Action plan
to boost knowledge transfer

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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.

STI Strategy including new research fund, venture fund and reformation of University
Basic research plays an important role for business firms not only in technology transfer but also in 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.

1. **1st Basic Plan**
   - FY1996-FY2001
   - "Promotion of S&T learning and Enhancement of understanding and interest"
   - Total Budget: 17 trillion JPY

2. **2nd Basic Plan**
   - FY2001-FY2005
   - "S&T in society and for society"
   - Total budget: 24 trillion JPY

3. **3rd Basic Plan**
   - FY2006-FY2010
   - "S&T supported by society and citizen for its contribution"
   - Total budget: 25 trillion JPY

4. **4th Basic Plan**
   - FY2011-FY2015
   - "Development of Policy Created together with Society"
   - Total budget: 25 trillion JPY

5. **5th Basic Plan**
   - FY2016-FY2020
   - "Society 5.0"
   - Total budget: 26 trillion JPY
[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

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

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

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.

Reference: Chart 3-3-4, Japanese Science and Technology Indicators 2016 (in Japanese)
Reference: Chart 3-3-5, Japanese Science and Technology Indicators 2016 (in Japanese)
Reference: Chart 3-3-6, Japanese Science and Technology Indicators 2016 (in Japanese)
[Summary Chart 15] Percentage of firms that achieved product innovation in the selected countries (by involvement in R&D activities)

- All firms
- All R&D active firms
- All firms with no R&D

<table>
<thead>
<tr>
<th>Country</th>
<th>Period</th>
<th>Percentage of product innovative firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>(2009-12)</td>
<td>70%</td>
</tr>
<tr>
<td>Germany</td>
<td>(2010-12)</td>
<td>80%</td>
</tr>
<tr>
<td>France</td>
<td>(2010-12)</td>
<td>70%</td>
</tr>
<tr>
<td>U.K.</td>
<td>(2010-12)</td>
<td>60%</td>
</tr>
<tr>
<td>Korea</td>
<td>(2011-13)</td>
<td>60%</td>
</tr>
</tbody>
</table>
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)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>All fields</td>
<td>The number of papers</td>
<td>Fractional counting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Papers</td>
<td>Share</td>
</tr>
<tr>
<td>U.S.</td>
<td>27,434</td>
<td>49.2</td>
<td>1</td>
</tr>
<tr>
<td>Japan</td>
<td>3,240</td>
<td>5.8</td>
<td>2</td>
</tr>
<tr>
<td>Germany</td>
<td>2,966</td>
<td>5.2</td>
<td>3</td>
</tr>
<tr>
<td>France</td>
<td>2,533</td>
<td>4.6</td>
<td>4</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1,933</td>
<td>2.5</td>
<td>5</td>
</tr>
<tr>
<td>Italy</td>
<td>1,276</td>
<td>2.3</td>
<td>6</td>
</tr>
<tr>
<td>Australia</td>
<td>1,140</td>
<td>2.0</td>
<td>9</td>
</tr>
<tr>
<td>Sweden</td>
<td>957</td>
<td>1.8</td>
<td>10</td>
</tr>
</tbody>
</table>

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
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

Conventional Innovation Model

To realize a dream society

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

New society

Lead to the result

① Technology/Function

Existing technology

Existing technology

Existing technology

② ripple effect

② ripple effect

③ demand of Improvement

③ demand of Improvement

① Technology Seeds (Social needs)

Academic research

Academic research

Academic research

Academic research

Concurrent in world

Industry, University, Business

Social innovation "Dream"

Collaboration Industry/academia/government

Sensor & network

Nano Technology

Big data

ICT

Preventive medicine

Genomic

Advanced medicine

Regenerative medicine

House

service

energy

Social science

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

- Try and error
- Basic research
- Integration of arts and sciences
- Fabrication
- System
- Device
- Material
- Control
- Art
- Culture
- Service

Univ.
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>

<table>
<thead>
<tr>
<th>Vision 1</th>
<th>Vision 2</th>
<th>Vision 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secure sustainability as a country advanced in its aging population and declining birth rate: Smart Life Care, Ageless Society</td>
<td>Create a living environment with a high quality of life as a prosperous and reputable country: Smart Japan</td>
<td>Establish a sustainable society with vitality: Active Sustainability</td>
</tr>
</tbody>
</table>

Three Basic Visions of COI STREAM

- Vision 1: Smart Life Care, Ageless Society
  - Key concepts: functions, Medical Health, Mental Health, Motivation, Sports, Food, Tree → Realization of happiness
- Vision 2: Smart Japan
  - Key concepts: function, Intuition, Active thinking, Critical thinking, Six senses → Innovative thinking method
- Vision 3: Active Sustainability
  - Key concepts: function, Personalization, Resilience, Sustainability, Functionalization, Flexibility, Waste → Development of a durable town for centuries

Over the years, Visionary Leaders have intensively advised the COI sites and evaluated their performance.

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

Visionary Teams

[Promotion and evaluation of COI sites]

- The Visionary Teams are in charge of the progress management and activity assessment of COI sites.
- COI Sites implement R&D activities in accordance with advice and recommendations by the Visionary Teams.

**Vision 1**
- Visionary Leader: Yuzuru Matsuda (Advisor, Kyowa Hakko Kirin Co., Ltd.)
- Visionary Team member: Akio Onishi (Visiting Professor, Graduate School of Public Policy, The University of Tokyo)
- Visionary Team member: Masafumi Nogimori (Former Chairman of Astellas Pharma, Inc.)

**Vision 2**
- Visionary Leader: Satoshi Koike (CEO, Vegeta, Inc.)
- Visionary Team member: Hideaki Koizumi (Honorary Fellow, Hitachi, Ltd.)
- Visionary Team member: Atsushi Hasegawa (President, Concom, Inc.)

**Vision 3**
- Visionary Leader: Junichi Sato (President of the Japan Federation of Engineering Societies)
- Visionary Team member: Shinji Asakura (Former General Manager, GE International Inc.)
- Visionary Team member: Tetsuhiko Ikegami (Former President, The University of Azu)

Research adviser:
- Koji Shimizu (Professor, Kyoto University)
- Miwako Doi (Auditor, NICT)
- Yuji Furui (Project Assistant Professor, The University of Tokyo)
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.

- Iwaki Health Promotion Project
  - 600 medical and health data items per person

- “Ikiiki” Health Checkup Project
  - Health data of 3000 elderly people (Dementia)

- Hisayama Study
  - ≥50-year follow-up study on lifestyle diseases

- Kyotango Study (New)
  - Widely famous longevity area

Big Data

- Gut Microbiome
- Disease risk-factor identification
- Disease-predicting algorithm
- Optimal prevention and support

Realization of social innovation

Health Education

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

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Human resource development (Lecture, Workshop)</th>
<th>Health promotion activity support</th>
</tr>
</thead>
<tbody>
<tr>
<td>The feature of the center is that it demonstrates practical activities on real fields.</td>
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"<Stakeholders in health and medical fields get together>"

[Training health staff + Support]

Occupational 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

Core organization of social implementation

Center for Promoting Healthy Aging
Human resource development (Lecture, Workshop)
Health promotion activity support

Core organization of social implementation

Council of the Center for Promoting Healthy Aging

Aomori Medical Association

[Headquarter]

Aomori Medical Association

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

Prefecture • municipality

Hachinohe

Aomori

Hirosaki

Aomori

Core organization of social implementation

Center for Promoting Healthy Aging
Human resource development (Lecture, Workshop)
Health promotion activity support

‘Health Member’: Approx. 1,000 people

Shingo Mimura
Governor of Aomori prefecture

Kazushige Ichinohe
Head of the Aomori prefecture health and welfare department

Masaru Saito
Chief of the Aomori Medical Association

Shigeyuki Nakaji
Head of the Center for Promoting Healthy Aging
Specially-appointed Professor, Department of Social Medicine, Hirosaki University Graduate School of Medicine

Aomori Medical Association, Pharmacist Association, Dentist Association, Nursing Association, Dietetic Association

Aomori National Health Insurance Organization

JAPAN HEALTH INSURANCE ASSOCIATION

Japan Health Fitness Programmers’ Association

Health-related Association

 ※Correspond to Aomori prefecture health management certification system
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Who is key man in research and technology transfer

- Basic research
- Devil River
  - Fund for Technology transfer
- Valley of Death
  - Fund For Collaboration research work/
    Open Innovation

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 monitoring