
Technology Marketing 01 Orientation

Prof. K. FUKUYO, MOT, Yamaguchi Univ.



Outline of this module

- ▶ Introduction of lecturer
- ▶ About MOT
- ▶ Outline of Technology Marketing

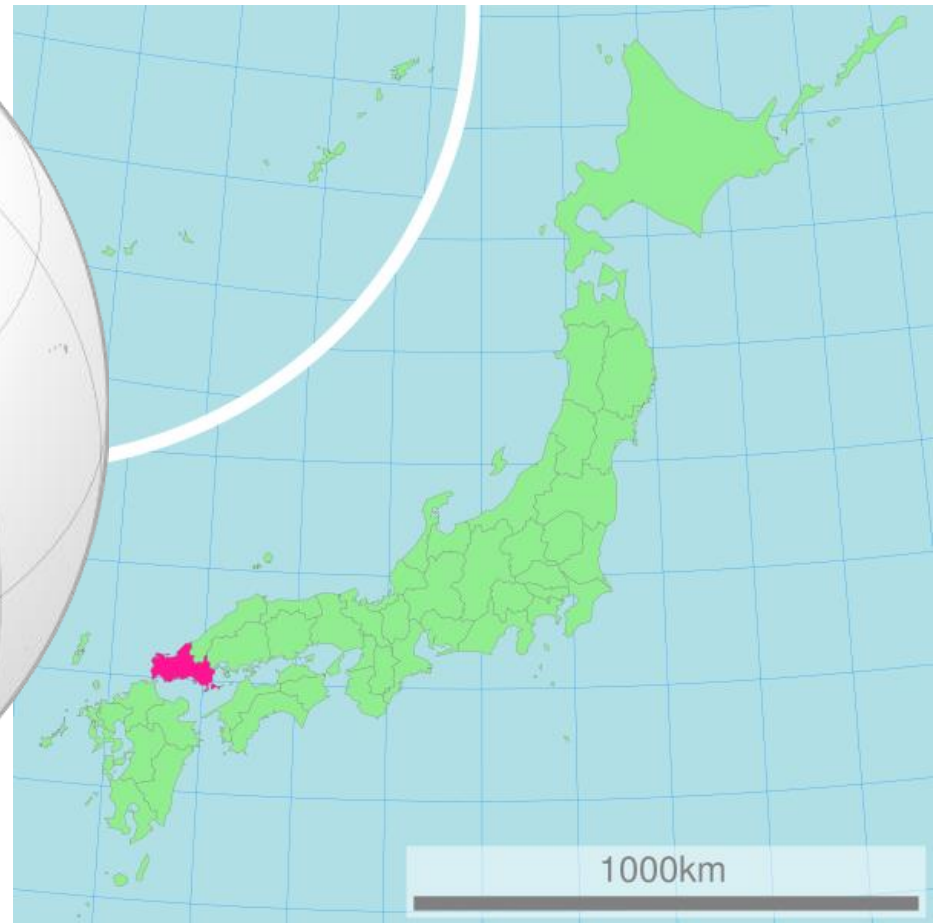
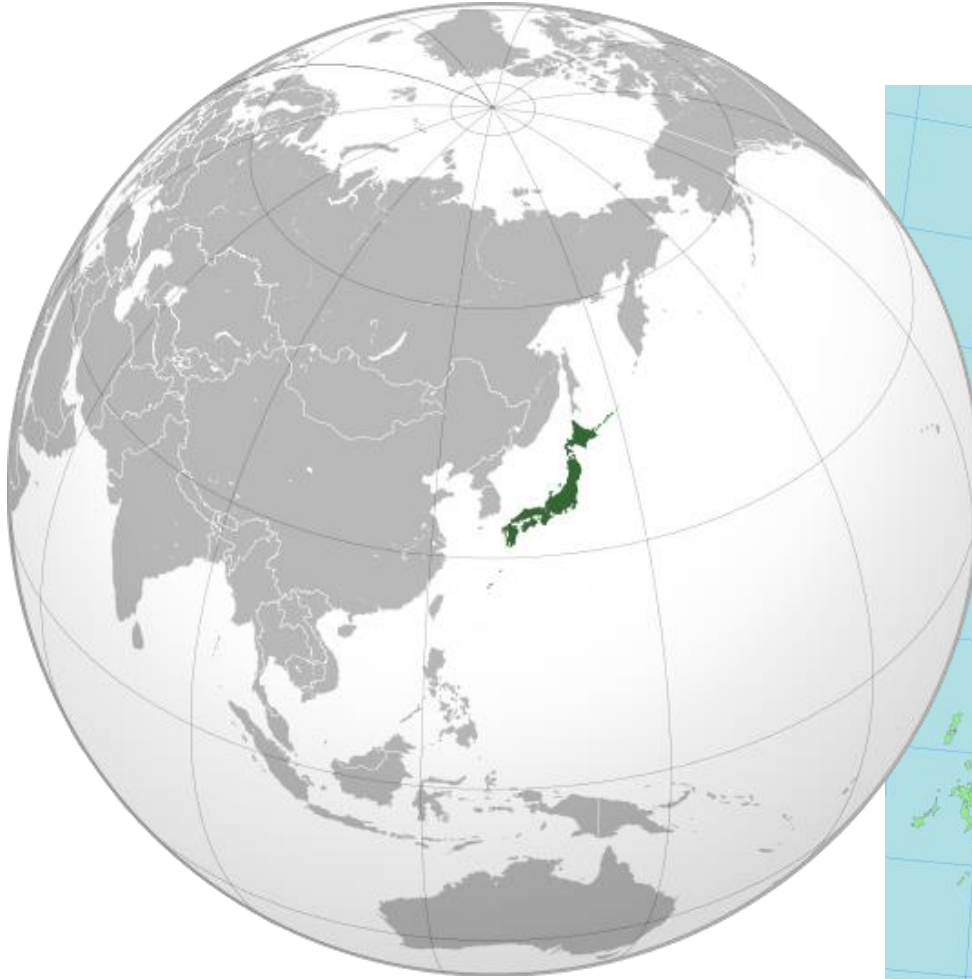


Introduction

▶ My background

- ▶ My name is Prof. Dr. Kazuhiro FUKUYO
- ▶ I got doctor's degree from Osaka University in 1998
- ▶ After that, I worked at Hitachi Ltd., one of the biggest electric companies in Japan
- ▶ I made air-conditioners and refrigerators
- ▶ In 2002, I changed jobs.
 - ▶ Because of rapid rise of Korean and Chinese companies in the field of home appliances
- ▶ Since then, I worked at Yamaguchi University as a professor of Graduate School of Innovation and Technology Management (MOT)

Japan and Yamaguchi



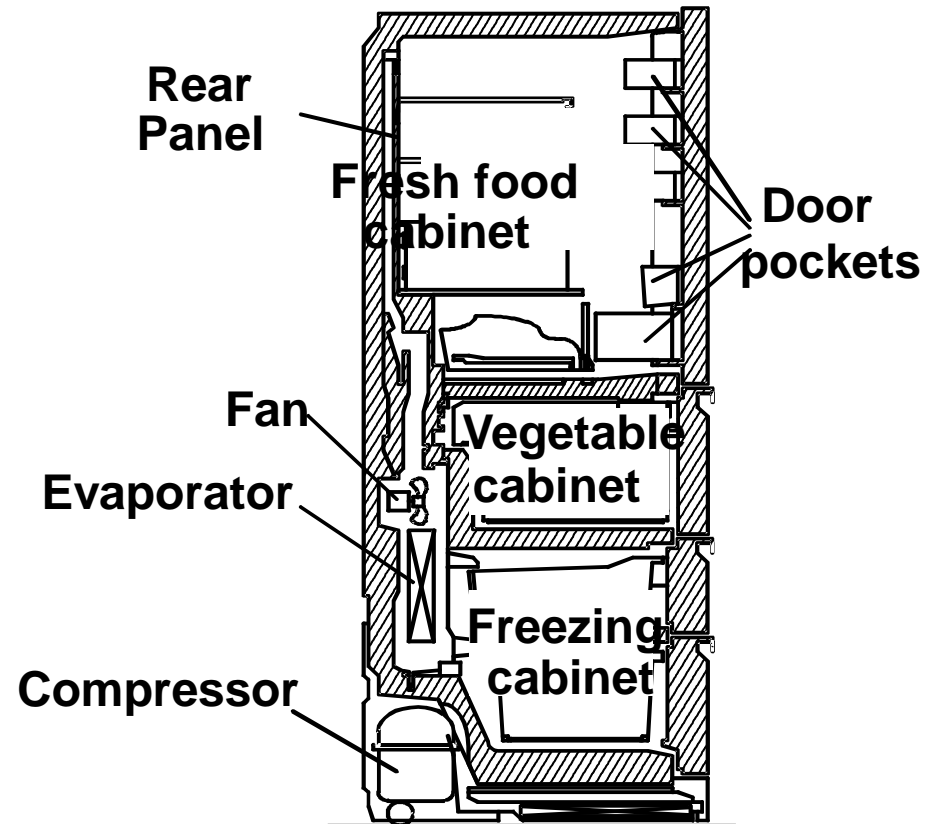
Yamaguchi University

- ▶ 1815, Yamaguchi Kodo (Lecture hall)
- ▶ 1905, Yamaguchi Higher School of Commerce
- ▶ 1939, Ube Higher Technical School
- ▶ 1944, Yamaguchi Prefectural Medical School
- ▶ 1949, All the above school were integrated and Yamaguchi University was founded.
- ▶ 2015, Yamaguchi University's 200th Anniversary



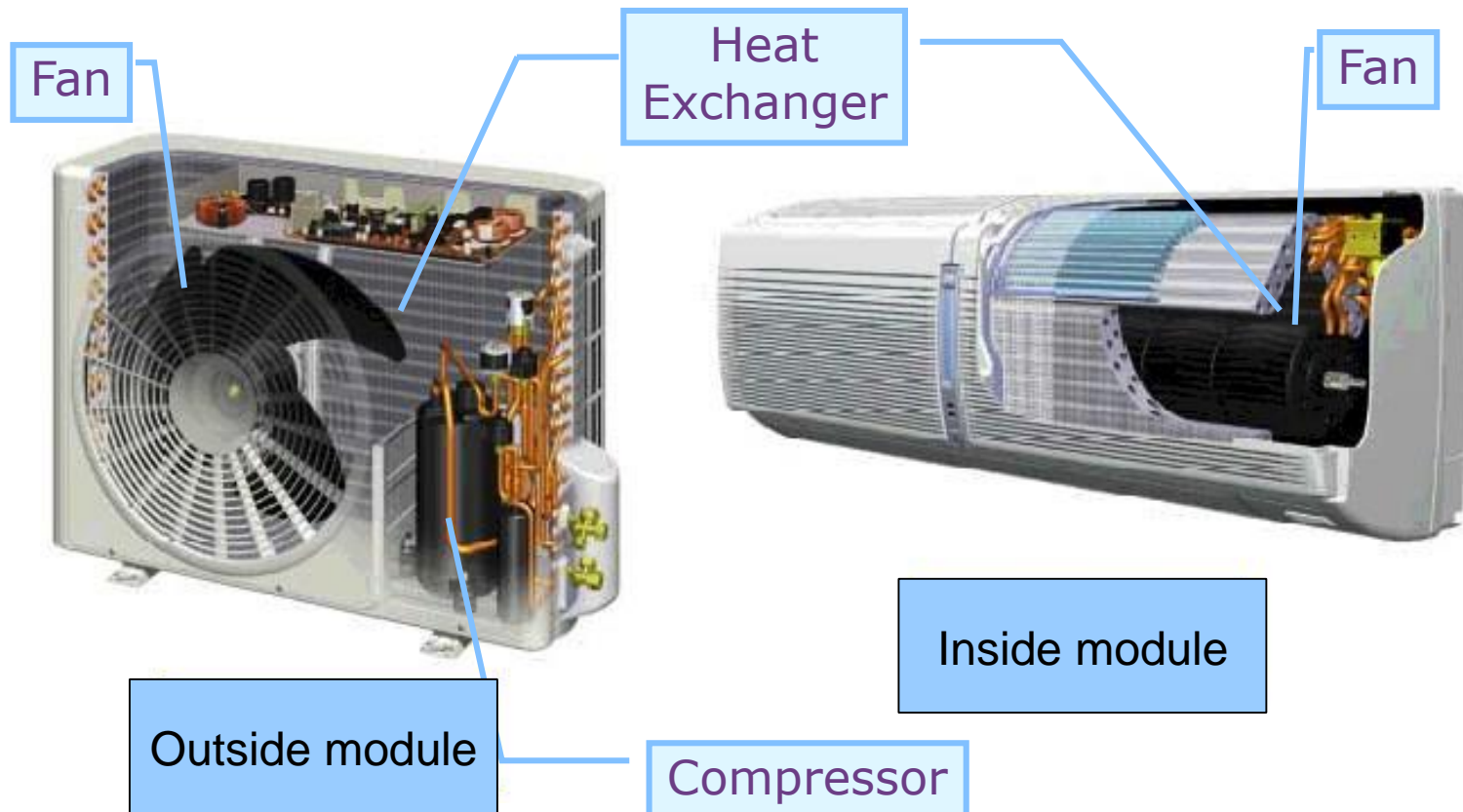
My works (at Hitachi)

- As a company employee
 - I developed air-conditioners and refrigerators



My works (at Hitachi)

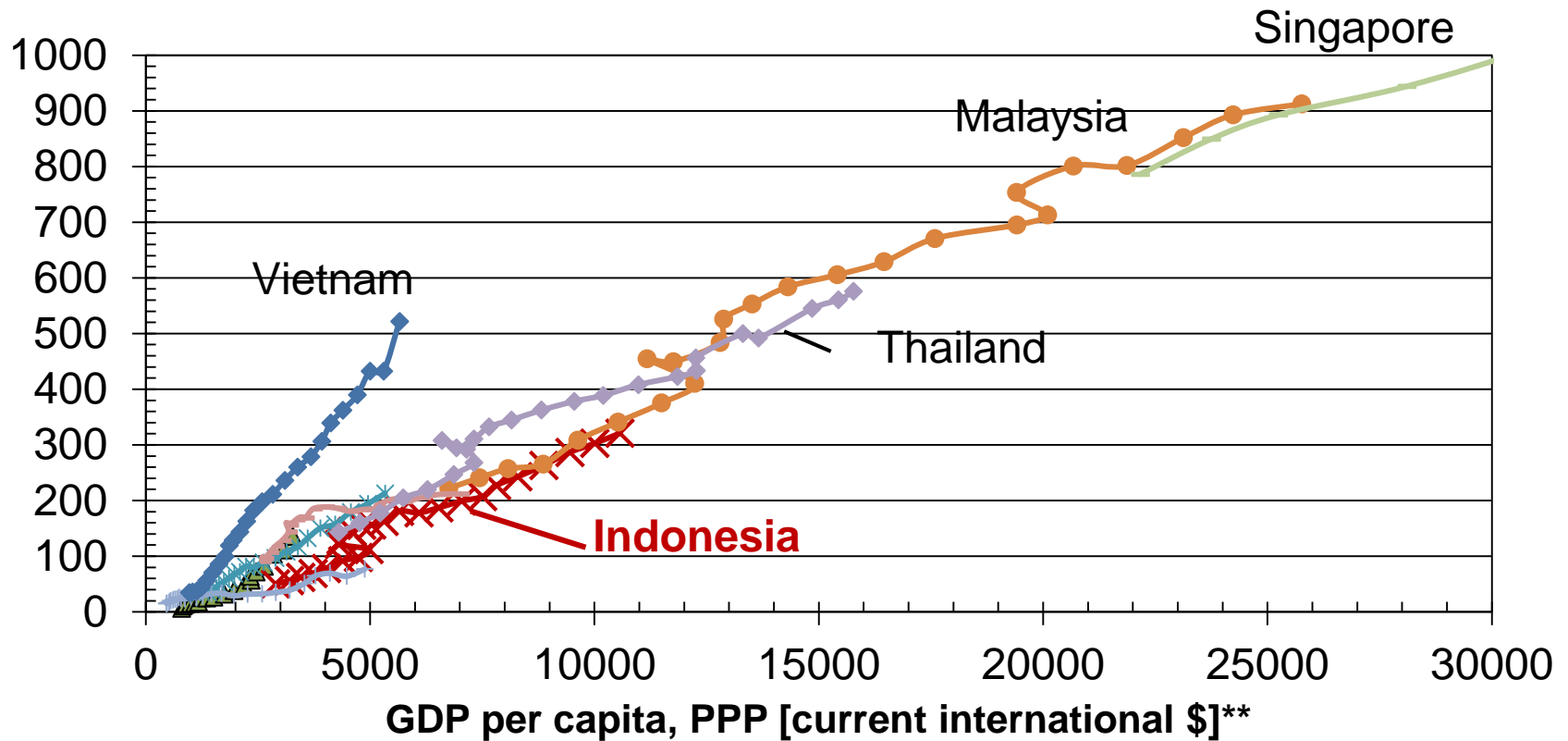
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My works (At University)

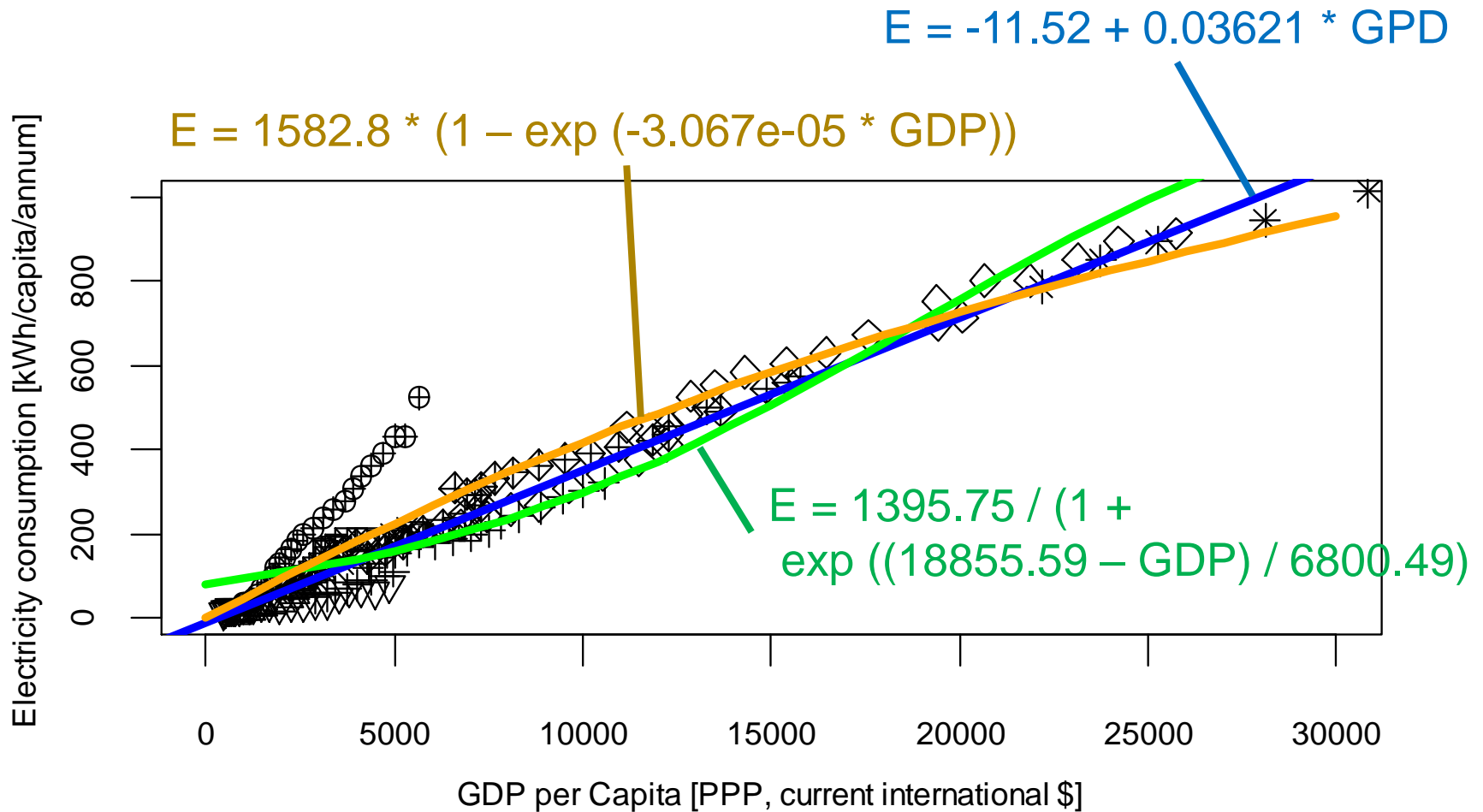
Energy statistics

Yearly residential electricity consumption per capita*
[kWh / capita / annum]



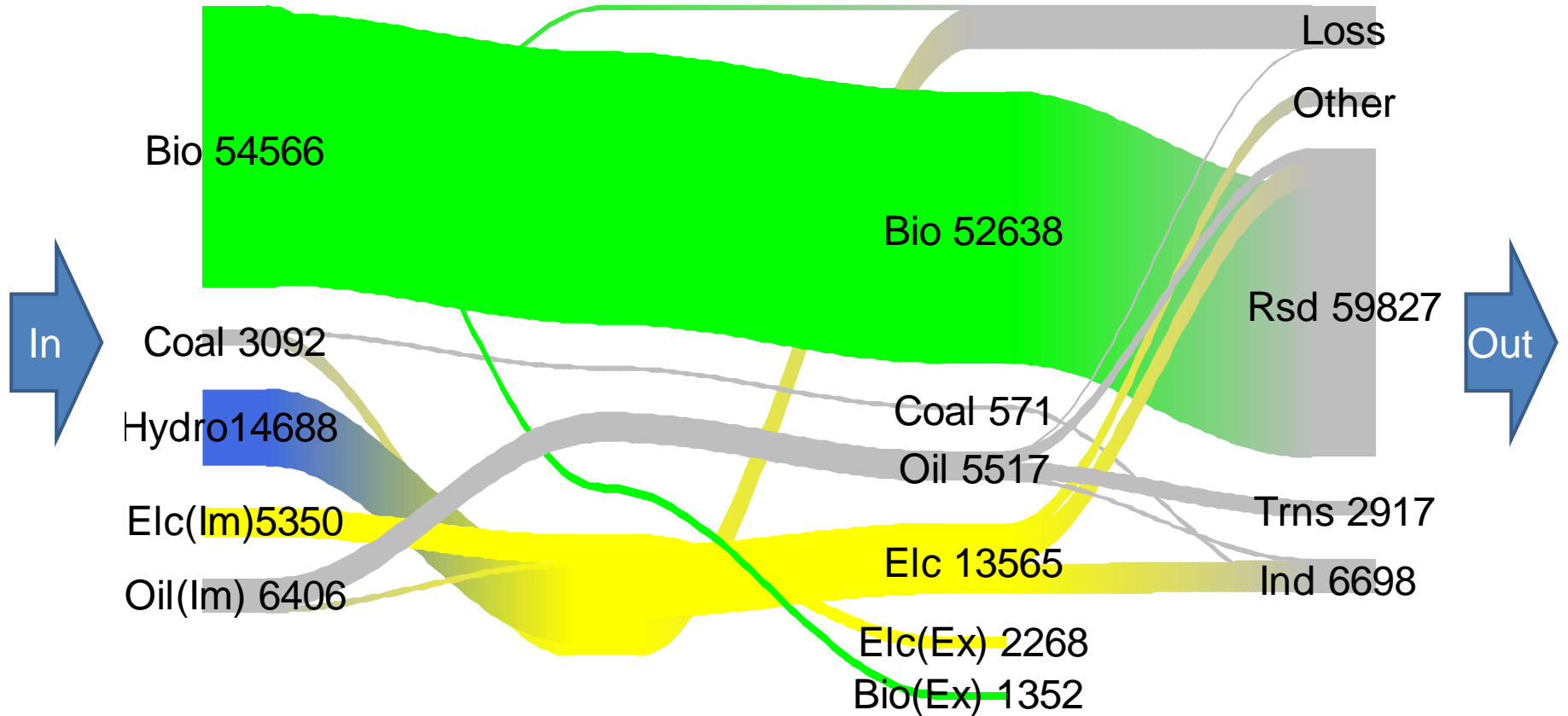
Source: *IEA, EDL; **World Bank

Regression curves



Strong relationship between energy consumption and economic development

Energy flow in Laos (2014)





What is caused by the economic development?

- ▶ Without **green innovation**,
- ▶ Increasing energy demand associated with the economic development especially in the emerging countries may accelerate the global warming

How to avoid?

Japan's attempts

- ▶ Historically, **Japan** has made many attempts to overcome energy difficulties
- ▶ Now **Japan** tries to introduce **renewable energy** to reduce GHG emission and improve self-sufficiency in energy
- ▶ **Japan**'s experiences may be useful references



My foreign experiences

- 2005
 - A member of Pilot Study for the Inland Higher Education Project in China
 - I went to China 4 or 5 times, visited about 20 universities.
- 2007
 - A member of Pilot Study for Knowledge Assistance for Rubber Industry Promotion and Financial Capability Development in Cambodia
- ▶ 2009 – present
 - ▶ Invited professor on the MBA course in National University of Laos
- ▶ 2011 – 2015
 - ▶ Supported the “Economic Census of Cambodia 2011” as a JICA expert
- ▶ 2017 – present
 - ▶ Support the “Economic Census of Nepal” as a JICA expert

Example of International Cooperation MOF, Indonesia non-degree program

- ▶ From December 3 to 17 in 2011, 30 persons from MOF, Republic of Indonesia came to YUMOT for Non-degree short term training under the Professional Human Resources Development Project Phase III (PHRDP-III)



Example of International Cooperation

MBA in Lao PDR

- ▶ Lao PDR adopted “Chintana-kan Mai (New Thought)” in 1986 and convert to a market economy
- ▶ To cultivate business leaders, National University of Laos and Japan International Cooperation Agency (JICA) established a MBA course
- ▶ YUMOT supports the MBA course and send 3 professors



About MOT

- What is “MOT”?
- The need for MOT
- Development of MOT human resources
- MOT education



What is Management of Technology?

▶ Definition

- ▶ “Management of Technology (MOT) refers to management by which technology-based corporations and organizations can create economic value and ensure their continued growth by assessing the potential of technologies and developing them into businesses.”

(METI & MRI Inc. "A Guide to MOT in Japan", November, 2005)

▶ In short,

- ▶ “Management of technology is to manage organizations (enterprises, teams, etc.) by using technology effectively.”

Source: Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005

Short history of MOT

- MOT has started with the management of a large-scale research and development project in the United States in the 1960's
 - E.g. The Apollo Program
- MOT has evolved and its central theme has changed over time
- In Japan, the training of MOT persons who can support innovation has become a focus of attention in recent years



By NASA (The Project Apollo Image Gallery (image link)) [Public domain], via Wikimedia Commons

Source: Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005

Peter Drucker said

- ▶ “The enterprise has two – and only these two – basic functions: **marketing** and **innovation**. **Marketing** and **innovation** produce results; all the rest are ‘costs’.”

P. Drucker: Management, New York: Harper & Row, 1974, p.61



Engineering and Marketing

- ▶ The essence of **engineering** is **innovation**
- ▶ **Engineering** creates the products and process that drive the growth of a company
- ▶ **Marketing** is the process of creating a customer
 - ▶ To create a customer, marketers must understand the capabilities of the product and understand the customer's mind

Stan Haavik: “Marketing for Engineers”, IEEE, 1996



Innovation, and technological innovation

- ▶ Of course, innovations are not limited to technological ones
- ▶ Schumpeter defines 5 types of innovations
 - ▶ **Product**
 - ▶ The introduction of a new good or of a new quality of a good
 - ▶ **Process**
 - ▶ The introduction of a new method of production
 - ▶ **Business model**
 - ▶ The opening of a new market
 - ▶ **Source of supply**
 - ▶ The conquest of a new source of supply of raw materials
 - ▶ **Mergers & divestments**
 - ▶ The carrying out of the new organization of any industry

Stick to technology


- ▶ Among the many types of innovations, MOT personnel have to concentrate first on technology-based / technology-driven innovation
- ▶ Because:
 - ▶ One of the basic functions of enterprises is innovation
 - ▶ MOT is to manage enterprises by using technology effectively
- ▶ But, of course, MOT personnel should know the relationship between technology and socio-economic matters

Technological and Social Systems interact strongly

- ▶ The great revolutions in agricultural technology have probably had more influence on how people live than political revolutions
- ▶ Changes in sanitation and preventive medicine have contributed to the population explosion (and to its control)
- ▶ Microprocessor is changing how people write, compute, bank, operate businesses, conduct research, and communicate with one another



six basic technology areas

- ▶ Agriculture
- ▶ Materials
- ▶ Manufacturing
- ▶ Energy sources and use  **My specialty**
 - Green Tech**
 - Green Innovation**
 - Green MOT**
- ▶ Communication and information processing
- ▶ Health technology

Agriculture

- ▶ People developed ways of manipulating plants and animals to provide food and support larger populations
- ▶ People planted crops and encouraged growth by cultivating, weeding, irrigating, and fertilizing
- ▶ Agricultural productivity has grown through the use of machines and fertilizers
- ▶ The widespread use of insecticides, herbicides, and fungicides also has greatly increased productivity

American Association for the Advancement of Science,
“Science for All Americans”

Materials

- ▶ Since the 1960s, materials technology has focused increasingly on the synthesis of materials with entirely new properties
- ▶ Plastics are synthesized in chemical reactions that link long chains of atoms together
 - ▶ It can be designed to have a wide variety of properties for different uses, from automobile and space vehicle parts, to food packaging and fabrics, to artificial hip joints and dissolving stitches

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“Science for All Americans”

Manufacturing

- ▶ Manufacturing processes usually involve three major steps:
 1. Obtaining and preparing raw materials
 2. Mechanical processing such as shaping, joining, and assembling
 3. And coating, testing, inspecting, and packaging
- ▶ In all of these steps, there are choices for how to sequence tasks and how to perform them
- ▶ So the organization of tasks to optimize productivity is another major component of manufacturing

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“Science for All Americans”

Energy (sources)

- ▶ Industry, transportation, urban development, agriculture, and most other human activities are closely tied to the amount and kind of energy available
 - ▶ Direct sunlight, wind, and water will continue to be available indefinitely
 - ▶ Plant fuels, wood and grasses, are self renewing, but only if we plant as much as we harvest
 - ▶ Fuels already accumulated in the earth such as coal, oil and natural gas, and uranium, will become more difficult to obtain as the most readily available sources run out

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Energy (use)

- ▶ For much of human history, energy had to be used on site, at the windmill or water mill, or close to the forest
- ▶ In time, improvement in transportation made it possible for fossil fuels to be burned far from where they were mined, and intensive manufacturing could spread much more widely
- ▶ In this century, it has been common to use energy sources to generate electricity, which can deliver energy almost instantly along wires far from the source
- ▶ Electricity, moreover, can conveniently be transformed into and from other kinds of energy.

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Communication

- ▶ Communication involves a means of representing information, a means of transmitting and receiving it
- ▶ Telephones, radio, television, satellites, sound and optical recordings, and other forms of electronic communication have increased the options and added to the flow of information
- ▶ Communication sometimes requires security

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And Information processing

- ▶ The invention of writing, tables of data, diagrams, mathematical formulas, and filing systems have all increased the amount of information we can handle and the speed with which we can process it
- ▶ Large amounts of information are essential for the operation of modern societies
- ▶ Generation, processing, and transfer of information is becoming the most common occupation of workers in industrialized countries

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Health technology

- ▶ The modern treatment of many diseases also is improved by science-based technologies
- ▶ Knowledge of chemistry, for example, has improved our understanding of how drugs and naturally occurring body chemicals work, how to synthesize them in large quantities, and how to supply the body with the proper amounts of them
- ▶ Substances have been identified that are most damaging to certain kinds of cancer cells
- ▶ Knowledge of the biological effects of finely controlled beams of light, ultrasound, x rays, and nuclear radiation has led to technological alternatives to scalpels and cauterization

American Association for the Advancement of Science, “Science for All Americans”

The Need for MOT (1)

- In order to open new markets amid the rapid changes in the economic environment caused by the advance of globalization, companies are required to employ strategic management to create new concept and add intangible value to businesses

Source:Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005

Effect of Globalization (1)

- It has various aspects which affect the world in several different ways such as:
- Industrial
 - Emergence of worldwide production markets and broader access to a range of foreign products for consumers and companies
 - Particularly movement of material and goods between and within national boundaries



Source: Wikipedia

Effect of Globalization (2)

- Financial
 - Emergence of worldwide financial markets and better access to external financing for borrowers
 - Simultaneous though not necessarily purely globalist is the emergence of under or un-regulated foreign exchange and speculative markets.
- Economic
 - Realization of a global common market, based on the freedom of exchange of goods and capital



Source: Wikipedia

The Need for MOT (2)

- All business are linked with technology
- And technological innovation is causing technology to become further segmented and specialized
- Against such a backdrop, professionals, who understand the essence of technology and management and can carry out management tasks (MOT personnel), are now essential for companies to develop new products, services, and business models and to carry on their economic activities

Source: Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005

The Need for MOT (3)



SKIP

- If the development of MOT personnel to lead technology-based businesses is promoted and an environment, in which such personnel can fully exert their skills, can be created, the conversion to economic value of the research and development investments would be facilitated
- It is anticipated that this would lead to increased industrial competitiveness and that it would stimulate the economy

Source: Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005



Development of MOT Human Resources (1)

- On-the-job training (OJT) at corporate workplaces and off-the-job training (Off-JT) through educational programs offered by corporate training institutions, universities, and other educational institutions are available as opportunities for human resources training in MOT

Source: Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005



Development of MOT Human Resources (2)

- Educational programs offered by universities and other educational institutions are expected to enable participants to accomplish the following:
 - Acquire the ability to make judgments and decisions in actual business situations
 - Gain an understanding of unsystematized matters through debates and other means
 - Effectively and intensively acquire already systematized knowledge
- It is also anticipated that the participants with various backgrounds will inspire one another

Source:Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005

MOT education

- To enhance the ability to manage technology, it is very important to develop the personnel to carry out MOT
- In today's quickly changing business climate, MOT personnel are required to be thoroughly knowledgeable in both the essence of technology and in management
- And MOT personnel are required to have such capabilities as the skill to promote business in a cross-organizational manner

Source:Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005



Features required of MOT education (2)

- Consequently, education to foster the development of MOT personnel must be
 - Practical (applicable to actual business situations)
 - Interdisciplinary (encompassing both technology and management fields)
 - Academic (supported by academic analyses and research)

Source:Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005

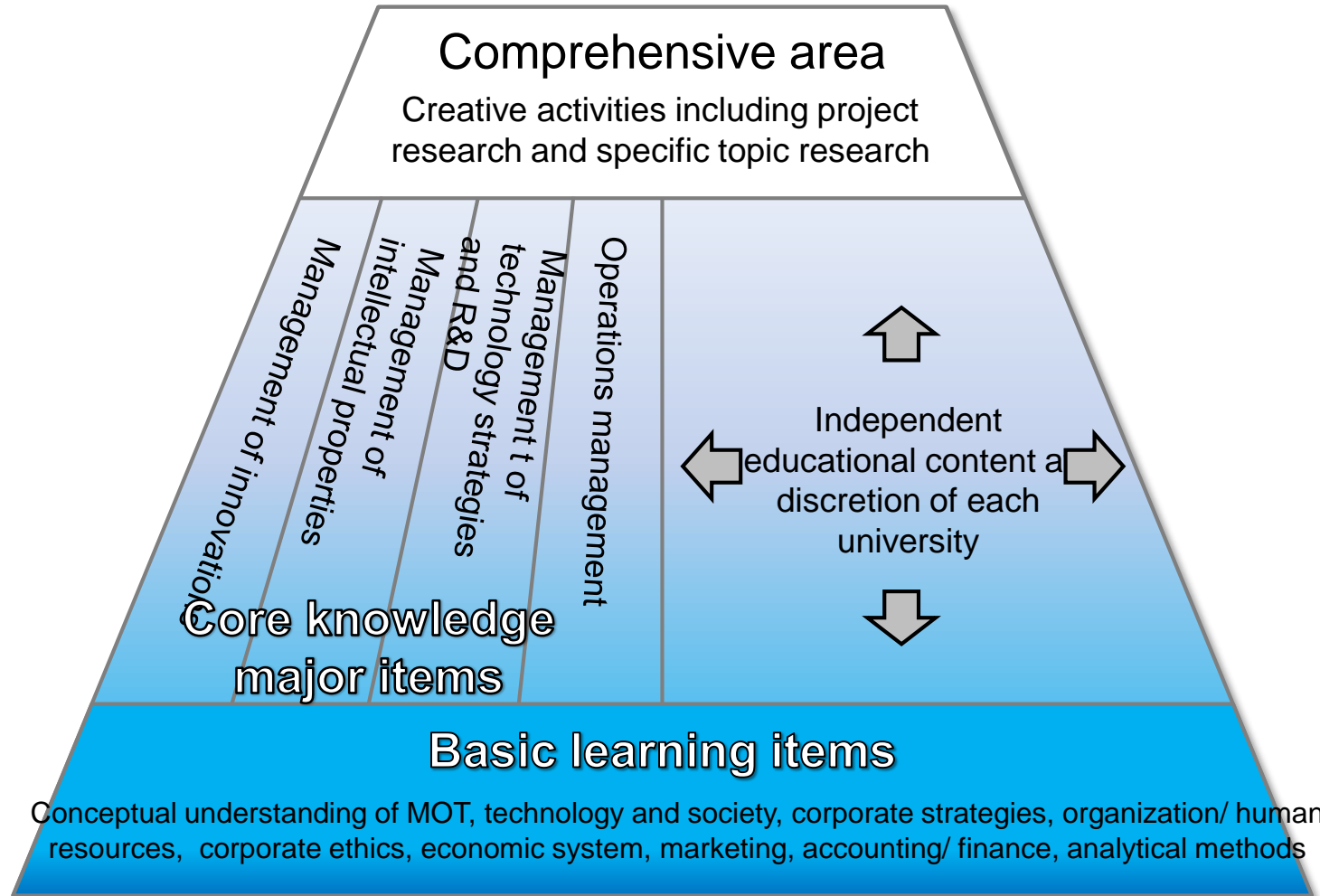


Features required of MOT education (3)

- In order to meet these requirements, it is useful to establish educational programs that enable participants to effectively acquire the skills required of MOT personnel
- Also effective is the adoption of educational methods (teaching methods) that help participants develop their teamwork and leadership skills as well as their ability to formulate visions and make decisions

Source: Ministry of Economy, Trade and Industry, “A Guide to MOT in Japan”, 2005

Framework of the core curriculum for MOT education, 2016



Core Curriculum for MOT-Education (1)

	Major Item	Intermediate-level category	
Basic Learning Items	MOT Fundamentals	CONCEPTUAL UNDERSTANDING OF MOT	Definition of MOT / MOT historical background / Acquisition of new concepts from MOT perspectives
		SCIENCE, TECHNOLOGY, AND SOCIETY	Ethics of engineers and scientists / Science, technology and society / Technologies and risks / Technology and standardization
		CORPORATE STRATEGIES	Management philosophy (mission) / Corporate strategies / Competitive strategies / Business strategies
		ORGANIZATION/HUMAN RESOURCES AND CORPORATE ETHICS	Definition of organization / Organizational design and management / Motivation / Leadership / Compliance and corporate social responsibility (CSR) / Risk management
		ECONOMIC SYSTEM	Consumer behavior / Corporate behavior / Market mechanisms
		MARKETING	Discovering and analyzing market opportunities / Approaches to market / Interactions with customers
		ACCOUNTING AND FINANCE	Financial statements / Cost accounting / Funding and enterprise value assessment
		ANALYSIS METHODS	Mathematical and statistical approaches / Social scientific approaches

Core Curriculum for MOT-Education (2)

	Major Item	Intermediate-level category
High-level Core Learning Items	MANAGEMENT OF INNOVATIONS	Definition of innovation / Open innovation / Corporate management and innovation / Social innovation / Architecture
	MANAGEMENT OF INTELLECTUAL PROPERTIES	Intellectual property and intellectual property rights / Securing rights / Management within the context of collaboration with external parties / Intellectual property strategies and portfolios / Standardization and intellectual property rights / Assessing value of intellectual assets
	TECHNOLOGY STRATEGIES AND R&D (RESEARCH AND DEVELOPMENT) MANAGEMENT	Concepts of technology / Company and/or business goals and technology strategies / Technology acquisition approach / Roles and activities of R&D / R&D management
	OPERATIONS MANAGEMENT	Production system / Evaluation indicators / Total quality control / Supply-chain management (SCM) / Project management (PM)

Outline of “Technology Marketing” (1)

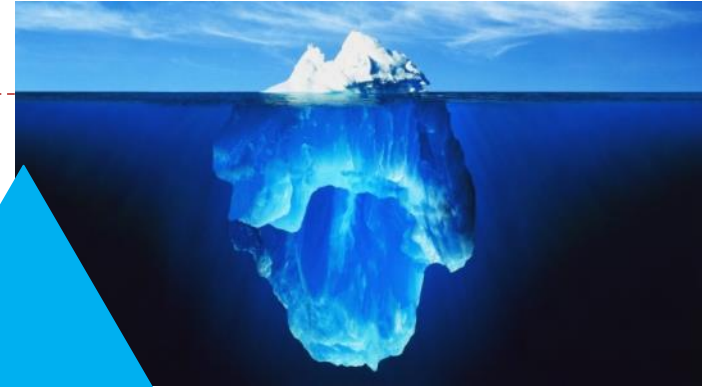
- ▶ "New product development is more than just making products that work." (T. Curtis)
- ▶ Firstly, the students in this course learn the following basic knowledge that engineers and scientists need to know:
 - ▶ definition of marketing,
 - ▶ finding a market opportunity by an environmental analysis,
 - ▶ segmentation,
 - ▶ targeting,
 - ▶ and marketing tools such as product, price, place, and promotion policies.

Outline of “Technology Marketing” (2)

- ▶ Secondly, the students learn the knowledge and skills related to the process of new product development where the engineers and scientists are deeply involved in:
 - ▶ clarifying a customer's problem,
 - ▶ concept design as interim solution for the customer's problem,
 - ▶ project design and detail design based on the concept design, manufacturing and tests, etc.
- ▶ In order to understand the process of marketing and new product development deeply, in parallel with lectures, each student draws up a product plan based on acquired knowledge and skills, and original ideas.

Business Mindset

Iceberg model:
If your amount of knowledge, skill,
and mind is small,
You cannot make large action



Jeriff Cheng, Creative Commons

visible



Action

Action

Mind

Mind

Knowledge

Skill

Knowledge

Skill

invisible



Request

- ▶ You should learn and think voluntarily
- ▶ This course does not give you fount of all knowledge on the technology marketing unilaterally
- ▶ You should study on terms, ideas, and cases associated with the technology marketing voluntarily
- ▶ You should think of application of what they learned to your country
- ▶ You should think that what is necessary for your country's industries

If you have questions

- If you have questions after the lectures, you can ask me by e-mail

fukuyo@yamaguchi-u.ac.jp

