Global Focus on Knowledge Lecture Series "Information Changes the World"

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Information Explosion and Creation of a New Network Society

#1 Information Explosion and Structural Change of Innovation

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OECD International Conference, Paris, May 2006



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



Transition of Major ICT Companies' Sales



Science & Information Technology, ©OECD, 2006

OECD Countries Import and Export of Software Products - by Country





"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





New Delhi, photo taken in Dec. 2005)

Social Innovation Founded the Grameen Bank, Micro Finance



From Wikipedia

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

Where is the market economy heading now

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



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http://www.mext.go.jp/b_menu/shingi/gijyutu/gijyu tu11/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) \diamond 3rd stage (late 20th – 21st c) Information and telecommunication infrastructures (digital data processes, semiconductors) • The 4^{th} stage (21st c) Ecological science: based on bio- and nano-technology, ICT !

What is Innovation?

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

What is Competition?

- <u>"Competition is a method by which a skillful association of machineries and human beings compete with other methods of association.</u> 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



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 indu	ustries	41%	
Manufacturi	ng	38%	
Educational	Service		7%

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

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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:

FujitsuSanya Uehara: board member of Fujitsu LabsNECHiroshi Kasahara: manager of The Central Research InstituteIBM JapanKazuyoshi Hidaka: manager of Tokyo Research LabsHitachiMasaharu 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

UT DUCR Research Promotion Team, Service Innovation Working Group

Organization of the Working Committee



Characteristics of the Working Committee

• Collegium-type Collaborative Research Model (large-bone researchoriented)

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)

UT DUCR Research Promotion Team, Service Innovation Working Group



Advances in Investigative Research

Problem 2

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





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









PDD-63 Critical Infrastructures











by Mr. Dan Bart, Member of ANSI Board

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

Figures removed due to copyright restrictions

Social Infrastructure and Ubiquitous Networks 1

- Global increase in information flow causes a global increase in material flow.
- \checkmark Enlargement of small-lot material transportation.
- \checkmark 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 (selfsupporting infrastructure) and nursing robots
- Ubiquitous network (RFID) and robot (Sensor Chip) using houses and cities.

- 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

Figures removed due to copyright restrictions

 China's cyber army is preparing to march on America, says the Pentagon.
 September 8, 2007. <u>http://technology.timesonline.co.uk/</u>

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 cyberattacks 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



http://nwgn-forum.nict.go.jp/gaiyo.html

