative (WPI)
MEXT/JSPS, (2007 - )

Evaluate as the World-top Level Research Institute from the Research Performance of 5 WPIs

Explore the Frontier Science by Fusion Research
Open to the World
Attract the World
Reform the Institutional Systems

Nine WPI Research Centers

Harvard
Cal Tech
WPI
MIT
Rockefeller

Origin of Universe/Earth/Life
KAVLI IPMU
Adopted in FY 2007

Life Science
iFReC
Adopted in FY 2007

Materials/Energy
AIMR
Adopted in FY 2007

ELSI
Adopted in FY 2012

IIIS
Adopted in FY 2012

ITbM
Adopted in FY 2012
Enrich Diversity in University

Initiatives on Enhancing Female Researchers
MEXT/JST

This program aims to support activities to foster improvements in the research environment so as to enable female researchers to optimally develop and demonstrate their research skills and balance work with personal responsibilities such as childbirth, childcare, and the long-term care of elderly relatives.

Initiatives on Tenure Truck System
MEXT/JST

Tenure Truck ➞ Tenure Post
Enrich Diversity
SAKURA Science Plan
Short-Term Invitational Program for Asian Youth

SSP in Collaboration with Exchange Programs

- Invite highly excellent youth including high school, university students and young professors in S&T
- Visit to Science Museum
- Visit to companies
- Science camp
- Attend S&T・Policy Symposium
- Exchange with researchers/ SIT administrators
- Lecture by distinguished scientists
- Visit to Research institutes
- STI & Education Ministries
- Super Science High school

Exchange Programs
- Student exchange program (related organizations)
- Youth exchange program (related organizations)
- Private sector’s program
4. Driving Innovation by Enhancing Borderless Connectivity and Convergence
Many Ways of Innovation

- Borderless Connectivity
  - Open Innovation

- Diversity and Convergence
  - Disruptive Innovation (Disruption)

- Societal Needs and Wants
  - Issue-drive Innovation
Innovation Centers for Advanced Interdisciplinary Research Areas (MEXT/JST) (2006 - )

Co-Creation of Innovation by Equal Partnership (University/Company)

- Innovation Center in University Campus
- Matching Fund
- Long-term: 10 years
- Interdisciplinary Area
- System Reform

Hokkaido University
Future Drug Discovery

AIST
Optical Routing Energy Saving

Kyoto University
Immuno-regulation Technologies

Kyoto University
Bio-Medical Imaging

Osaka University
Photonics Center

Kyushu University
Medical Redox Navigation

Tohoku University
Micro System Fusion

Tokyo Women’s Medical University
Regenerative Medicine

University of Tokyo
Nano Quantum Information Electronics

University of Tokyo
System Bio-Medicine

Yokohama City University
Clinical Proteomics

Kobe University
Innovative Bio Production
Center of Innovation (COI) for Creating a New Future, MEXT/JST

Vision 1: Secure sustainability as a country advanced in its aging population and declining birth rate. Smart Life Care, Ageless Society

Vision 2: Create a living environment with a high quality of life as prosperous and reputable country. Smart Country

Vision 3: Establish a sustainable society with vitality. Active Sustainability

Back-casting Visionary Leader

Research Promotion Institute

Industry, Municipality, Academia Under One Roof
Co-creation with Society  
JST-MIRAI Program (2017 - )

**Small Start type**

- **MEXT**
  - 4 Areas based on the 5th S&T Basic Plan
  - Super smart Society, Sustainable Society
  - Safe and Secure Society, Low carbon Society

**Theme decision**

- **JST**
  - Call for proposal research projects (FS)

  **Feasibility Studies**
  - Up to 3 years
  - 20 million JPY/year/project

  **R&D Projects**
  - Up to 5 years
  - 200 to 400 million JPY/year/project

**Large Scale type**

- **MEXT**
  - Theme decision to change current technology system and to be future basic technology

**Industrial / Societal Needs/wants**

- **S&T Trends**
  - investigated by JST

**Call for proposal**

**research projects**

- **JST**
  - R&D Projects

  **R&D Projects**
  - Up to 10 years
  - 400 to 600 million JPY/year/project
Issue-driven Innovation

S&T Research Partnership for Sustainable Development (SATREPS) JST/JAICA
German Innovation Award
Gottfried Wagner Prize
For Young Researchers in Japan

Partner Companies
BASF Japan, Bayer Holding, Bosch Co.
Continental Japan, Evonik Japan, Daimler, Merk, Schffler Japan, Siemens Group in Japan

Embassy of Germany, DAAD, DFG, Fraunhofer, JST, JSPS

JURY
Chair: M. Aizawa
- T. Kishi
- M. Gonokami
- A. Fujishima
- J. Yamagiwa

Digitalization & Mobility
Materials
Energy
Life
5. Concluding Remarks

- Urged to enhance core competence of individual university toward a brighter future.

- Enforced to transform university for empower diversity and transdisciplinary research over the Silo Effects.

- Encouraged to create disruptions from convergence of diversities by collaboration with society, business & industry toward a brighter future.