

Global Focus on Knowledge Lecture Series

"Information Changes the World"

Sudoh-01 Nov. 8, 2007

Information Explosion and Creation of a New Network Society

#1 Information Explosion and Structural Change of Innovation

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The University of Tokyo

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OECD International Conference, Paris, May 2006

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- ✓ It is said that students are moving away from the sciences.
- ✓ Is economic influence among the information industries declining?
- ✓ Are information-related sciences and technology losing their impact on society?

ICT industry-related data

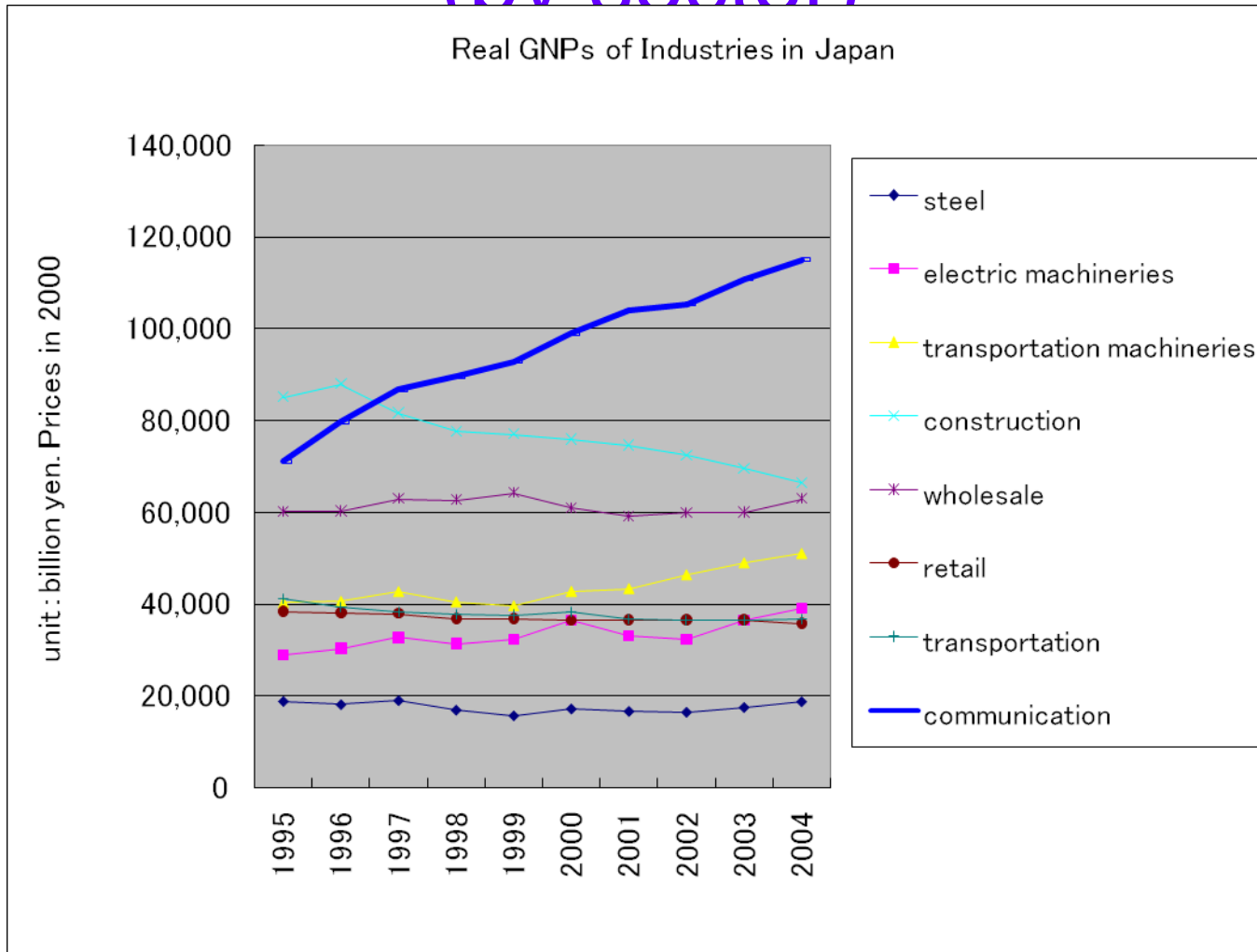
resources:

- **Report in Information & Communication, 2006**
- **OECD Information & Technology Outlook, 2006**

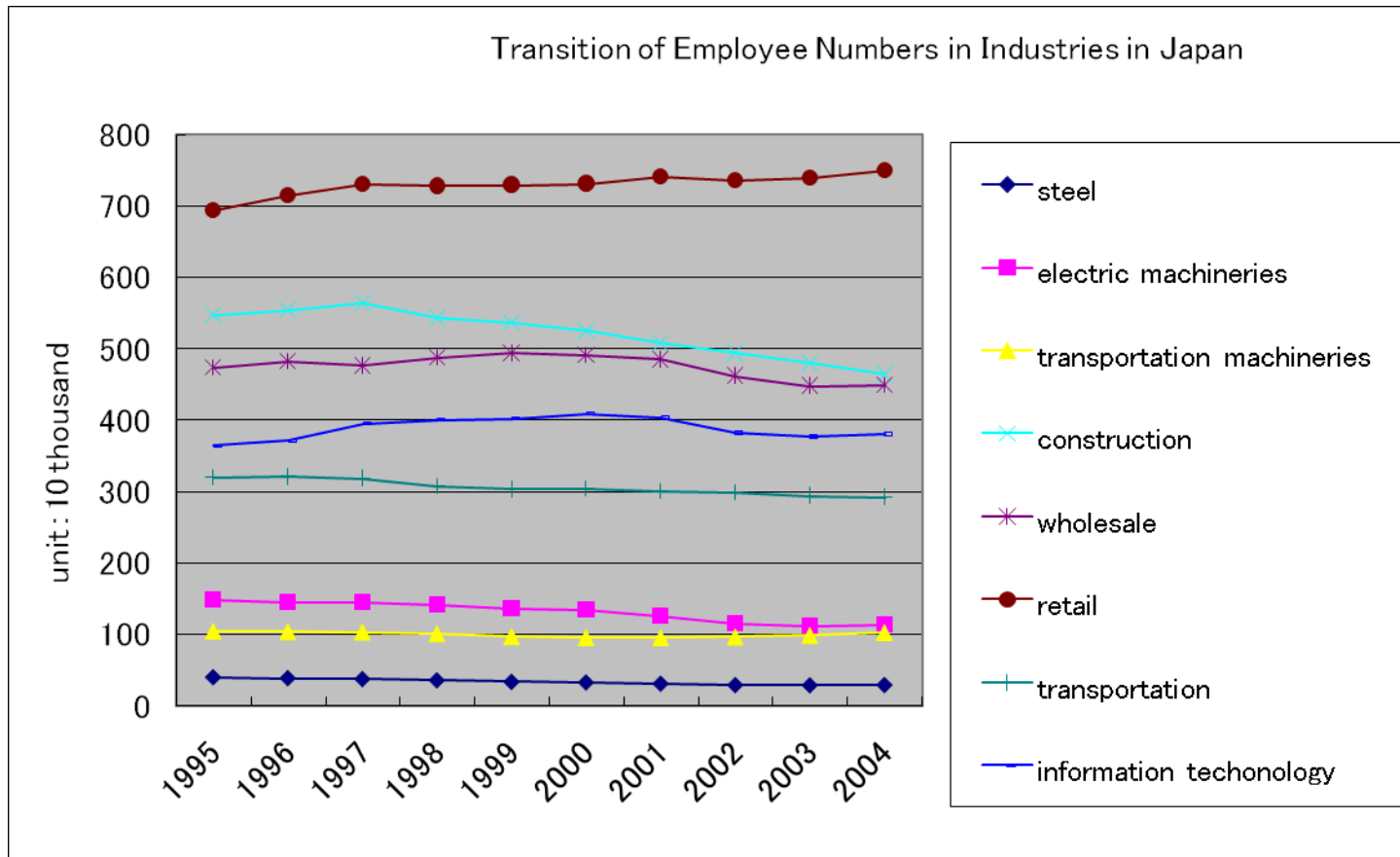
published:

June, 2007

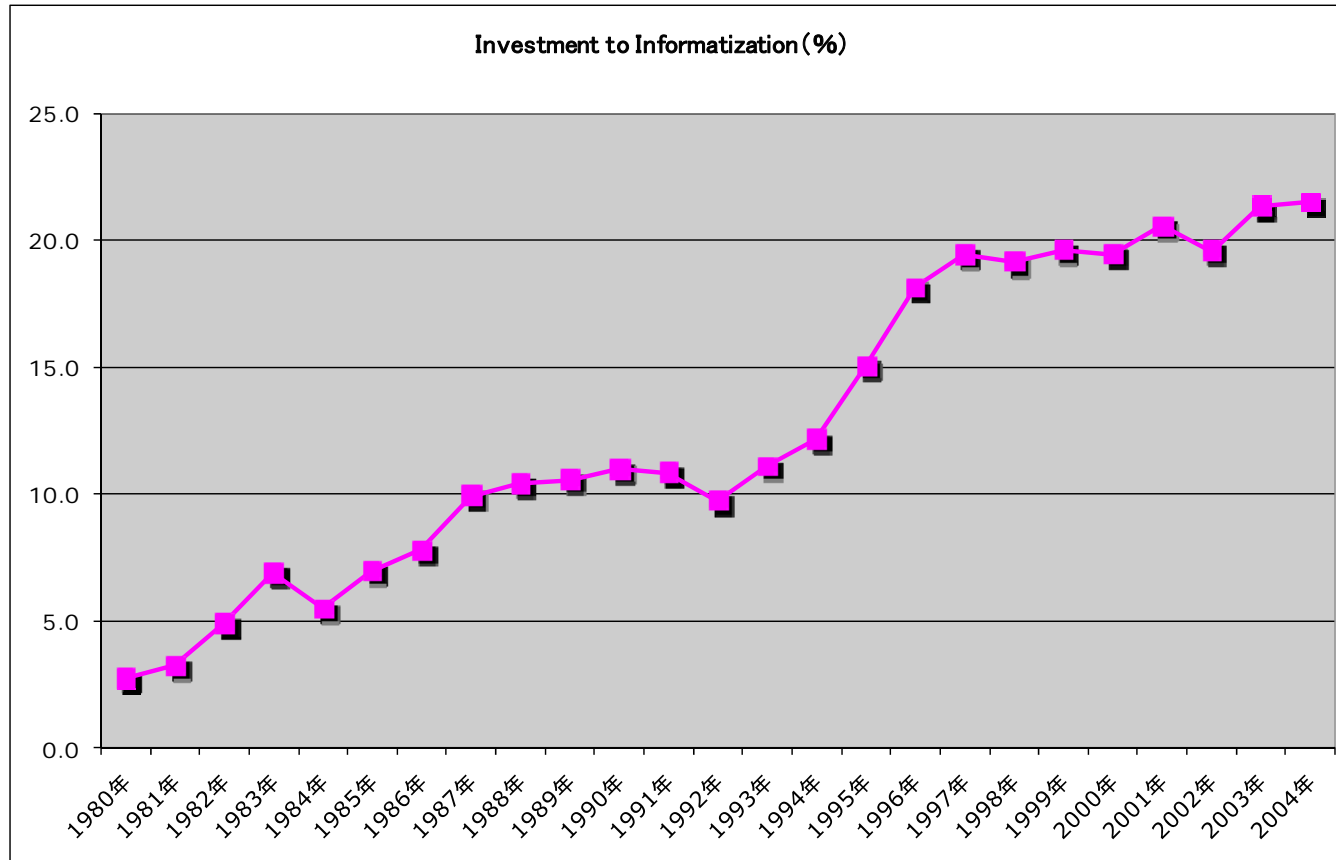
Real GNPs of Industries in Japan (by sector)



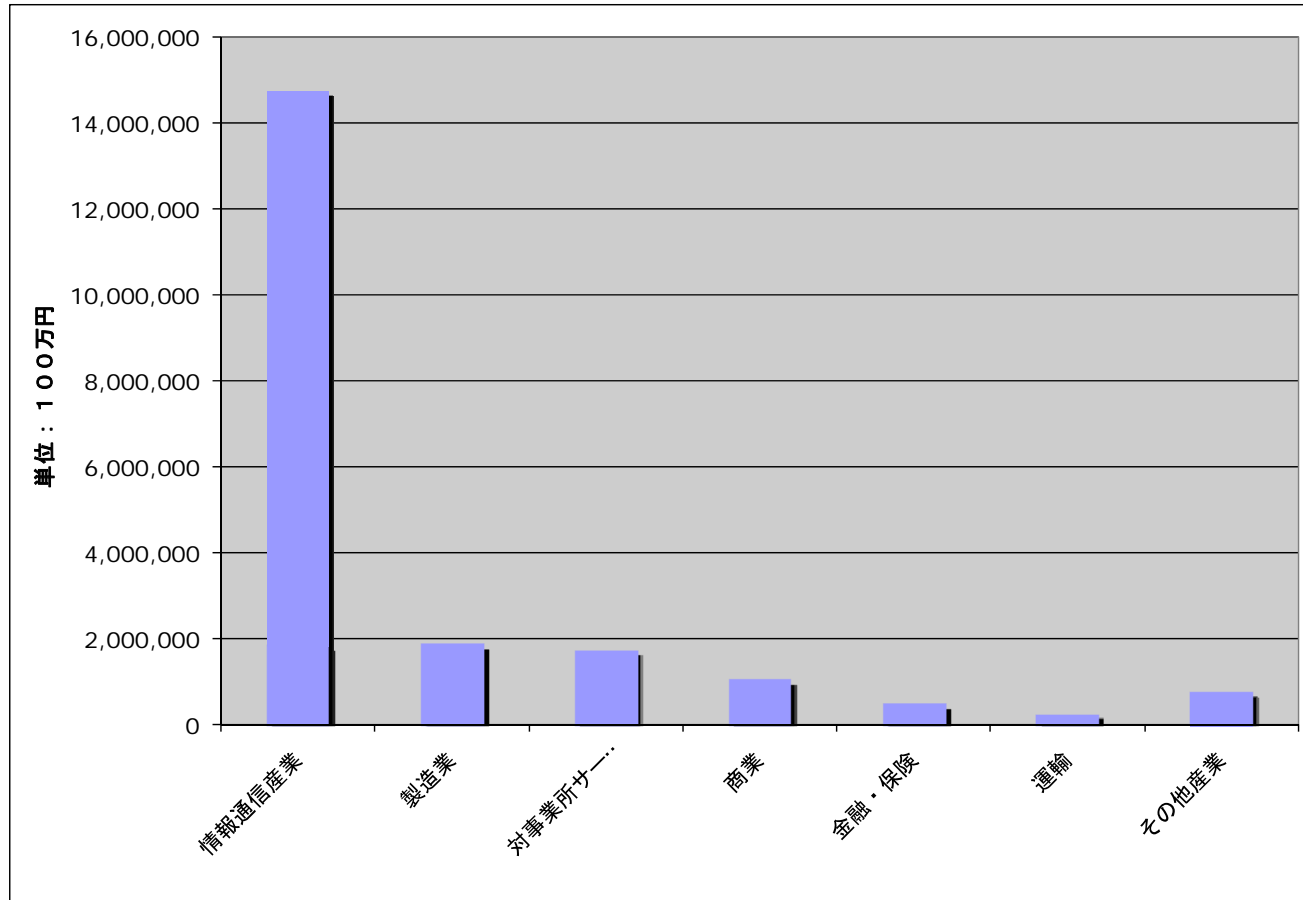
Transition of Employees Numbers in Industries in Japan



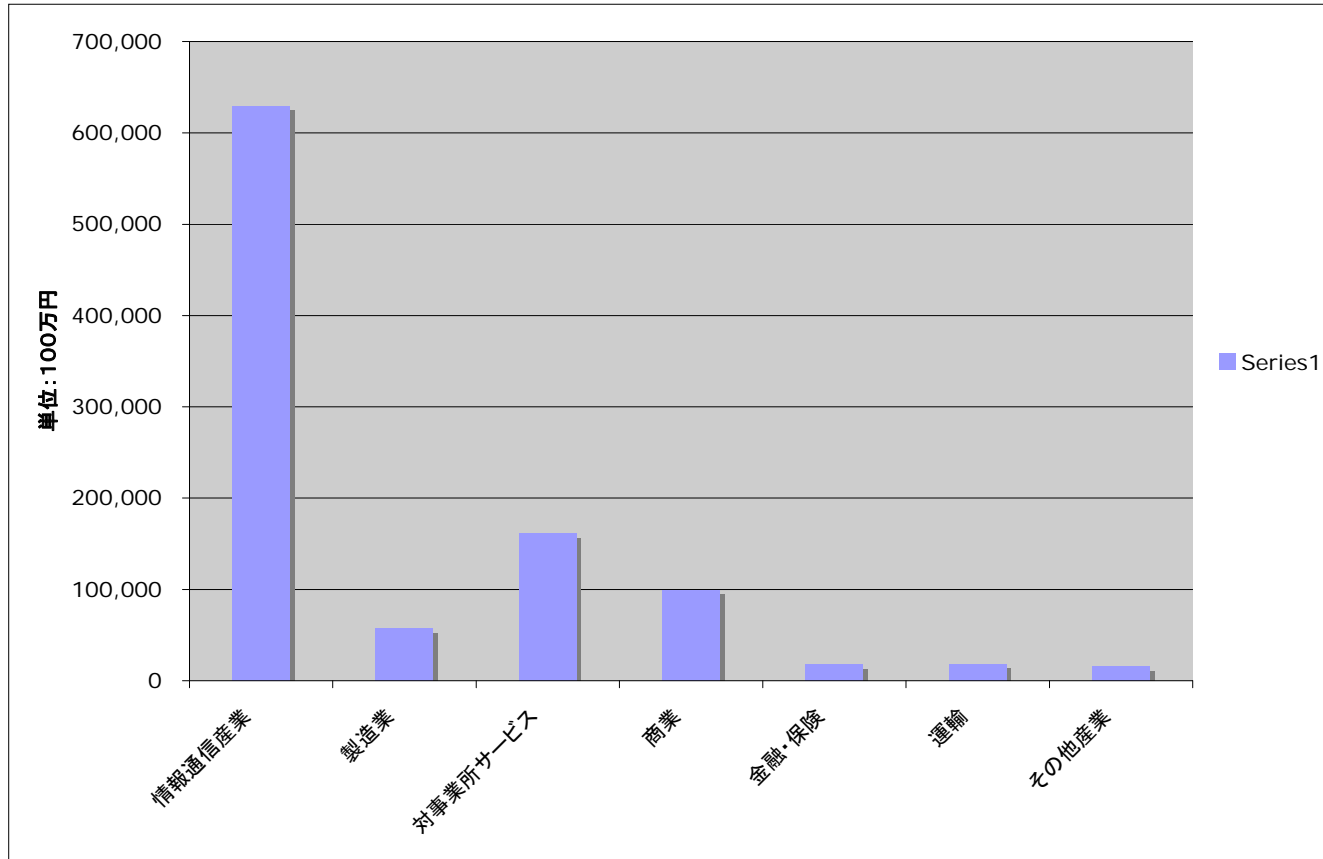
Investment in Informatization in Private Businesses



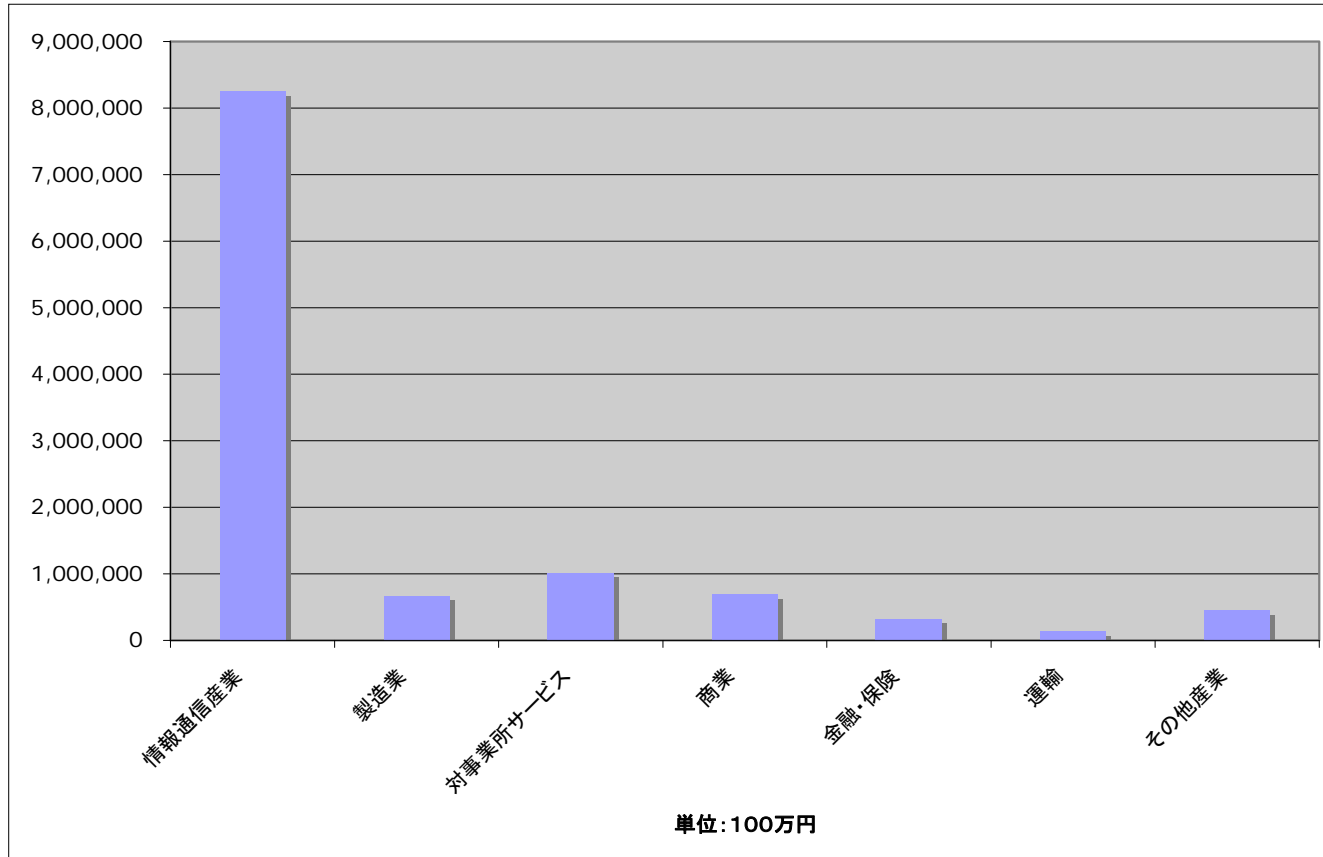
Industry Incentives



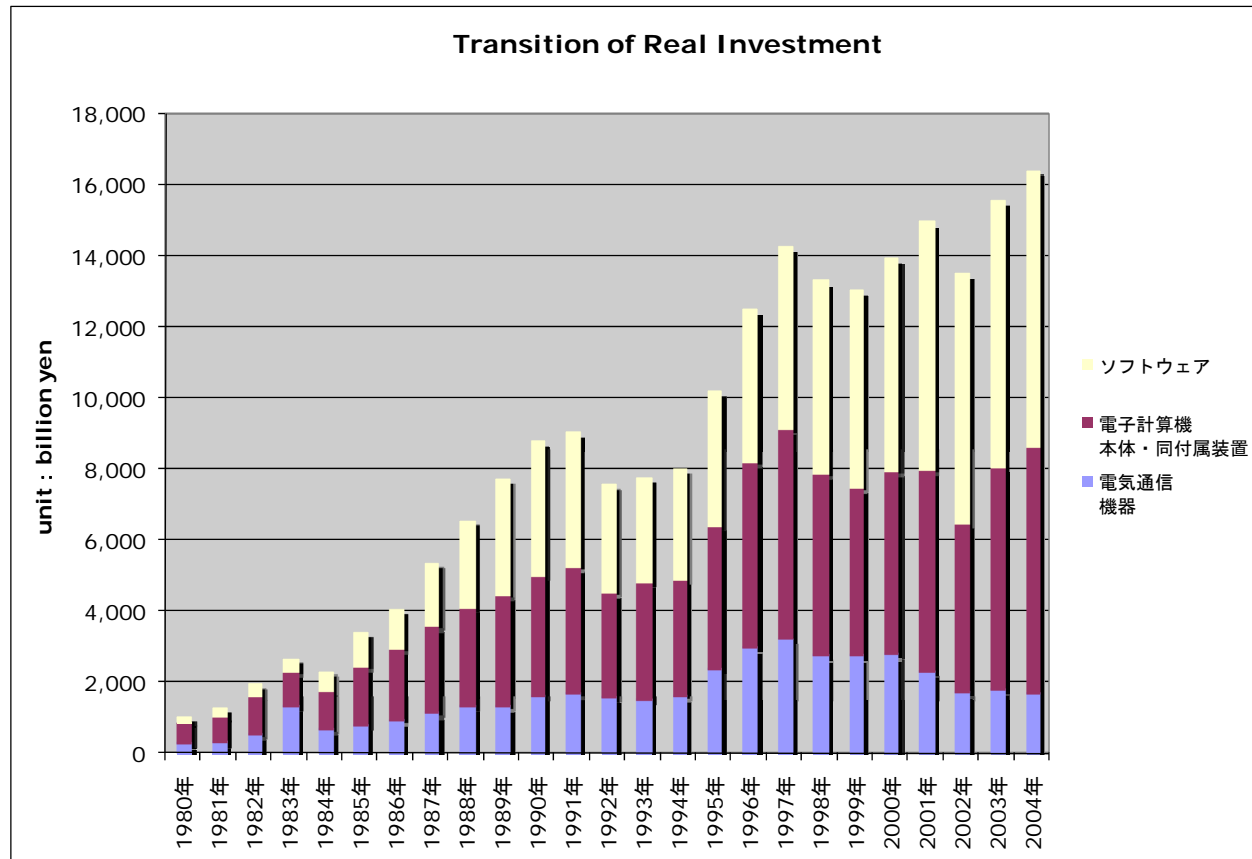
Employees Incentives



GDP Incentives



Transition of Real Investment in Informatization in Japan



Sales of Major ICT Companies: by sector

Major sectors:

IT services

ASP
(Application Service
Providers)

SaaS
(Software Services)

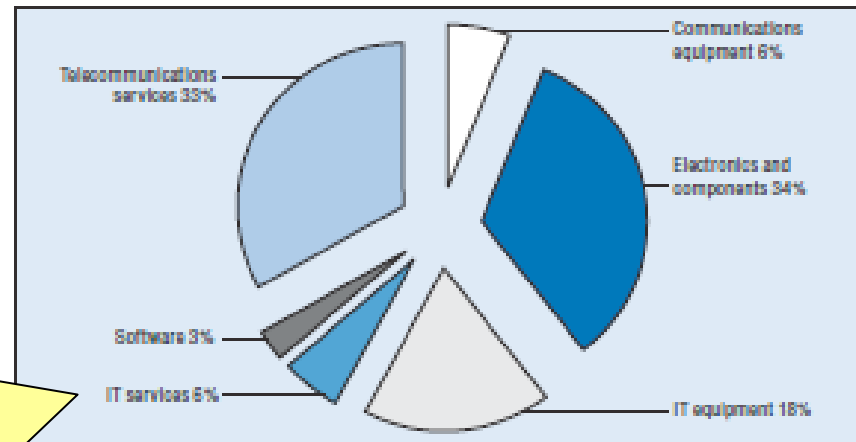
SOA
(Service-Oriented
Architecture)

Java, J-Ruby, etc.
(Open Source
Development)



Figure 1.7. Top 250 ICT firm revenue shares by sector, 2005

Percentages



† Preliminary 2005 data are based on financial year reported in 2005 or most recent four quarters.
OECD, Compiled from annual reports, SEC filings and market financials.

StatLink: <http://dx.doi.org/10.1787/350131873778>

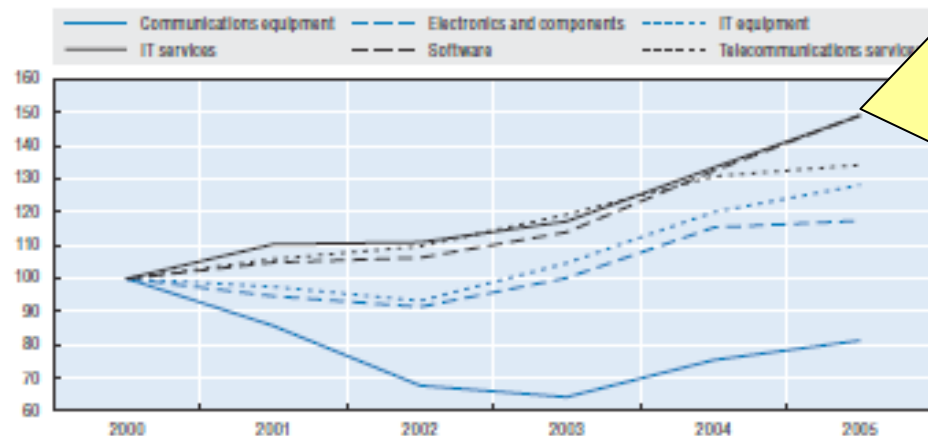
**Information and Communications Technologies OECD
Information Technology Outlook 2006:
(Complete Edition - ISBN 9264026436)
Science & Information Technology , ©OECD, 2006**

Transition of Major ICT Companies' Sales



Figure 1.8. Top 250 ICT firm revenue trends by sector, 2000-05

USD current prices, index 2000 = 100



Note: Preliminary 2005 data are based on financial year reported in 2005 or most recent four quarters.

Source: OECD, Compiled from annual reports, SEC filings and market financials.

StatLink: <http://dx.doi.org/10.1787/450640348023>

Information and Communications Technologies OECD
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Important sectors :

IT services

**ASP
(Application Service
Providers)**

**SaaS
(Software Services)**

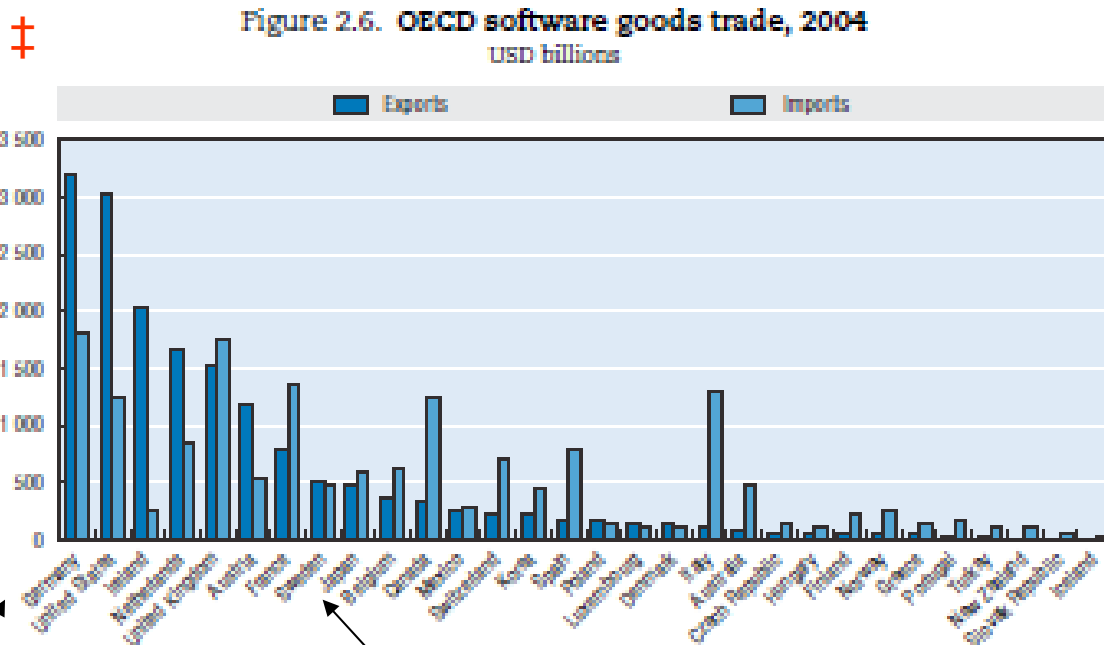
**SOA
(Service-Oriented
Architecture)**

**Open Source Development
(Java, J-Ruby)**

OECD Countries

Import and Export of Software Products

- by Country



Source: OECD ITS database.

StatLink: <http://dx.doi.org/10.1787/150782758630>

Germany

Japan

Information and Communications Technologies OECD
Information Technology Outlook 2006:
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“The world has become poor these past 15 years.”

Professor Joseph E. Stiglitz

**Prof. Stiglitz (Columbia Univ.) in Tokyo, photo taken in October 2007
2001 Nobel prize economist**

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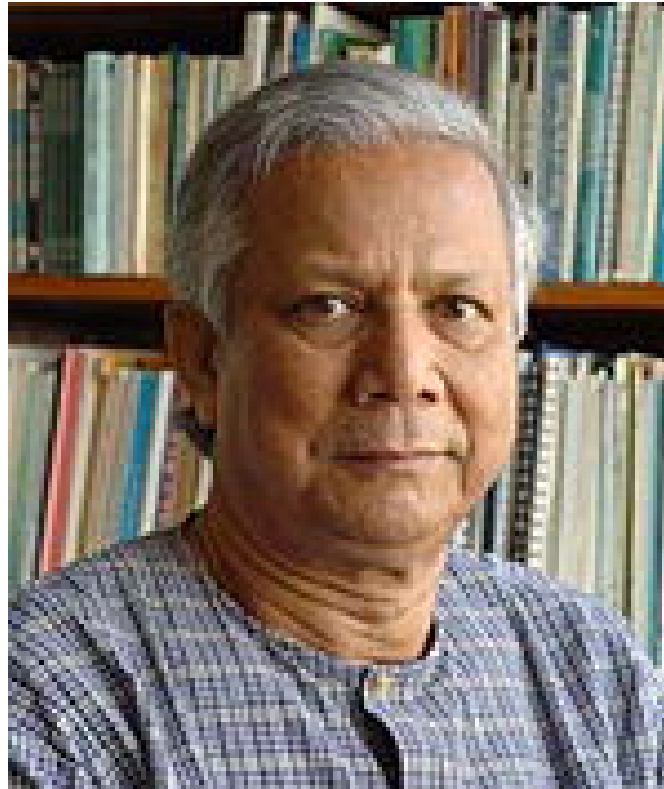


New Delhi, photo taken in Dec. 2005)

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Social Innovation

Founded the Grameen Bank, Micro Finance



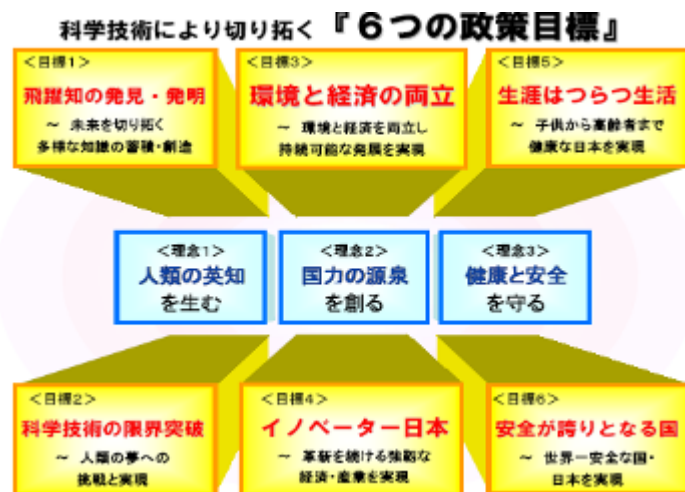
From Wikipedia

Professor Muhammad Yunus (recipient of the 2006 Nobel Peace Prize)

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Where is the market economy heading now?

New development must be sought featuring ICT, bio- and nano-technology, and ecological science.



copyright : MEXT

http://www.mext.go.jp/b_menu/shingi/gijyutu/gijyutu11/siryo/05080501/001.pdf, p3

Techno-Social Paradigm

◆ 1st stage (late 18th - early 19th c)

Railway infrastructures (steel, steam engines)

◆ 2nd stage (late 19th – early 20th c)

Road infrastructures (electricity, internal combustion)

◆ 3rd stage (late 20th – 21st c)

Information and telecommunication infrastructures (digital data processes, semiconductors)

◆ The 4th stage (21st c)

Ecological science : based on bio- and nano-technology, ICT !

What is Innovation ?

- Innovation is the creation of new values by associating production procedures, resources, and labor power in a new way.
- ✓ Joseph A. Schumpeter, *The Theory of Economic Development*, 1926

What is Competition ?

- “Competition is a method by which a skillful association of machineries and human beings compete with other methods of association. A method of association is a success, in other words, a technology progresses, not only when it is brilliant, but also when it is simply healthy.”
- ✓ M. J. Piore and C. F. Sabel, *The Second Industrial Divide*, 1984
- Multiple circuits for technology development are always needed.

Open Innovation

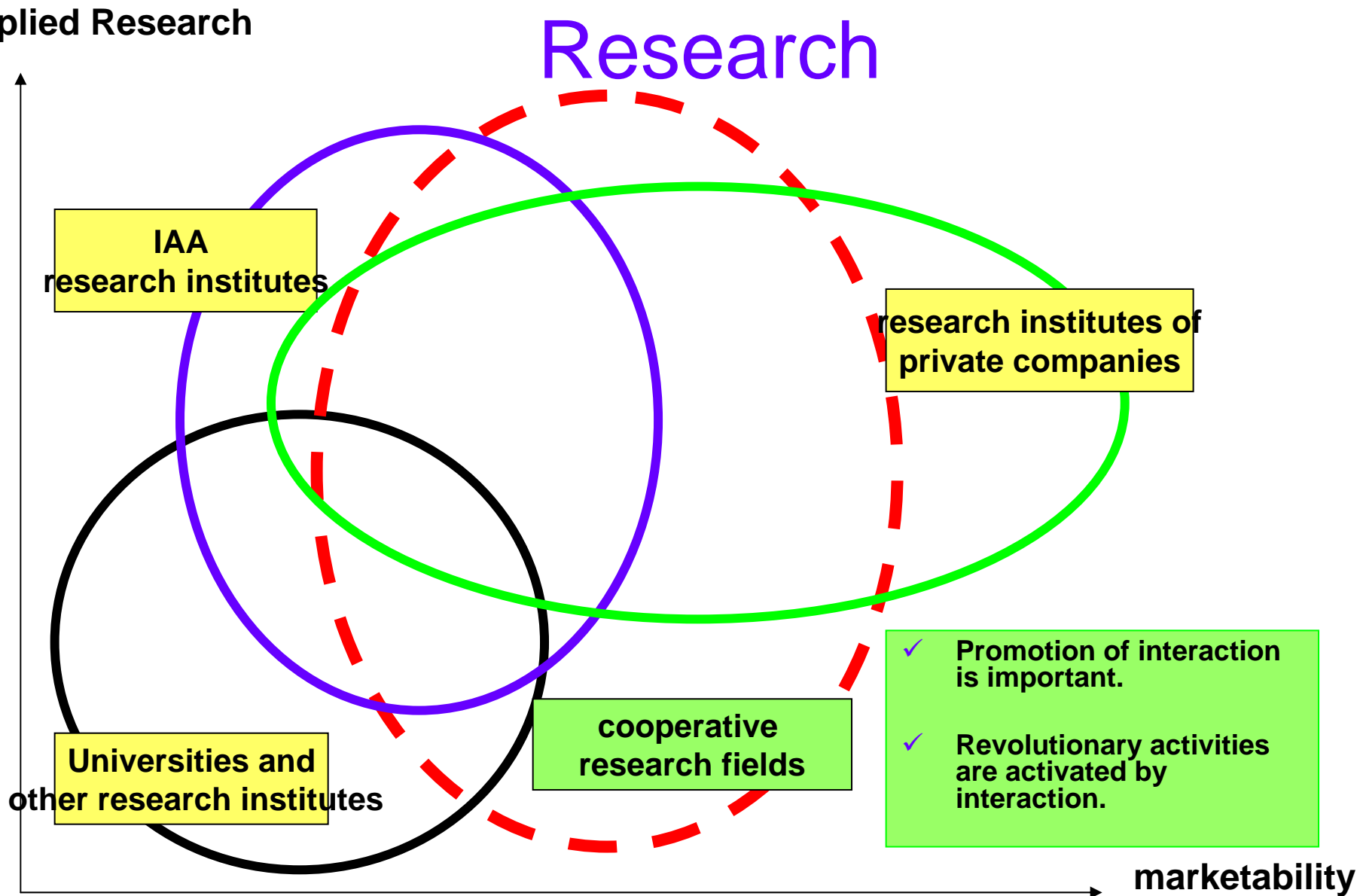
- Open innovation is different from innovation that uses only internal knowledge -- in the sense that it utilizes external knowledge via networks. It is innovation made possible by the collaboration of several actors.
- choice: a strategy for acquiring specific properties
- coordination: how we coordinate information is important.
- competition: Network-versus-Network Competition
- Open innovation is not a value created by one extraordinary talent. It is creating values by activating interactions between actors each of whom puts into practice the “architecture of participation” where actors who have the potential to collaborate with other talents work together.

Innovation in America

■ Activating Innovation

- Deepening science and technology
- Promoting interactions with other fields of knowledge
- Supporting collaborative creativity
- Constructing a global infrastructure

Specialization in Research



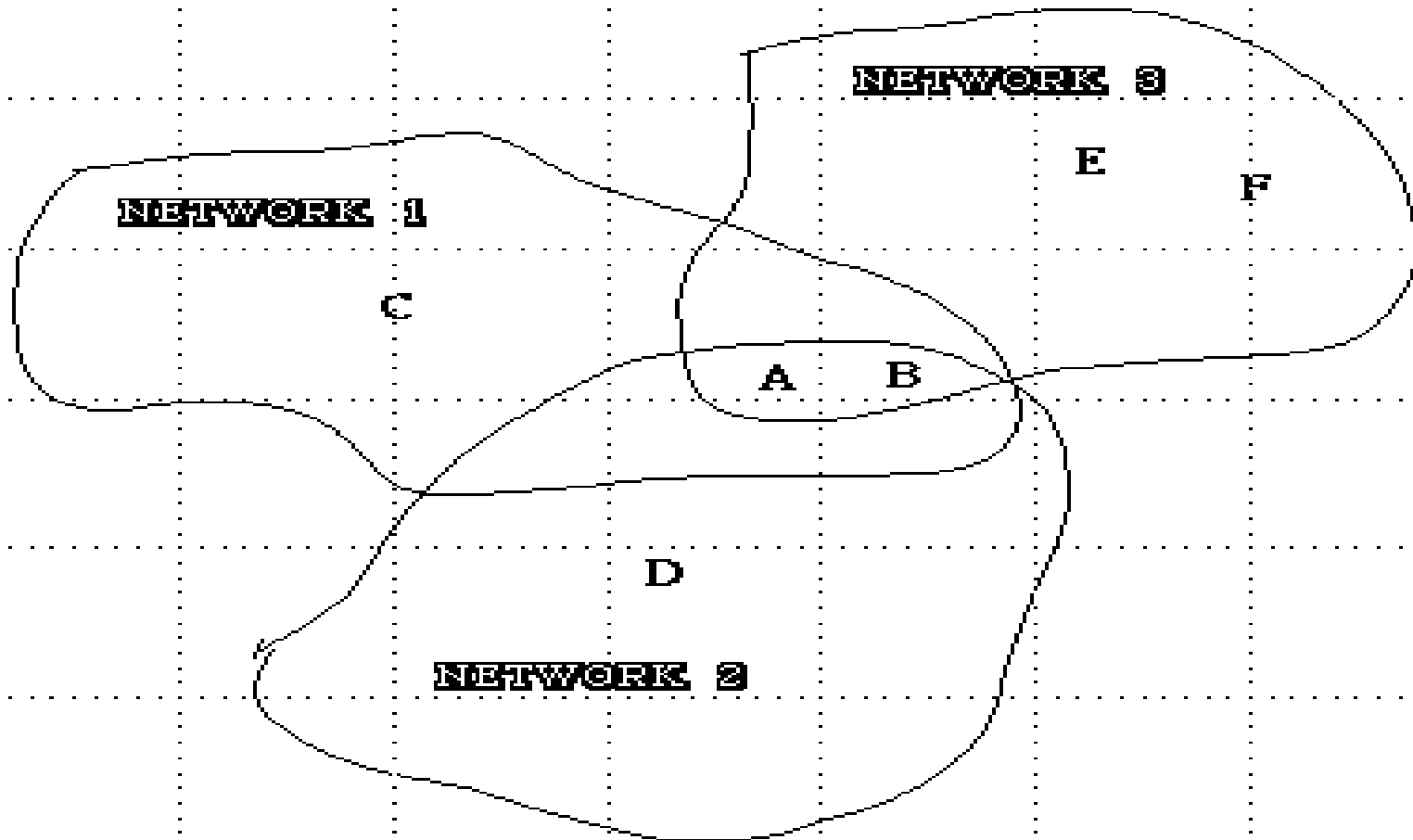
Creative Destruction

- Paradigm - Destroying Innovation
- Paradigm - Sustaining Innovation
- ✓ Eiichi Yamaguchi “Innovation—Destruction and Resonance” NTT Publishing, 2006
- We aspire to “Paradigm-Destroying Innovation”.

Creativity

- Each people has several fields of activity, and they are integrated by relating the essence of each different field of activity to other fields in a particular way.
- Individuality is defined by the properties of these integrated and multi-participating activity fields, and is expressed by how various information (factors) from those fields interact.
- On the premise that individuality is structured as outlined above, creativity is expressed as the activity of relating different fields of activity and changing the manner
- In which they interact.
- ✓ Osamu Sudoh “The Interactive Network Society”, 1995

Creativity



Problem 1

- A person who possesses deep knowledge of both economy/society and ICT is extremely rare.
- Many organizations are not utilizing ICT.

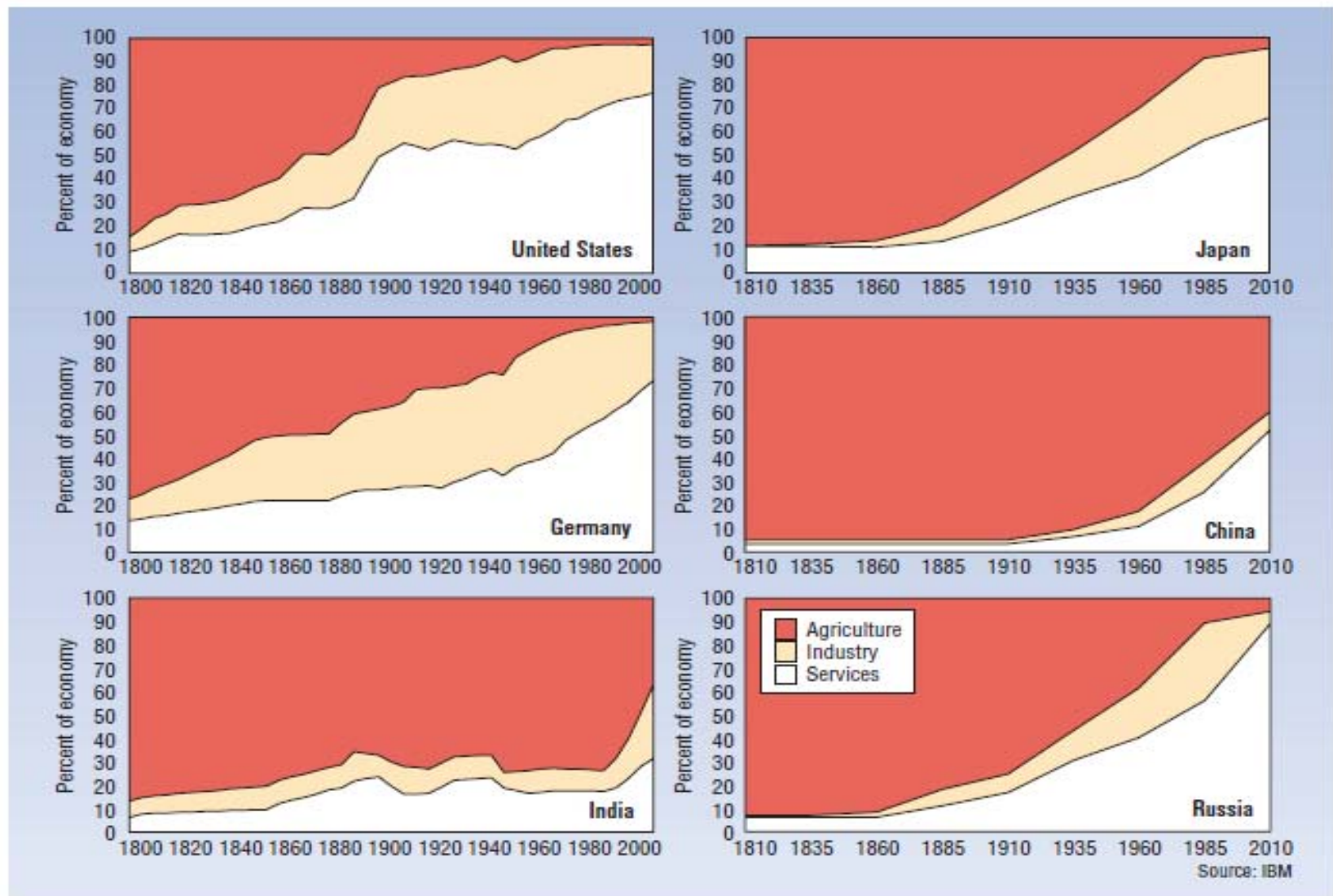


Figure 1. Services represent a growing segment of the developed and developing worlds' economies.

Paulson, *Services Science : A New Field for Today's Economy*, IBM Web Site

Service Innovation Working Group

**Division of University Corporate Relations
Research Promotion Team**

1 Working Group Launch - Background

- **Density Increase in the Service Industries** → GDP ratio 70%
- **Palmisano Report (the U.S. Council on Competitiveness)**
Promotion of interdisciplinary science ⇒ **Importance of Service Science**
To gather knowledge about computing science, industrial technology, mathematics, management engineering, social science, laws, and search for methods to promote innovation in business and technology
→ **August, 2007 America COMPETES Act.* passed by Congress.**
NSA is going to propose policies so that the government can deal with the service sciences strategically.

(*The Creating Opportunities to meaningfully Promote Excellence in Technology, Education, and Science Act.)
- **Academic-industrial Alliance Research Started in the U.S and EU**
UC Berkley, MIT, The University of Texas
The University of North Carolina
Oxford (Great Challenges in the Service Industries)
- **The second computer science?**

Toward the Formal Launch of a Working Group

The 7th Science and Technology Interchange Forum

- October 13, 2006
- Open forum for members of the planning group
- Theme: “Service-modeling to Co-create Values”
- Panel discussion on the service sciences
Is there a science for service innovation?

•Participants	180
Service industries	41%
Manufacturing	38%
Educational Service	7%

- Results of the Survey
Is a scientific approach to services meaningful?
- | | |
|-------------|-----|
| Yes | 56% |
| No | 7% |
| Do not know | 38% |

第7回科学技術交流フォーラム
「価値を共創するサービスモデリング」

東京大学 弥生講堂一条ホール

2006年10月13日(金)
13:00~18:00

東京大学 弥生講堂一条ホール

2 Working Group - Launch and Concept

- Name: UCR-WG “Service Innovation Working Group”**
- Goal: A new service modeling method which would be a core in the service sciences will be studied by universities and industries using a multidisciplinary approach including industry needs analysis and advanced scientific research in universities.**
Launching real academic-industrial collaborative research projects, contributes to service industries, businesses and social systems in Japan.
- Activities**
Establishing service studies in the research domain, problem-solving academic-industrial research is to be conducted by sub-working groups.
 - 1) Visualization of service**
 - 2) Optimization of service**
 - 3) Creation of service**
- This research project is supposed to be a preparation for the following specific collaborative researches.**
- Working term: one year**
- Cultivation of multi-disciplinary research and collaboration is to be considered a long-term initiative.**

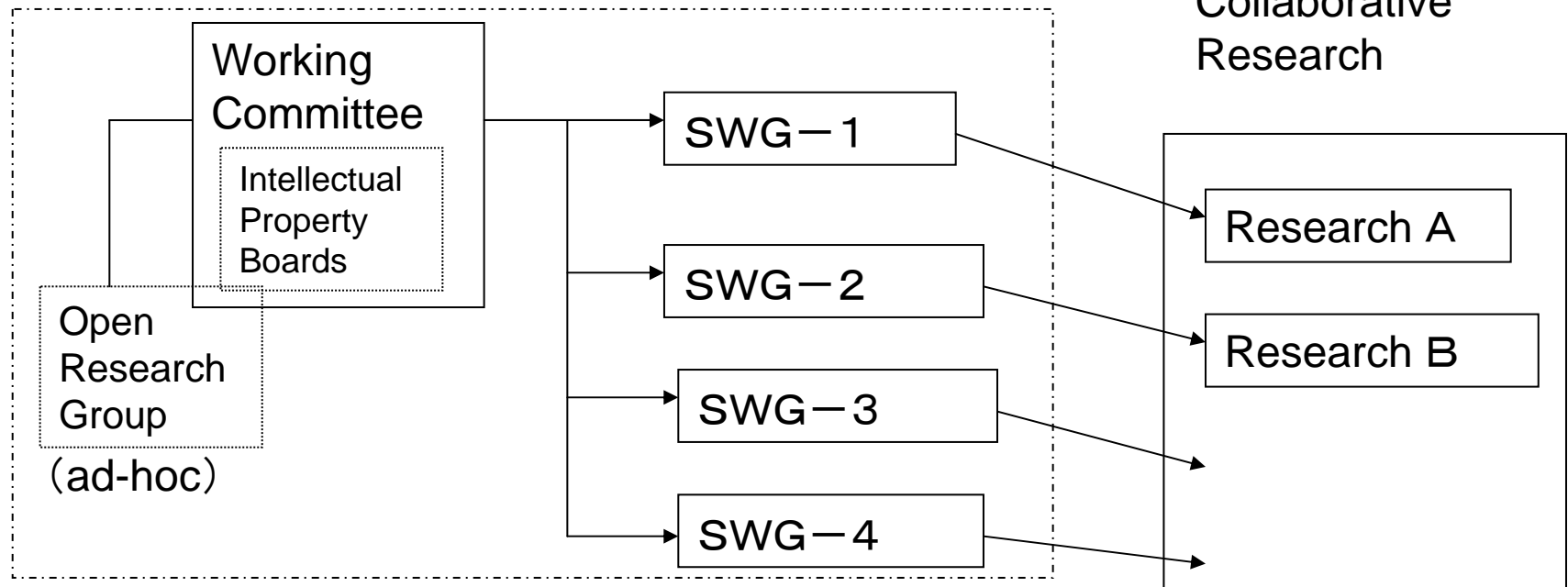
Members of the Working Committee

- president: Graduate School of Information Science and Technologies Prof. Masato Takeichi
- vice-president:: Research into Artifacts, Center for Engineering Prof. Kanji Ueda
- university members:
 - School of Engineering, Prof. Hideaki Miyata
 - School of Engineering, Prof. Tamio Arai
 - School of Engineering, Prof. Kazuo Furuta
 - Graduate School of Information Science and Technology, Prof. Atsuyoshi Sugihara
 - Graduate School of Information Science and Technology , Prof. Kazuo Murota
 - Interfaculty Initiative in Information Studies, Prof. Osamu Sudoh
 - Research Center for Advanced Science and Technology, Prof. Takashi Nanya
- industry members:
 - Fujitsu Sanya Uehara: board member of Fujitsu Labs
 - NEC Hiroshi Kasahara: manager of The Central Research Institute
 - IBM Japan Kazuyoshi Hidaka: manager of Tokyo Research Labs
 - Hitachi Masaharu Akatsu: manager of The Systems Development Lab.
- *note: Noted members are representative members.
- organizers: Office of Collaborative Research Development, Division of University Corporate Relations
 - Proprius21 Program Officer: Masao Ebino

Organization of the Working Committee

	Initiative Companies	Leaders - Academia
SWG—1	Hitachi	Prof. Sudoh
SWG—2	IBM	Prof. Furuta
SWG—3	Fujitsu	Prof. Murota
SWG—4	NEC	Prof. Ueda

Committee Organization Chart



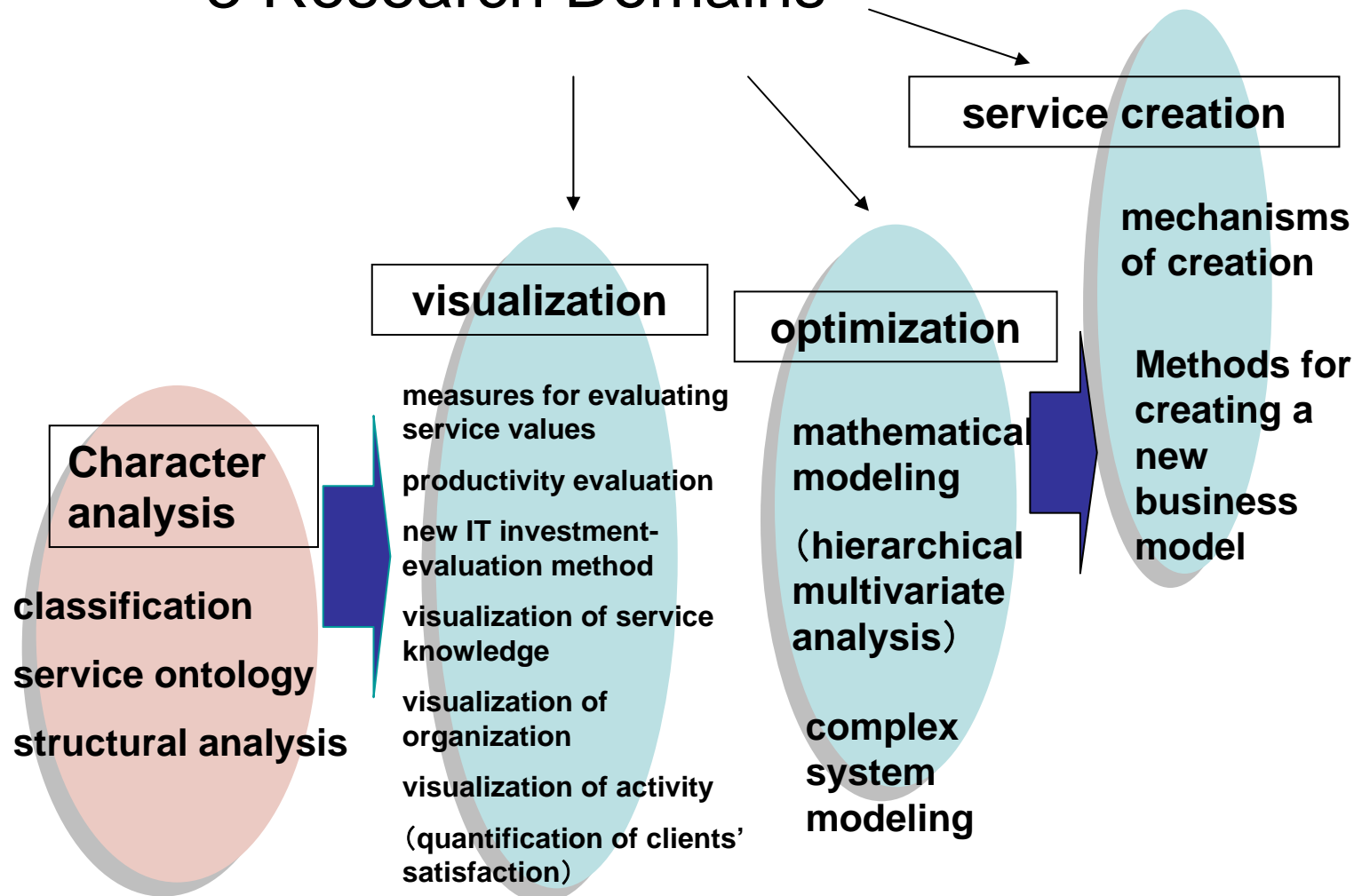
Characteristics of the Working Committee

- Collegium-type Collaborative Research Model (large-bone research-oriented)
 - From a collegium to a research model (engagement type)
- Participation of 4 major IT vendors
 - NEC, Fujitsu, Hitachi, R&D section of IBM Japan
- Participation of several university research departments
 - Research departments of engineering, information science and technology, economy, and other research centers
- “Service modeling to create values”
 - multi-disciplinary, based on mathematical science and engineering
- Experimental proof from case studies is important.
 - Especially, case studies conducted in public environments (such as in universities)

3 Research Domains

Application
field

Fundamental
field



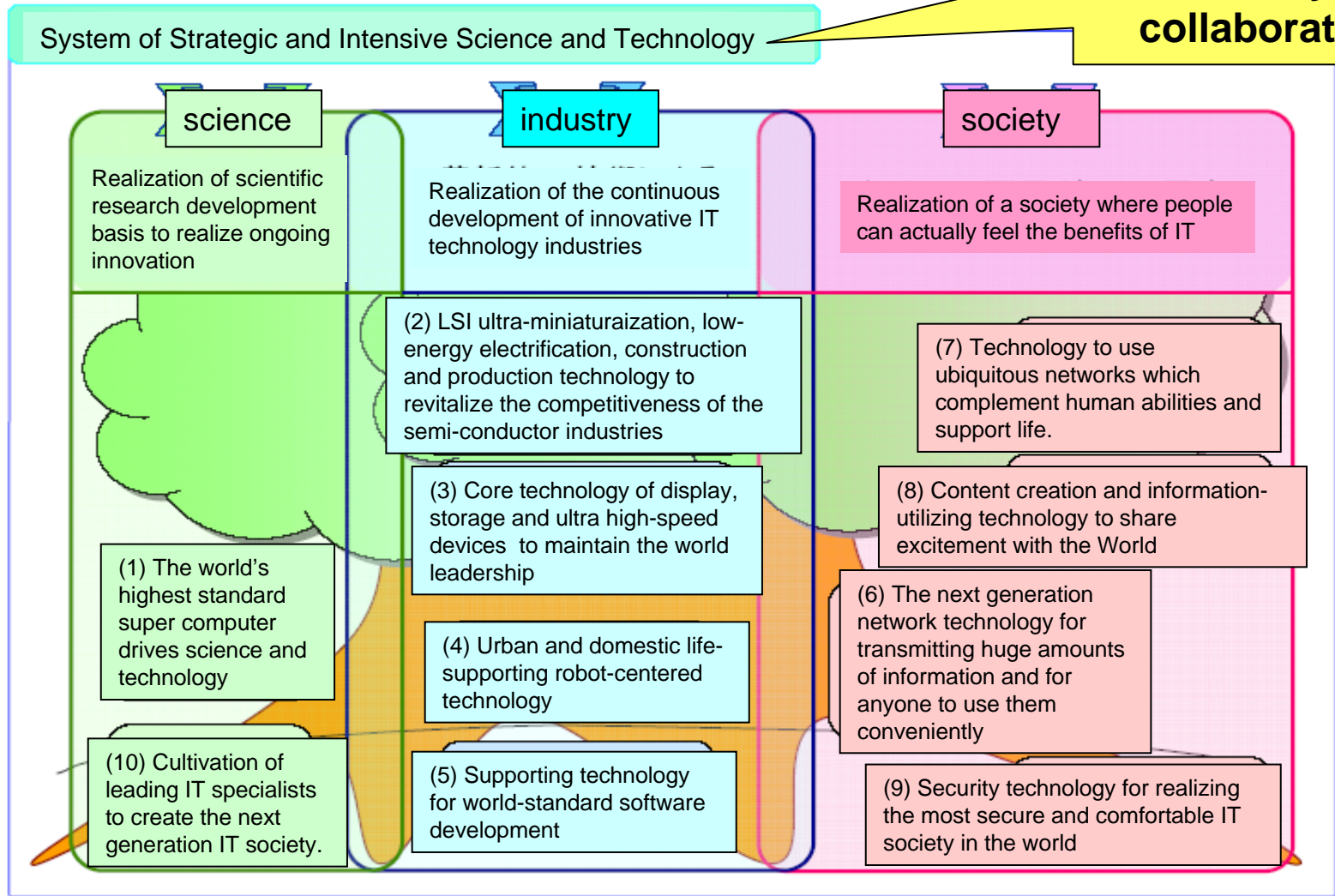
Advances in Investigative Research



Problem 2

- What will the future of ICT be?
- What will the future of the network society be ?

How can science, industry and society collaborate?



resource : Council for Science and Technology Policy, Information-Communication Project Team, March, 2006

<http://www8.cao.go.jp/cstp/project/bunyabetu/jyoho/4kai/siryo2.pdf>

Critical Infrastructures

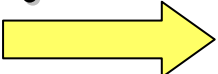
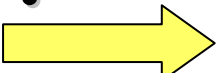


Net-Centricity

- **Importance of risk management**
 - Need for total management of essential infrastructures.
- **Securement of visualization capability**
 - Invisible things cannot be managed.
 - Network control of unstructured data

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Social Infrastructure and Ubiquitous Networks 1

- Global increase in information flow causes a global increase in material flow.
- ✓ Enlargement of small-lot material transportation.
- ✓ Strict observance of delivery times
 -  maintenance of airports/ first rate highways
 -  development of transportation networks such as ITS
- GPS, high-sensitive vehicles (robotization) etc.
- Those responsible for driving and manufacturing cars using the ubiquitous network (RFID) and robots (Sensor Chips) ?
- Who is in charge of road management?

Social Infrastructure and Ubiquitous Network 2

- Universal society infrastructure (self-supporting infrastructure) and nursing robots
- Ubiquitous network (**RFID**) and robot (**Sensor Chip**) using houses and cities.

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due to copyright
restrictions

- Product liability?
- Administrative responsibility?
- Relationship between utilizing private information and protection?
- Risk management and insurance fees?

Deepening Security Risks

■ Bot net attack

- An organized attack by Bot

■ Zombie attack

- Spyware which breaks into a computer terminal without leaving evidence

■ Path highjacking



From Wikipedia

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◆ **China's cyber army is preparing to march on America, says the Pentagon.**

September 8, 2007.

<http://technology.timesonline.co.uk/>

◆ The U.S. Army pointed out that the biggest threat is China. Commander Lieutenant-General Robert Elder who is in charge of electronic warfare in the U.S. Army was assigned to head up a new 'cyber command' unit. General Elder says "China is the only country showing a willingness to win the cyberwars."

2007.06.14, CNN/REUTERS

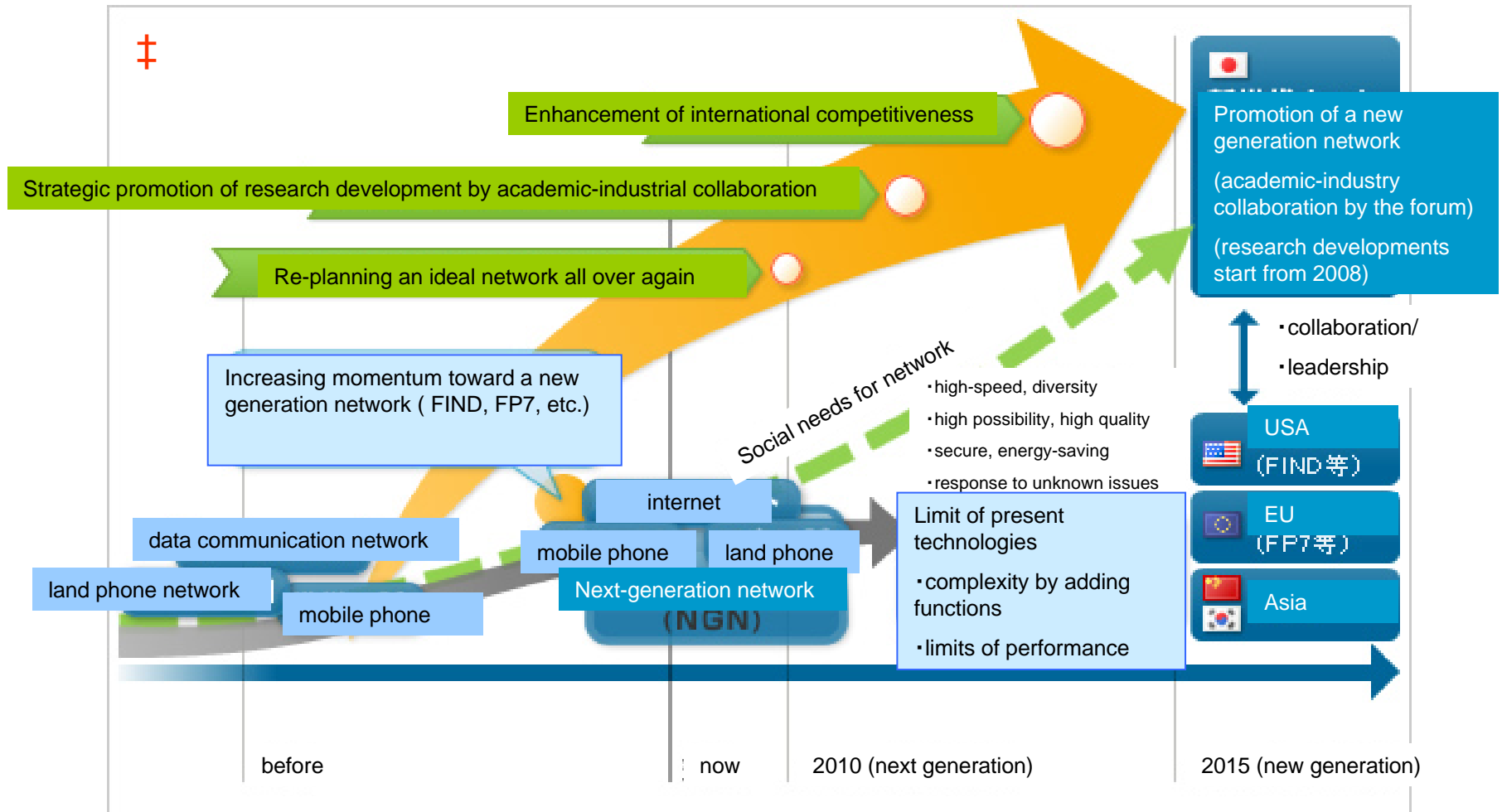
- ◆ The English newspaper, “Guardian”, reported on reported that several computer networks of British government institutions had been broken into by the Chinese army. A series of cyber-attacks considered to be from China were detected in the Pentagon and in German government institutions. (London, Sept.5th, Jiji Press)
- ◆ Director general, Delon, of the intelligence agency under the direct supervision of the prime minister of France, National Defense General Secretariat warned that there is evidence of hacker invasion into several computer systems in several national institutes.

A Series of Cyber-Attacks

- ✓ There were a series of cyber-attacks (spyware) probably directed by China on the Pentagon, British government, German government, French government, Australian government, and New Zealand government.
- ✓ No attack on the Japanese has been reported to date, but this does not mean that there has been no attack.
- ✓ Implementation of tracking and detecting technology - Digital Forensics - is important!

A “New Generation Network Promotion Forum” has begun !

- The Limits of the Internet
- Needs for Post-Internet research and development



Professor Emeritas : Tadao Saito (UT)

General assembly
President
Vice-president: few

New Generation Network
Promotion Board
President

Committee Chairman :
Prof. Tomonori Aoyama
(Keio Univ.)

Executive Board

Research Development Strategy Working Group
consideration of strategies from fundamental research to application (direction, roadmap)

**Prof. Masayuki
Murata**
(U. of Osaka)

Assessment Working Group
consideration of a new generation network society, economical aspects

**Prof. Osamu
Sudoh**
(UT)

Test Bed Network Promotion Working Group
test bed network, promotion of demonstrative experiments

Yuji Inoue
**(Telecommunication
Technology Committee)**

Project Promotion Working Group
vision sharing, communication, promotion of a new generation network,

**Prof. Hideyuki
Tokuda**
**(Keio
University)**

General affairs: Ministry of Internal Affairs and Communication