Science, Technology and Innovation Policy of Japan
～　IoT Innovation by MEMS　～

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Council for Science, Technology and Innovation,
Cabinet Office

Cycle of Economic Growth
～Roles of Industry and National～

Sustainable economic growth can be realized by creation of innovation.

●strategic allocation of resources
（prior investment, common base.etc)
●environmental arrangement
（regulation, system, Tax system)
＊promotion of industry-academia-government collaboration

Creation of
Innovation

Enhancement of global industry competitiveness

Expansion of market scale, profit improvement,

・Increase of tax revenues
・job opportunities

Improvement of financial strength

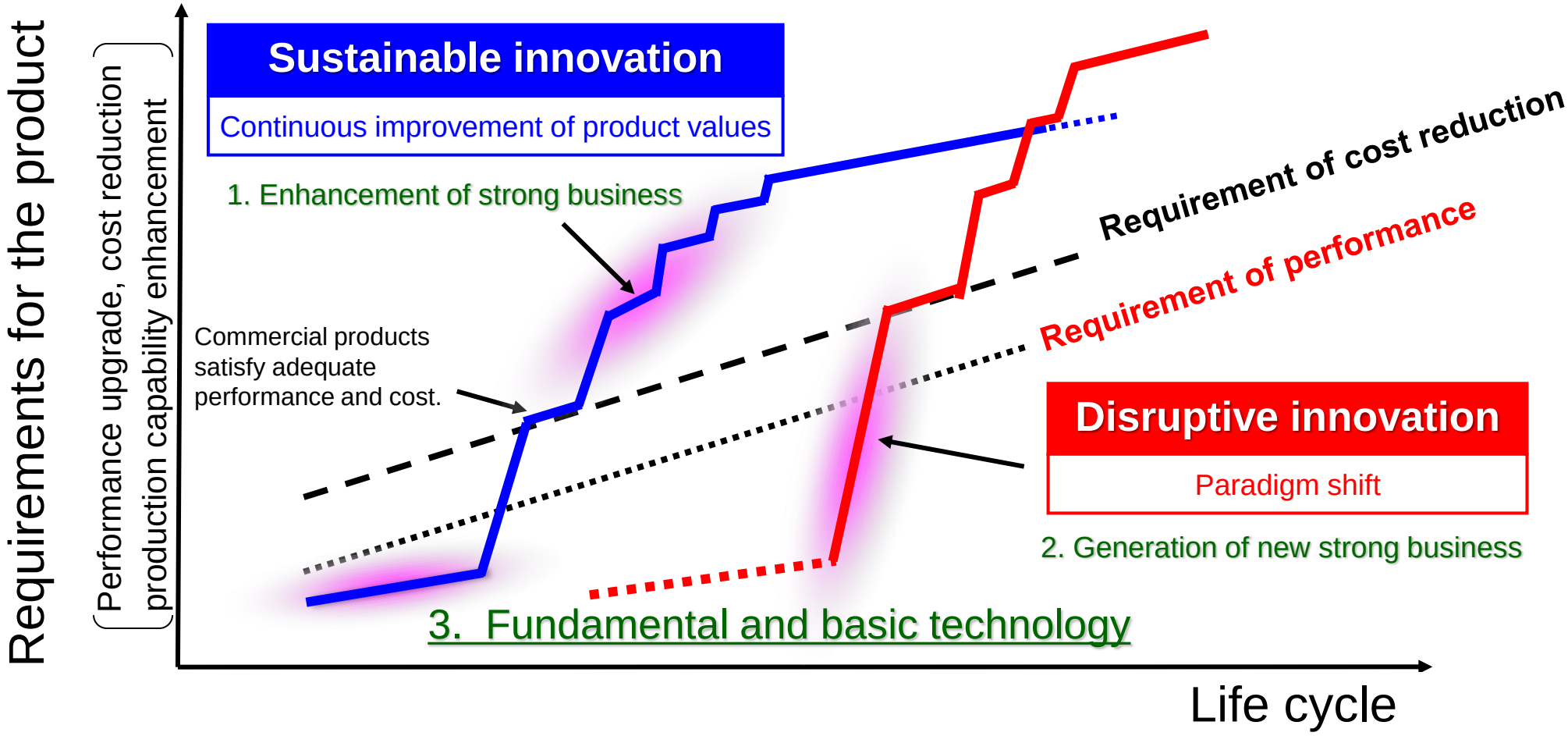
・financial reconstruction

Increase of investment for R&D and production capacity

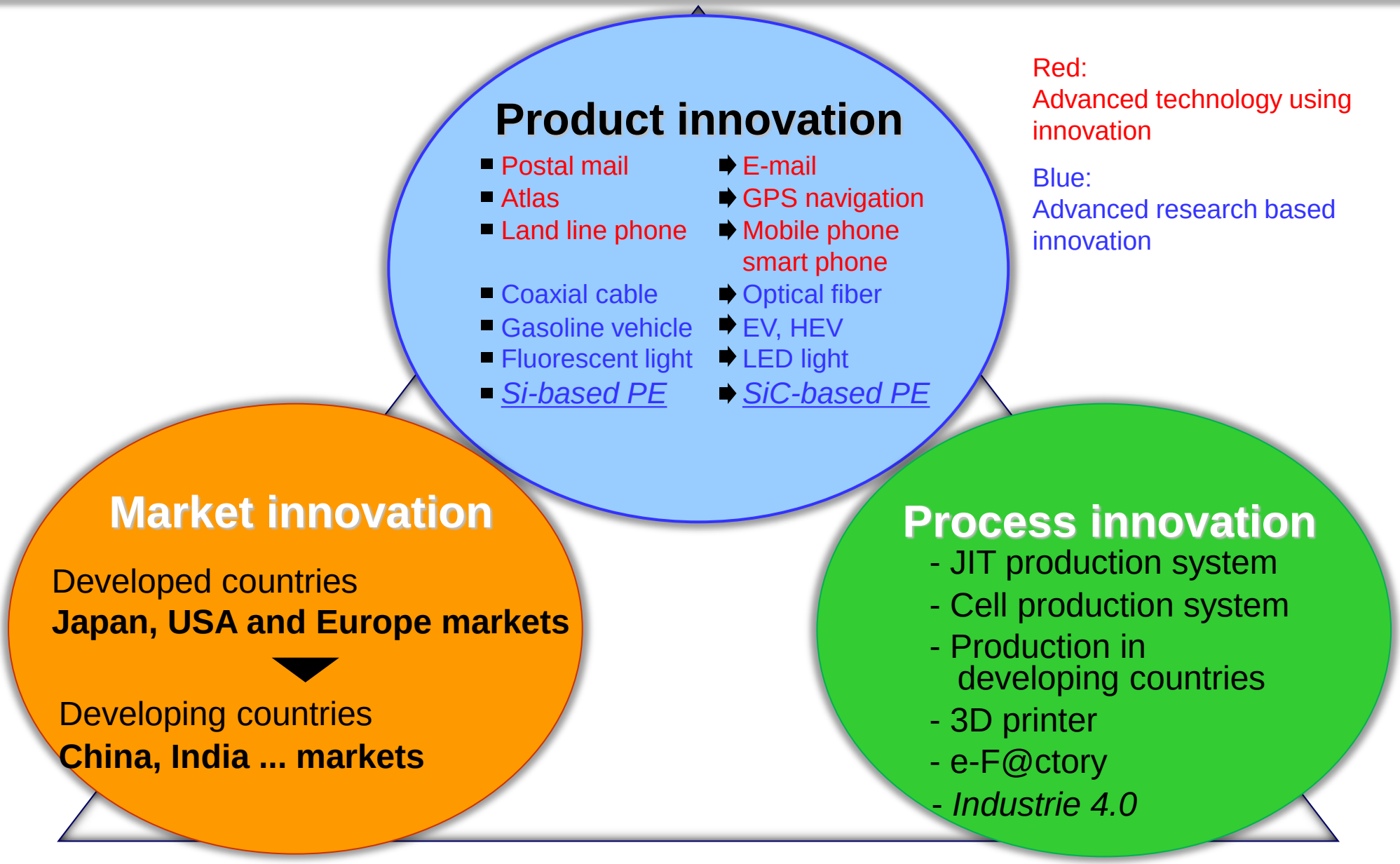
・Realization of national wealth
(Welfare, Education, Infrastructure, etc.)
・Global warming countermeasures,
・Supports to developing countries, ・・・

Sustainable Innovation and Disruptive Innovation

- Innovation is an action to change industry and society drastically by developing new technologies and/or new products based on invention and discovery.
- Innovation can be classified into two types
  - "Sustainable innovation" and "Disruptive Innovation".
- Balancing two types of innovation and Fundamental/basic technology are important.



Three Types of Disruptive Innovation



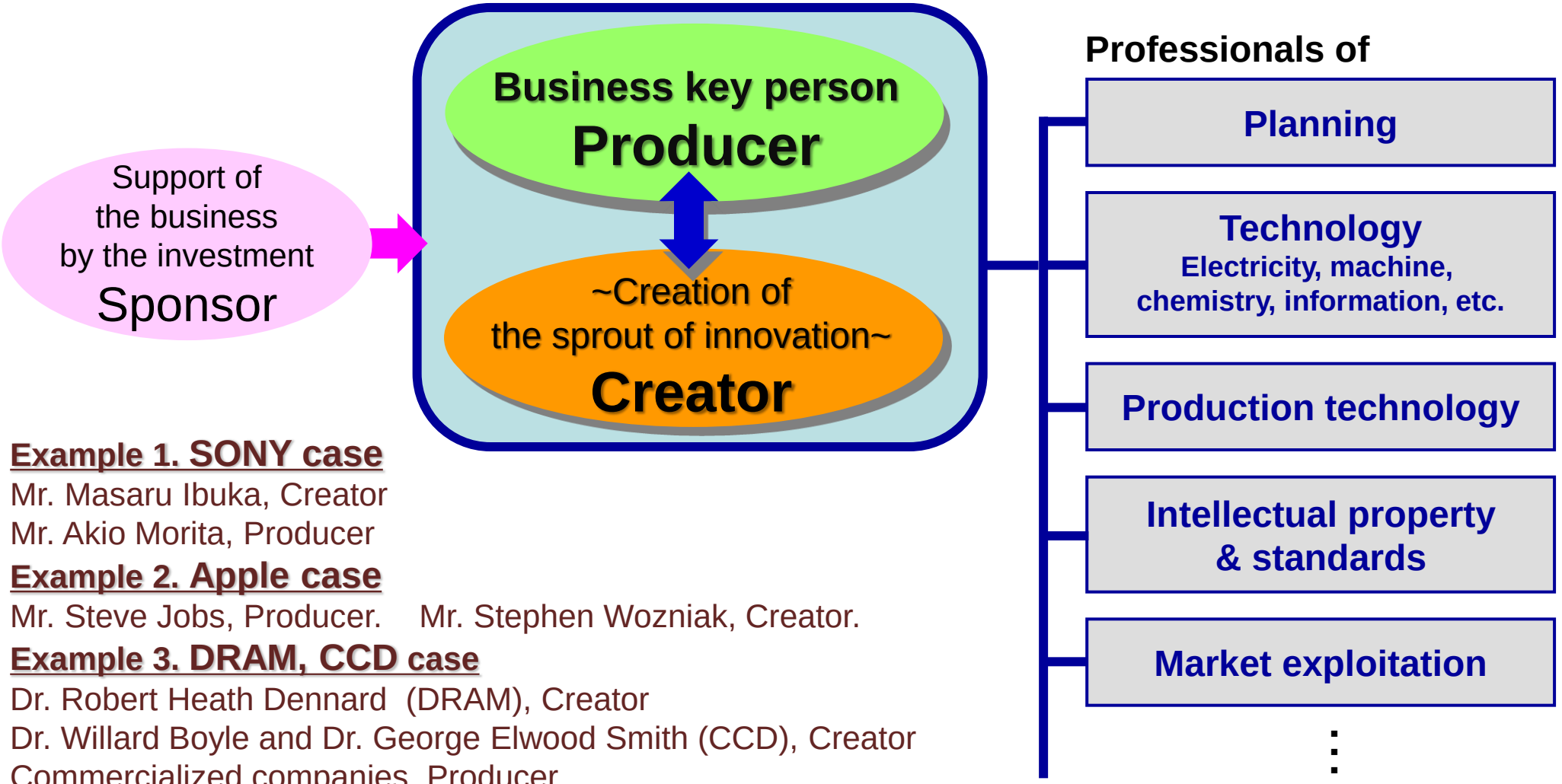
Red:
Advanced technology using innovation

Blue:
Advanced research based innovation

GPS: Global Positioning System, EV: Electric Vehicle, HV: Hybrid Vehicle, LED: Light Emitting Diode, PE: Power Electronics

Cultivation of Human Resources for Creations of Innovation

- Creator makes a sprout of innovation and producer brings the sprout to business.
- Both creators and producers are important in innovative business strategies.
- Strategic cultivation of diversified professionals.



Example 1. SONY case
Mr. Masaru Ibuka, Creator
Mr. Akio Morita, Producer

Example 2. Apple case
Mr. Steve Jobs, Producer. Mr. Stephen Wozniak, Creator.

Example 3. DRAM, CCD case
Dr. Robert Heath Dennard (DRAM), Creator
Dr. Willard Boyle and Dr. George Elwood Smith (CCD), Creator
Commercialized companies, Producer

Japan Revitalization Strategy

The Three Arrows of Abenomics

Aggressive monetary policy

Flexible fiscal policy

New growth strategy

New growth strategy

- Japan → World's most innovation-friendly country
- CSTI (Council for Science, Technology and Innovation) → Headquarter function for creation of innovations
- Innovations and regulatory reforms → Driving force of economic revitalization and growth

※Innovation is added

Reorganized to the Council for Science, Technology and Innovation（**CSTI**） （May 19 ,2014）

Comprehensive Strategy on Science, Technology and Innovation - A Challenge for Creating Japan in a New Dimension – June 7, 2013 Cabinet Decision

Executive Members of CSTI

<Main Missions>

1. Investigate and discuss basic science, technology and innovation policies
2. Investigate and discuss science, technology and innovation budgets and allocation of human resources
3. Evaluate Japan's key R&D

	**Dr. Yuko Harayama** Professor Emeritus, Tohoku University Academy		**Dr. Motoko Kotani** Professor, Tohoku University Academy
	**Dr. Kazuo Kyuma** Former Executive Advisor, Mitsubishi Electric Corporation Industry		**Mr. Hiroaki Nakanishi** Chairman, Hitachi, Ltd. Industry
	**Dr. Kazuhito Hashimoto** Professor, University of Tokyo Academy		**Dr. Toshio Hirano** President, Osaka University Academy
	**Mr. Takeshi Uchiyamada** Chairman, Toyota Motor Corporation Industry		**Dr. Takashi Onishi** President, Science Council of Japan Affiliated Organization

Five Grand Challenges toward Ideal Society

CSTI accelerates to address the **Five Grand Challenges** for realization of ideal society in 2030 and powerful promotion toward economic revitalization.

1. Realization of clean and economical energy system
2. Realizing of a healthy and active ageing society as a top-runner in the world
3. Development of next generation infrastructures as a top-runner in the world
4. Regional revitalization taking advantage of the regional resources
5. Early recovery and revitalization from the Great East Japan Earthquake

Three perspectives to accelerate activities for the solution of the policy challenges

Taking initiatives on the solution of integration issues and the cross-ministry measures and through programming

Strengthening industrial competitiveness through cross-cutting technologies

Capitalizing on the opportunities of the 2020 Tokyo Olympic and Paralympic Games

Comprehensive Strategy on Science, Technology and Innovation – Bridge of Innovation toward Creating the Future – June 24, 2014 Cabinet Decision

Implementation of the Comprehensive Science, Technology and Innovation Strategy

(1) Establishment of "Science and Technology Budgeting Strategy Committee"

Initiative in science and technology budgeting for the whole government

(2) Establishment of "Cross-ministerial Strategic Innovation Promotion Program (SIP)"

Total ¥50B (budget for FY2014)

Creation of a cross-ministry program for promoting innovations

(3) Establishment of "Impulsing PAradigm Change through disruptive Technologies (ImPACT)"

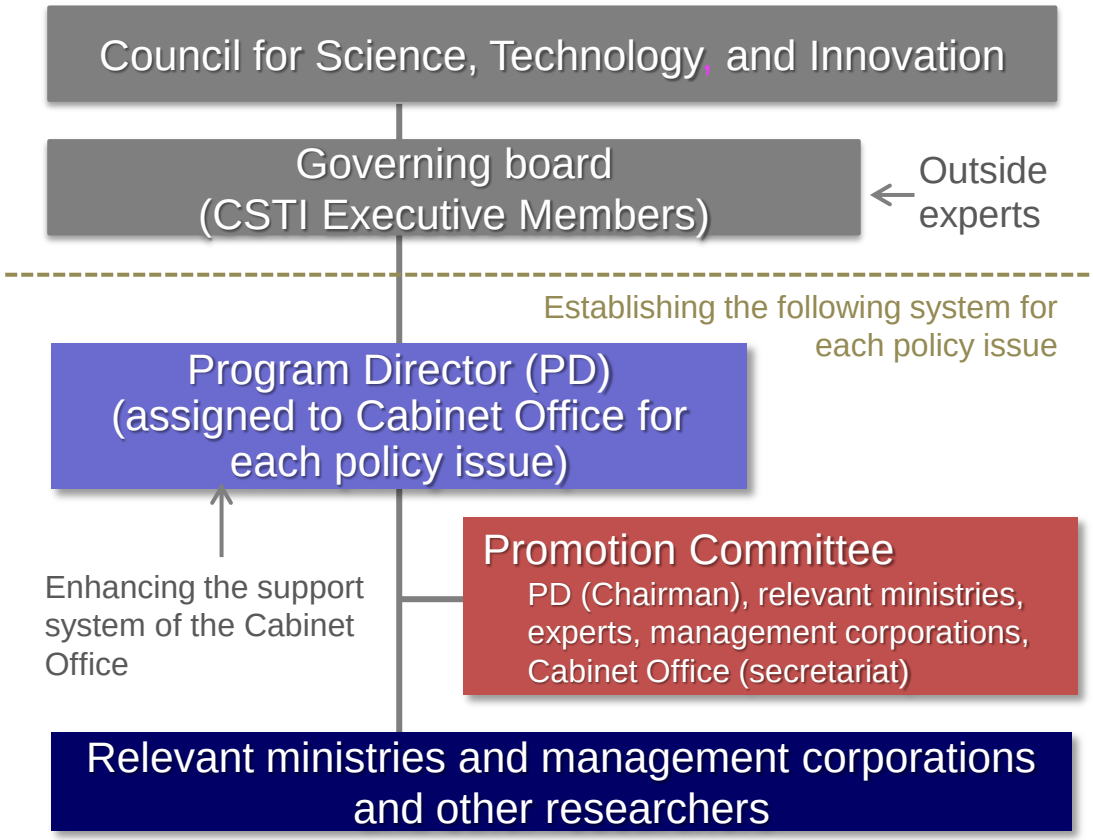
Total ¥55B
(Supplementary budget for FY2013(establish funds))

high risk / high impact R&D to create the disruptive innovation with paradigm shift

Cross-Ministerial Strategic Innovation Promotion Program (SIP)

- Aiming to realize Science, Technology and Innovation through basic research, application research, and commercialization by cross-ministerial cooperation.
- CSTI decides subjects to solve the significant issues and achieve the remarkable economic growth.
- CSTI appoints Program Directors (PDs) for each project and allocates the budget.

"Expenses for FY2014 were budgeted at 50 billion yen to the Cabinet Office.



Program Directors and Subjects of SIP

Academy | Industry

Innovative combustion technology

Masanori Sugiyama
Toyota Motor Co.,Ltd.

Innovative structural materials

Teruo Kishi
Univ. of Tokyo, NIMS

Next-generation ocean resources development technologies

Tetsuro Urabe
Univ. of Tokyo, JMEC

Tech. for maintenance/upgrading/ management of infrastructures

Yozo Fujino
Yokohama National Univ.

Tech. for creating next-generation agriculture, forestry and fisheries

Takeshi Nishio
Univ. of Hosei

Next-generation power electronics

Tatsuo Oomori
Mitsubishi Electric Co.,Ltd

Energy carrier

Shigeru Muraki
Tokyo Gas Co.,Ltd.

Autonomous cruising (automatic driving) System

Hiroyuki Watanabe
Toyota Motor Co.,Ltd.

Reinforcement of resilient function for preventing and mitigating disasters

Masayoshi Nakashima
Univ. of Kyoto

Innovative design/manufacturing technologies

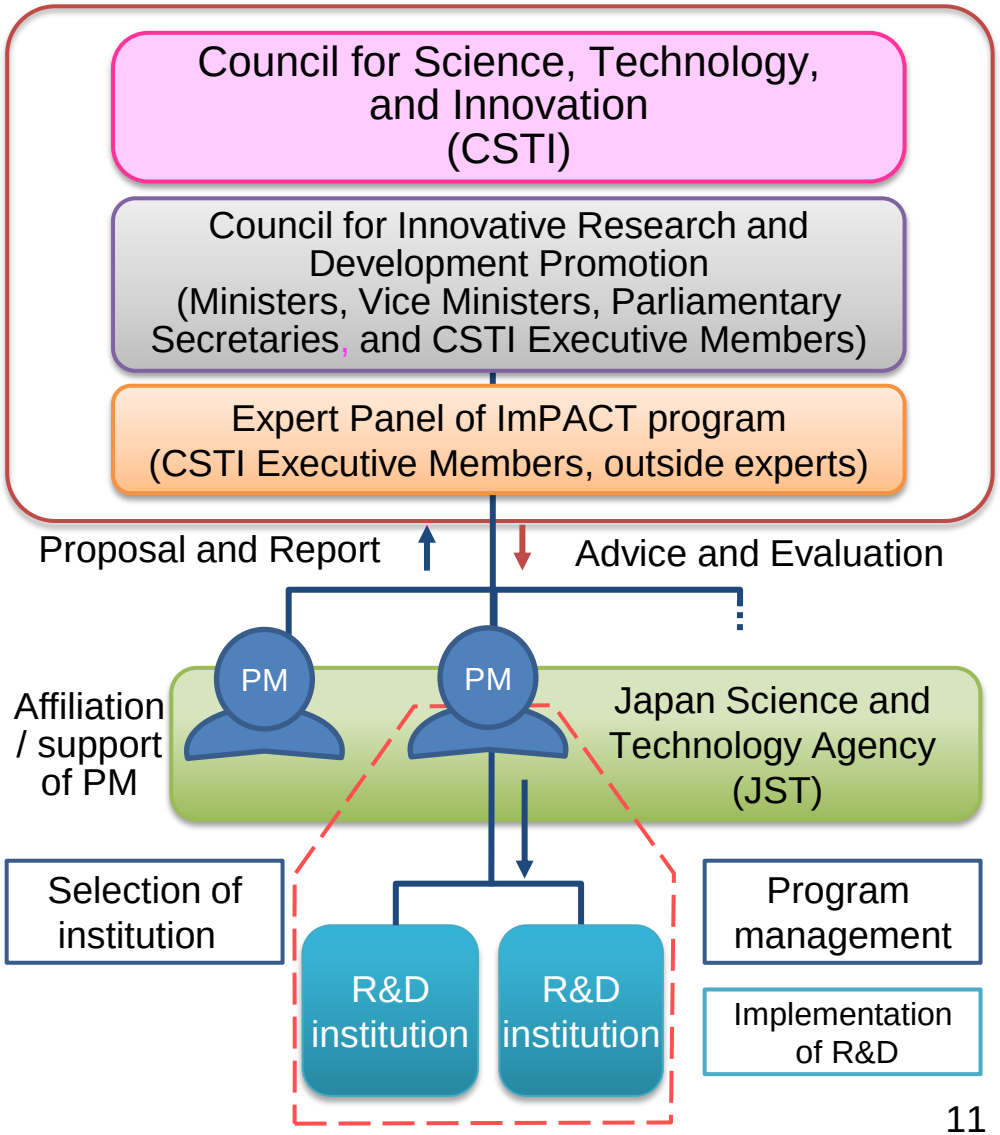
Naoya Sasaki
Hitachi, Ltd.

Impulsing PAradigm Change through disruptive Technologies (ImPACT)

— Synergize the US DARPA model with the Japanese FIRST model —

- Create disruptive innovations which revolutionize industries and society through high risk / high impact R&Ds.
- Giving great authority for planning, acting and managing the program to Program manager(PM).
- PM is expected to work as a producer, not as a researcher.
- Reinforcing the supporting system for PMs by following the previous Japanese Big Program, FIRST, with help of the JST.

Appropriating 55 billion yen were budgeted in the supplementary budget for FY2013(establish funds).



Program Managers and Subjects of ImPACT

Academy | Industry

"Flexible Tough Polymer" with Ultra Thin Film and Excessive Strengths

Kohzo Ito
University of Tokyo

Novel Value Creation by Systematic Generation of Serendipity

Keisuke Goda
University of Tokyo

Safe, Secure and Aged Society with Ubiquitous Power Laser

Yuji Sano
Toshiba Corporation

Ultimate Ecological IT Apparatus Having a Extremely Long Life without Batteries

Masashi Sahashi
Tohoku University

Innovative Cybernic System to Realize Zero Intensive-nursing-care Society

Yoshiyuki Sankai
University of Tsukuba

Materials Industry Revolution by Super Highly-functional-structure Protein

Takane Suzuki
Kojima Industries Corporation

Tough Robotics Challenge

Satoshi Tadokoro
Tohoku University

Reduction and Recycling of High-level Radioactive Wastes by Nuclear Transformation

Reiko Fujita
Toshiba Corporation

Ultra-high speed and Multiplexed Sensing System of Extremely Small Amounts of Substances beyond Evolution for the Detection

Reiko Miyata
Nagoya University

Newly Growth Industry Creation by Innovative Visualization Technology

Takayuki Yagi
Canon Inc.

Energetic Life by Visualization and Control of Brain Information

Yoshinori Yamakawa
NTT DATA Institute of Management Consulting Inc.

Highly Intelligent Social Base by Quantum-networking with Quantum Artificial Brain

Yoshihisa Yamamoto
National Institute of Informatics

Overview of Phase 5 of Basic Program for Science and Technology (tentative draft)

Ideal Nation

Capable of continuing to create intellectual assets and nurture fundamental technologies with the potential evolving as a nation in this grand era of science and technology transformation.
(1) A nation that possess international competitiveness and delivers sustainable growth in the future, while ensuring the progress of society
(2) A nation where its citizens can feel safe, secure and affluent, and realize a good QOL
(3) A nation that proactively approaches global challenges, such as large-scale natural disasters and climate change, and contributes to progressive sustainable development throughout the world

Aim to be recognized as the nation best suited for developing innovations in the world; doing so by achieving total optimization, including institutional reviews on applications and customs

<Points of Focus>

○ Initiatives for future creation of industries and transformation of society

- Innovations in manufacturing technologies and system integration that enable the nation to evolve with the new paradigm shift in this grand era of transformation in science, technology and innovation, including progress towards a more encompassing digital society
- Creation of disruptive innovation attained through challenging to understand and cultivate the unknown

○Address economic/social challenges the nation faces

- Resolve economic/social issues through the application of science, technologies and innovations

○Nurture and strengthen fundamental technologies

- Strengthen basic foundation (i.e., human resources and fundamental research potential)
- Create and implement innovation systems

In order to avoid sporadic implementation of individual policies and to achieve total optimization, integrate policies and measures organically as a system and implement them

○ Create innovation systems

• Foster and mobilize human resources • Strengthen fundamental research • R&D foundations, • University reform, R&D institution reform • Research funding reform • Industry-academia partnerships • Facilitate open innovation • Emphasize bridging role • Small- and medium-sized companies/second-tier companies/venture businesses • Intellectual property, standardization • Global expansion • Regulatory/ institutional reform, etc.

○ R&D driven by national government

• R&D for the future creation of industries/transformation of society • R&D for resolving economic/social issues • Fundamental research

○ Science, technology and society

• Deeper communication with citizens • Fairness in research, etc.

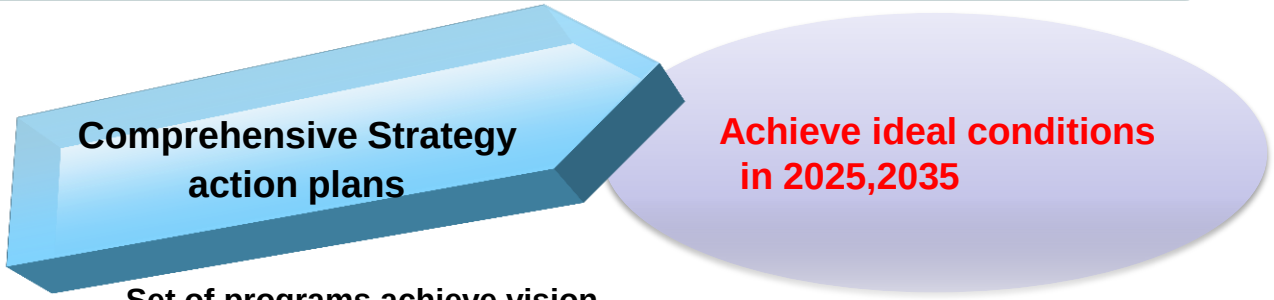
Phase 5 of Basic Program for Science and Technology
– View – Drafting innovation strategies to attain objectives

Envision affluent industrial and social structures in Japan and share this vision for which the people, government, industry and academia must collaborate to achieve

I) Innovation strategies in harmony with the philosophy of the Japan Revitalization Strategy
II) Phase 5 of Basic Program for Science and Technology [medium- to long-term]
III) Comprehensive Science, Technology and Innovation Strategy [annual]

Phase 5 Basic Program for Science and Technology (FY2016–2020)

Draw up medium- to long-term vision Japan should achieve in order to realize objectives



Set of programs achieve vision

[Example of medium- to long-term vision]
Capitalize on strengths and overcome weaknesses

- ◆Further strengthening of strong industries
- ◆Create solution systems businesses
- ◆Construct innovative design production systems

Devise new industrial structure

- ◆Efficient, affluent, and safe society

Measures for decreasing population and aging society

- ◆Lively and attractive regional communities

Departure from centralization

Enhance ICT foundations (big data, cyber security, artificial intelligence, IoT, imaging, etc.)

Specify the industrial and social structures to be achieved in 10 years' time as the medium- to long-term vision

Phase 5 of Basic Program for Science and Technology
– Views – Enhance command center role in effort to deliver innovation

Further emphasize the role of the Council for Science, Technology and Innovation as the command center for achieving sustainable economic growth

■ Optimum allocation of science and technology budgets

- **Integrated use of budgets for both general account and special accounts and grants**
- **Strategic fund allocation**

  Science and technology vs education, fundamental studies vs competitive funds, focus areas (energy, life sciences, etc.), increase budgets for SIP and ImPACT, etc.

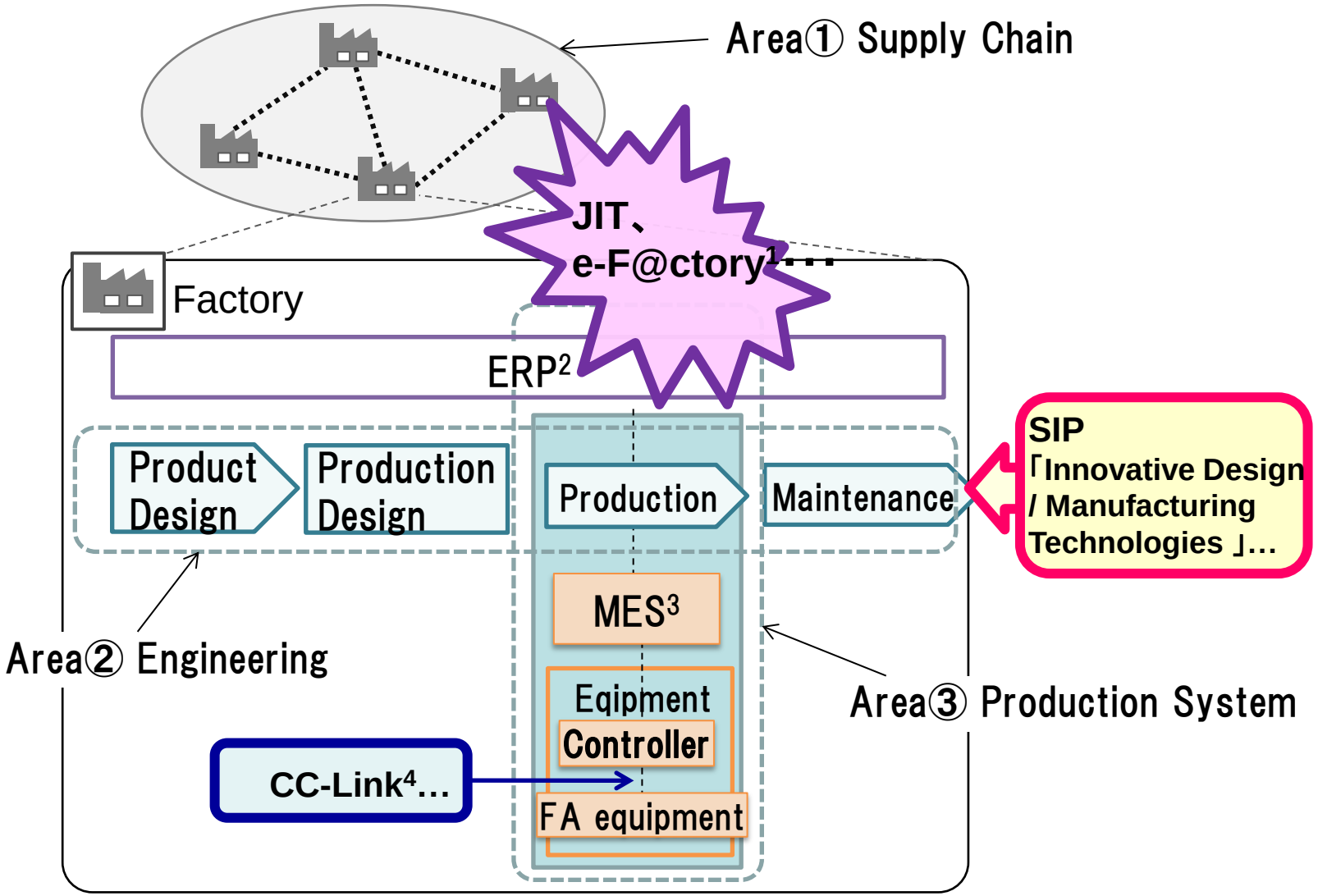
■ Command center by area, coordination of policies across ministries

- **Increase SIP tasks, strengthen cross-ministry coordination with SIP at the core**
- **Ensure programming linking different ministries' policies**

  R&D, regulatory/institutional reforms, global standards, verification, intellectual property policies
- **Consolidation of fundamental technologies shared by different areas and vertical development**

  Vertical development of fundamental technologies such as ICT (big data, cyber security, etc.) , nanotechnology and robots for not only fields like energy, health and longevity, next-generation infrastructures and regional vitalization, but also for space, marine, national security and other possible areas of application.

By the Digital Revolution, Design, Production, and Integration of The Distribution System

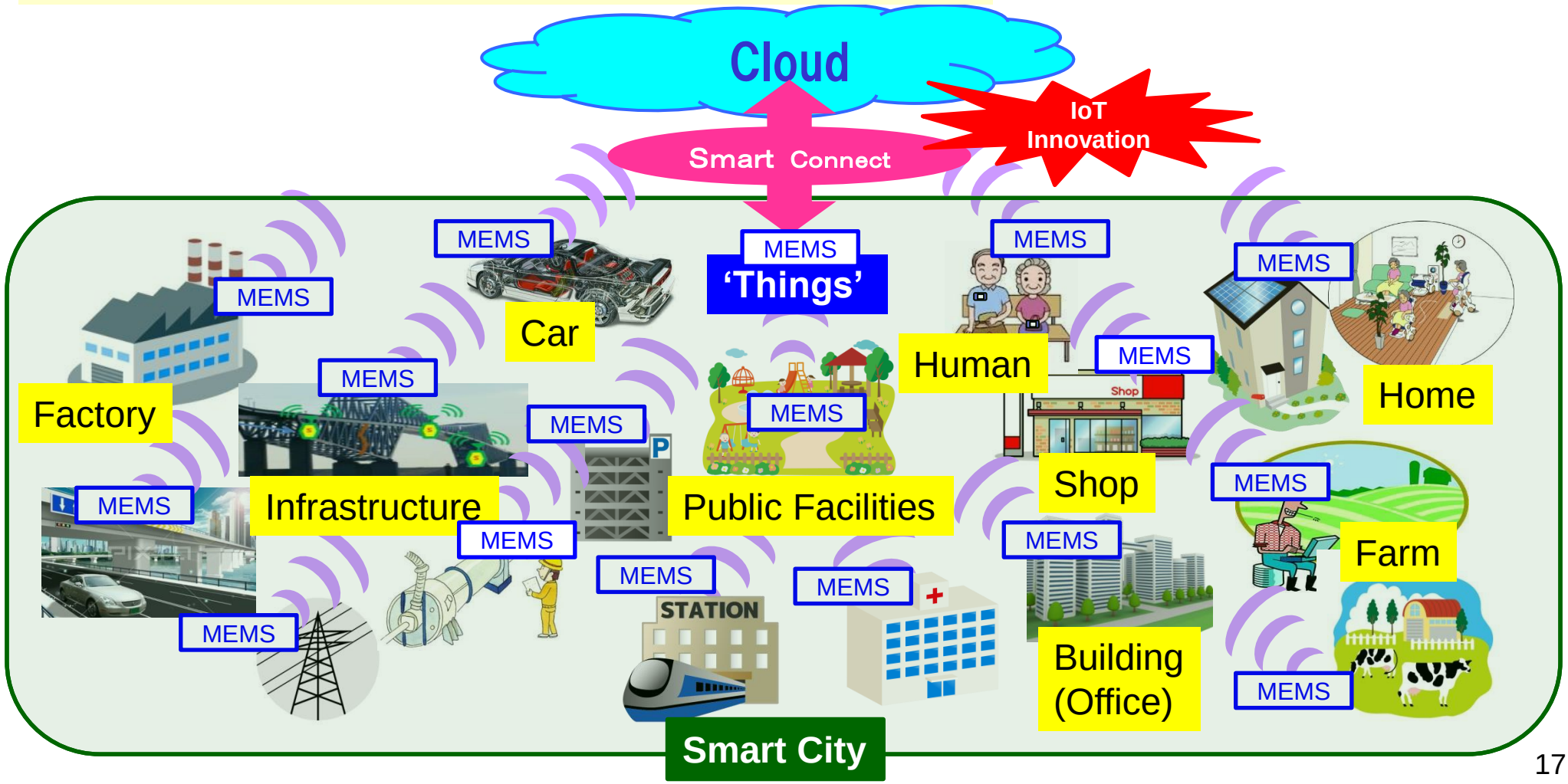


1)Business solutions of Mitsubishi Electric Corporation
2)ERP: Enterprise Resource Planning
3)MES: Manufacturing Execution System.
4)Mitsubishi Electric Corporation：CC-Link , Siemens：Profibus, Rockwell: DeviceNet

Expectation to MEMS in IoT Innovation

- **MEMS is one of the key technologies for IoT**
- **MEMS smartly connects 'Things' to 'Cloud'.**
- **MEMS changes 'Things(H/W)' to 'IoT'.**
- **MEMS opens data of 'Things' to everyone.**

IoT Innovation



Thank you for your kind attention

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SIP	:	http://www8.cao.go.jp/cstp/gaiyo/sip/index.html
ImPACT	:	http://www8.cao.go.jp/cstp/sentan/about-kakushin.html