Toward the Creation of Innovation

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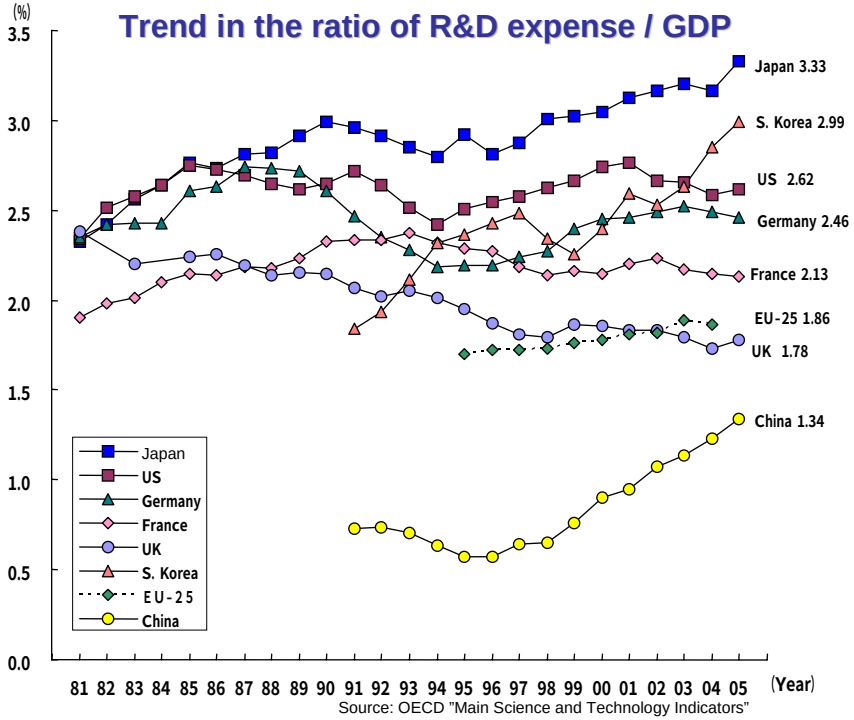
1. Current Situation and Challenges with Innovation

Current state of R&D in Japan

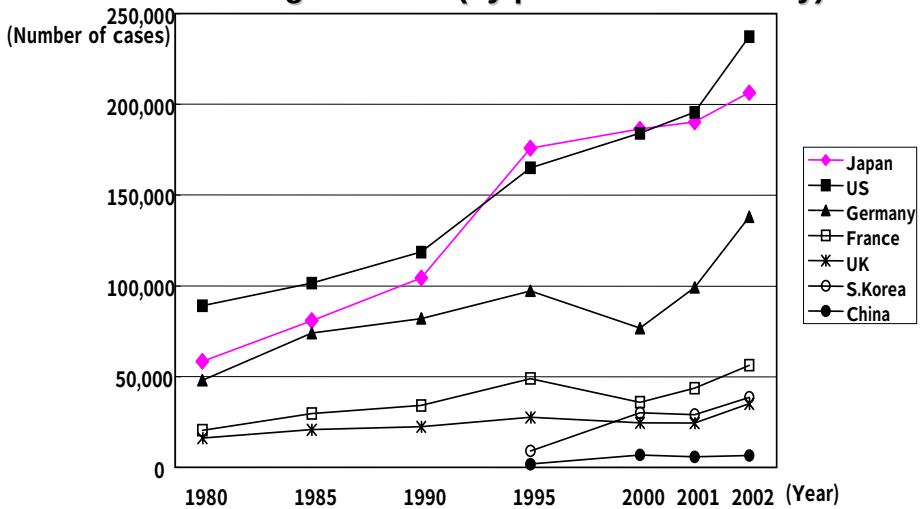
- The ratio of total R&D expense in Japan vis-à-vis GDP exceeds 3%, which represents an extremely high level compared with those in other countries.
- The R&D expense is about 18 trillion yen and the number of researchers is about 820,000.The number of researchers per 10,000 labor force is the highest in the world.

Trend in the ratio of R&D expense / GDP



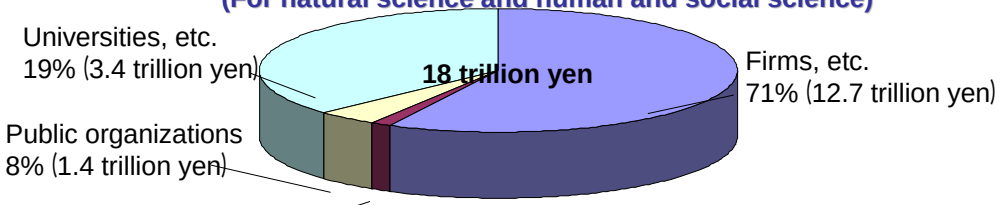
Source: OECD "Main Science and Technology Indicators"

An International Comparison of Number of Cases of New Patent Registrations (by patentee nationality)



Source: WIPO "INDUSTRIAL PROPERTY STATISTICS," JPO "Japan Patent Office Annual Report"

Research Expenditure in Japan (2005) (For natural science and human and social science)



Source: "Report of Survey of Science and Technology Research" (Statistics Bureau of the Ministry of Internal Affairs and Communications)

A Number of Researchers per 10,000 Labor Force Population

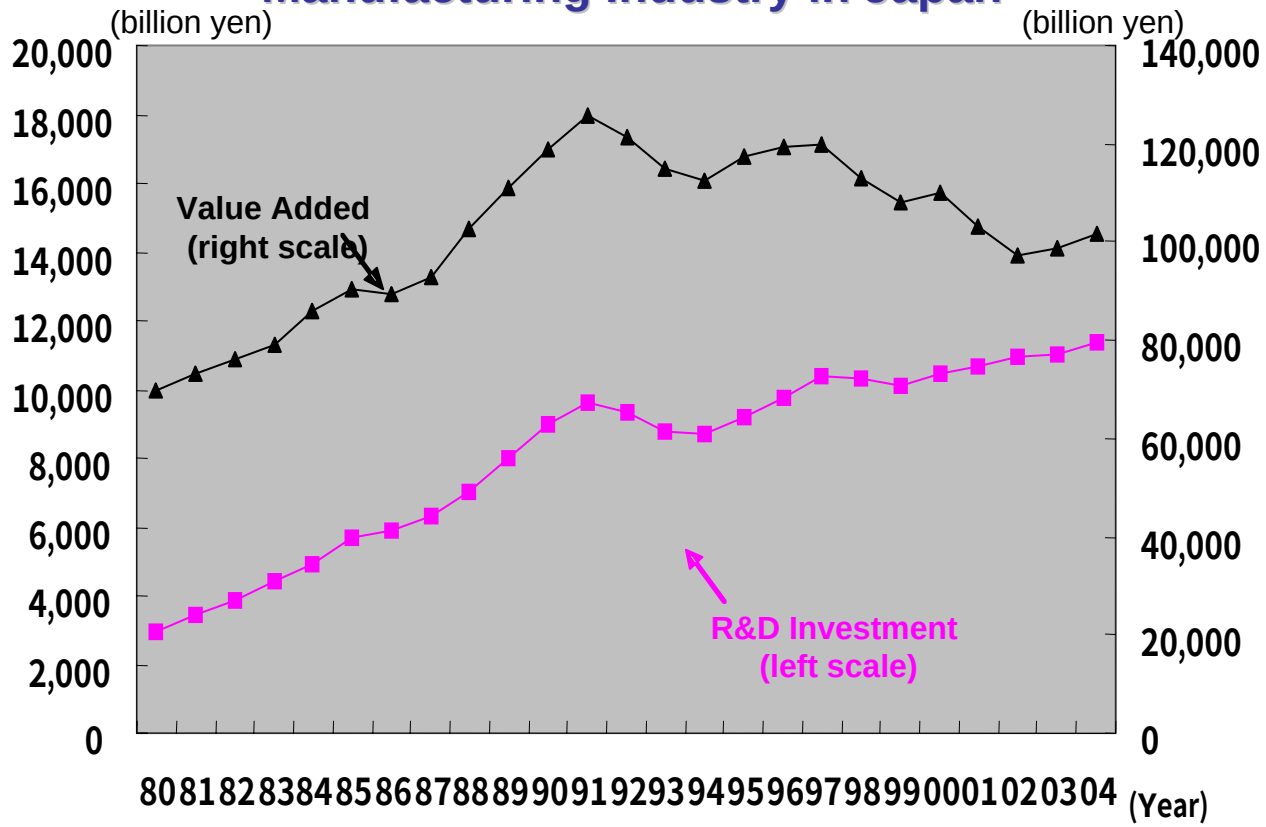
Rank	country name	Number of researchers
1	Japan	101.8
2	U.S.	91.2
3	South Korea	75.7
4	France	72.9
5	Germany	65.3
6	UK	54.6

Source: MEXT "Science and Technology White Paper"

Relationship between R&D Investment and Value Added

Since entering the 1990's, investment efficiency in R&D declined, with a tendency of a declining value-added, whereas R&D investment increased.

R&D Investment and Value Added of Manufacturing Industry in Japan



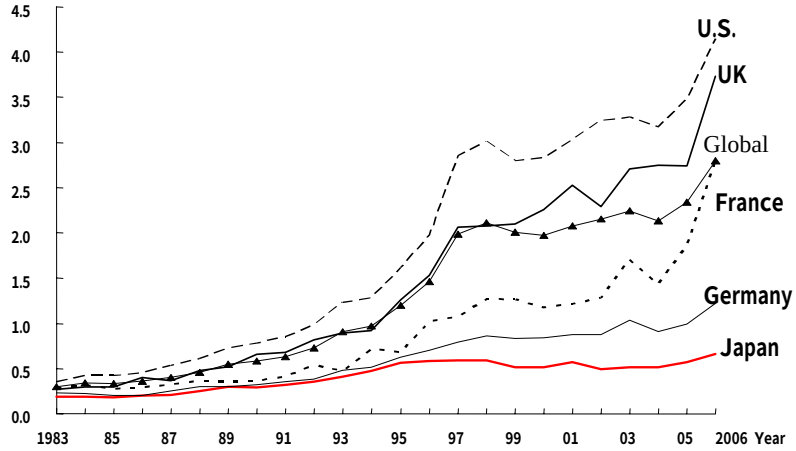
Value-added =Production value－(raw materials used, depreciation, etc.)

Source: Statistics Bureau, Ministry of Internal Affairs and Communication：Results of Survey on Science and Technology
Ministry of Economy and Trade and Industry: Census of Manufactures

Challenge ①: R&D

- The importance of integration and collaboration of various sectors or development activity with insights into basic science is growing.
- Corporate R&D in recent years is no longer able to continue the “Linear Innovation Model,” such as conventional “Basic research → Applied Research→ Development/Commercialization”.

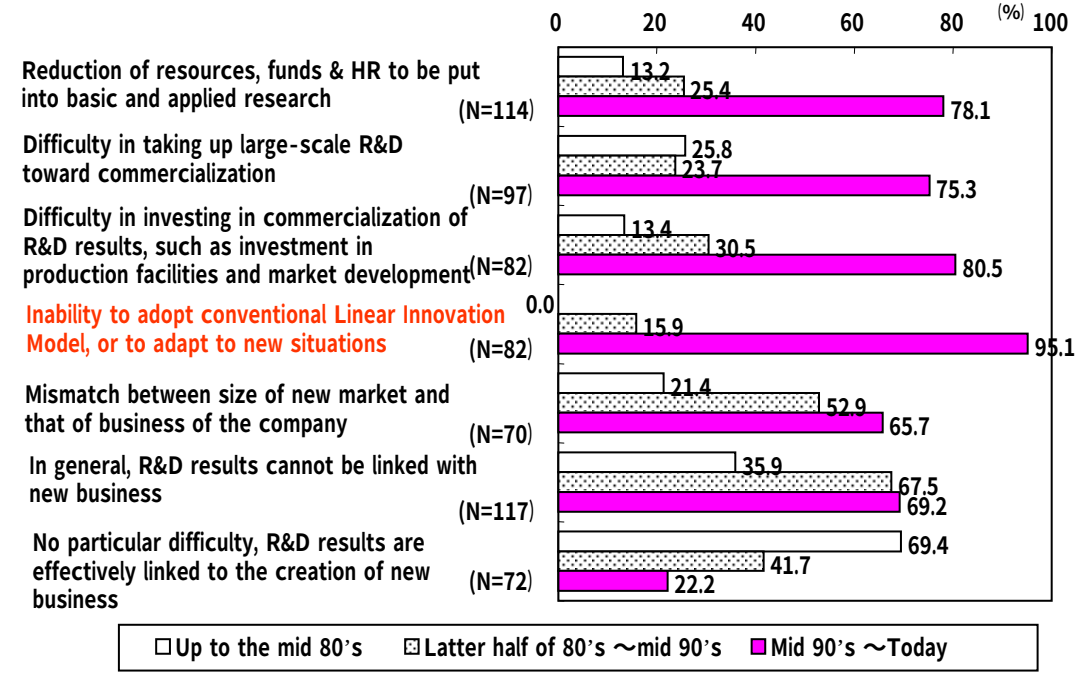
Science Linkage in US patents



Source: National Institute of Science and Technology Policy: "Science & Technology Trends - Quarterly Review”

Note: Science linkage is the number of citation of scientific articles described in the examination reports of US patents.

Changes in commercialization of R&D results in the 1980’s and 1990’s



Source：Ministry of Economy, Trade and Industry: Fact-finding Survey on Industrial Technology Development Capacity in Japan (FY 2003)

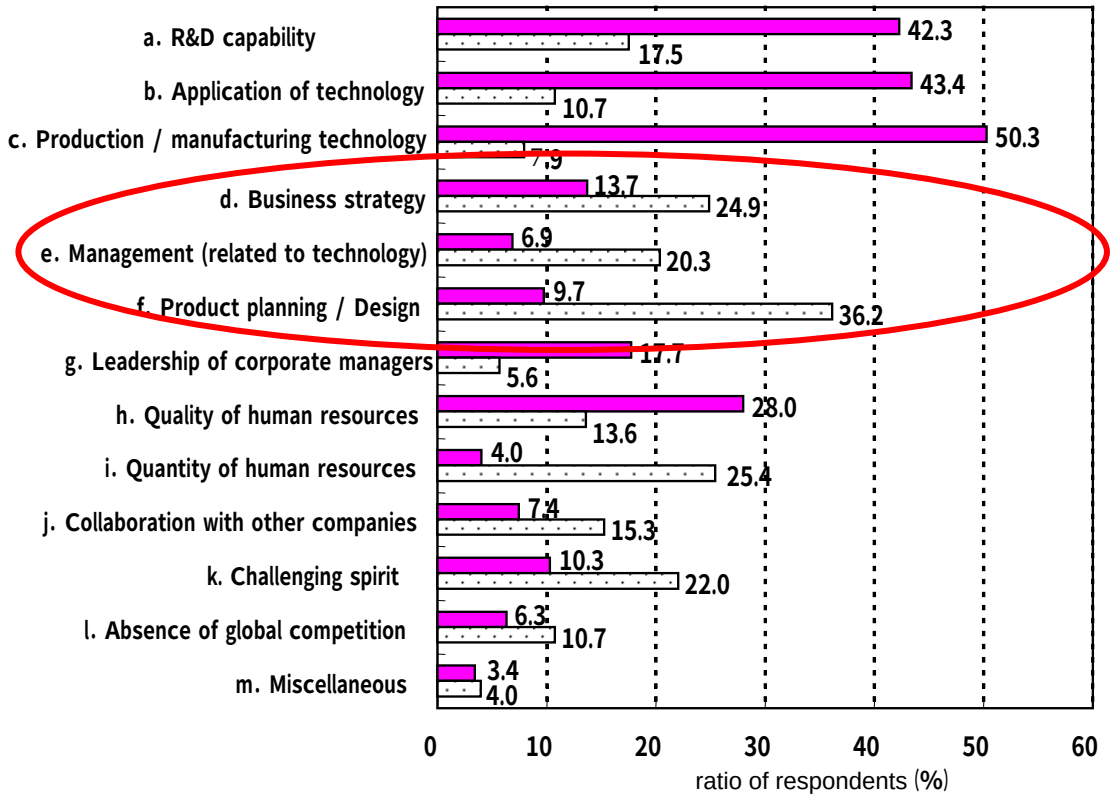
Note：Questionnaires were sent out to companies with high R&D investment (161) in each business, and central research institutions and business research institutions (370).

Time of Survey; August 2003, Respondents 113 companies and 156 research institutions.

Challenge ②: Business Strategy

Japanese companies evaluate their competitiveness in terms of business strategy that they have weak points such as business strategy utilizing R&D, R&D aimed at the market and product planning reflecting market needs.

Strength and shortage from the viewpoint of competitiveness(2004)



Business strategy utilizing R&D

R&D aimed at market

Product planning reflecting market needs

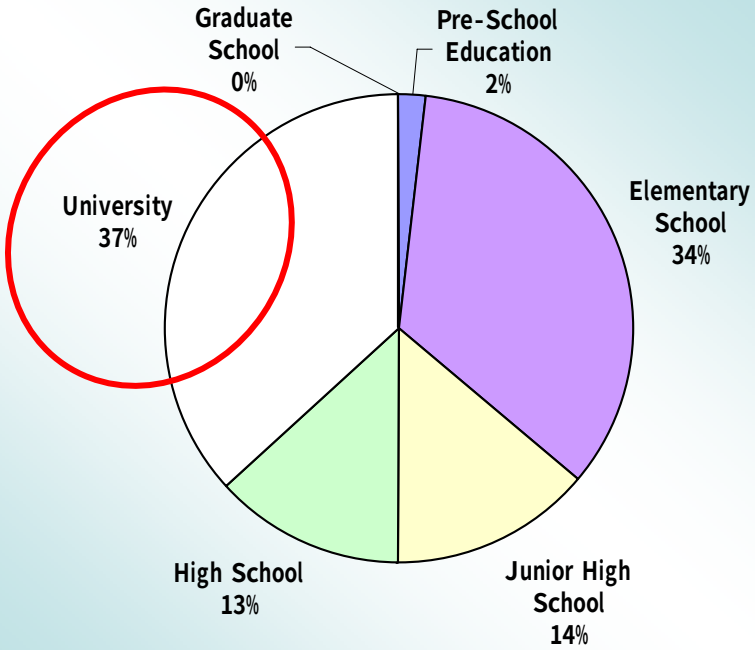
Upper: Competitive Strength (N=175)
Lower: Competitive weakness (N=177)

Source: Survey on science technology development in 2004, METI
Note: 328 companies with large R&D investment were selected

Challenge ③: Development of Human Resources

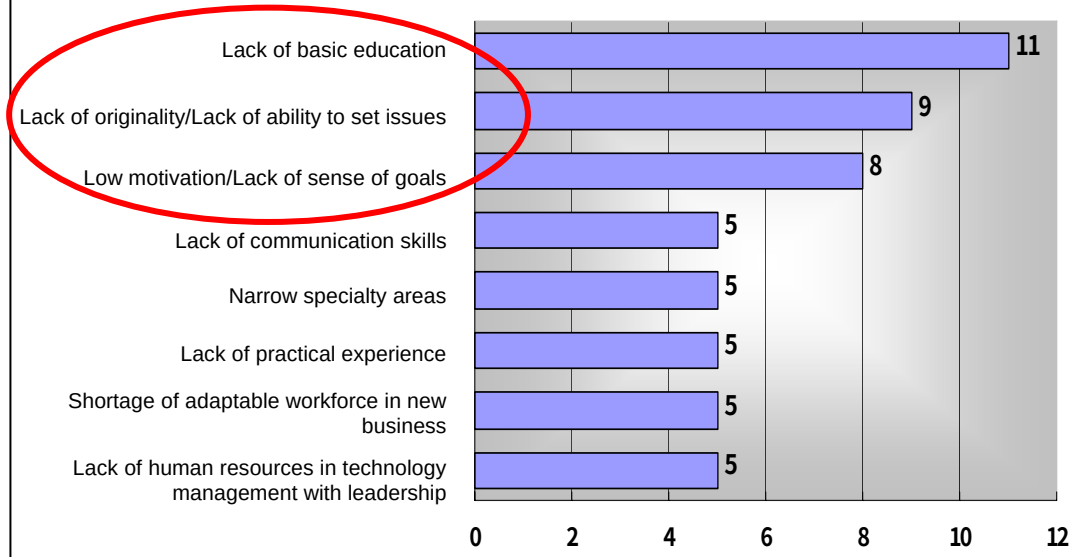
Industry voices many issues associated with human resource development programs offered by educational institutions, including the lack of basic knowledge or lack of originality/lack of ability to set issues.

Discontent among Industry against Education Stage



Source: Questionnaire survey by KEIZAI DOYUKAI (Japan Association of Corporate Executives)

Issues of Human Resources in Engineering, including New Graduates

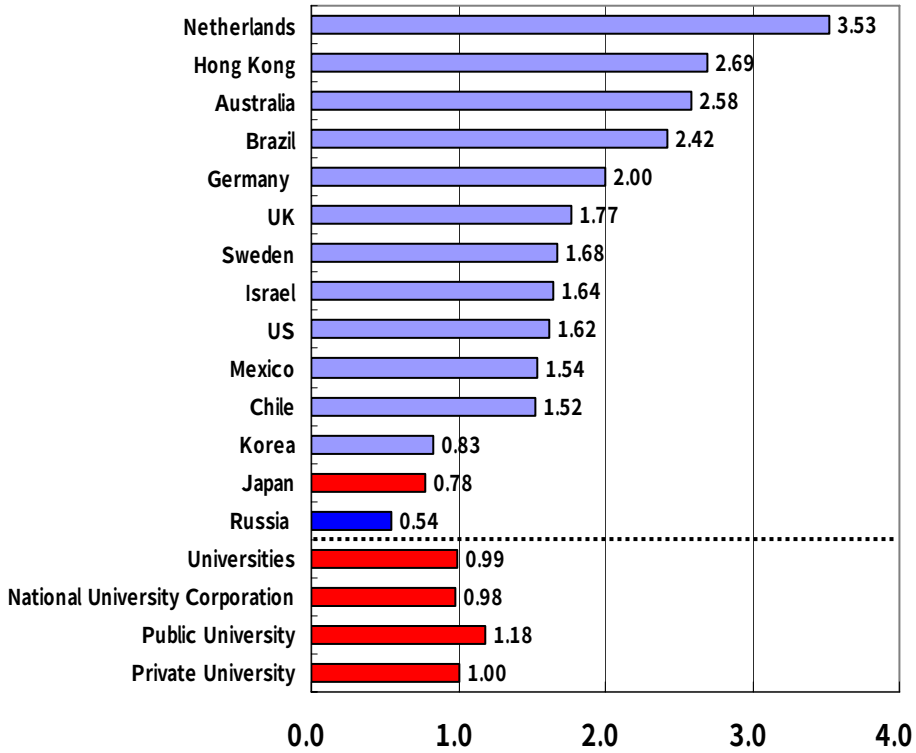


(Source: Questionnaire survey by Nippon Keidanren)

Challenge ④: Mobility of Human Resources

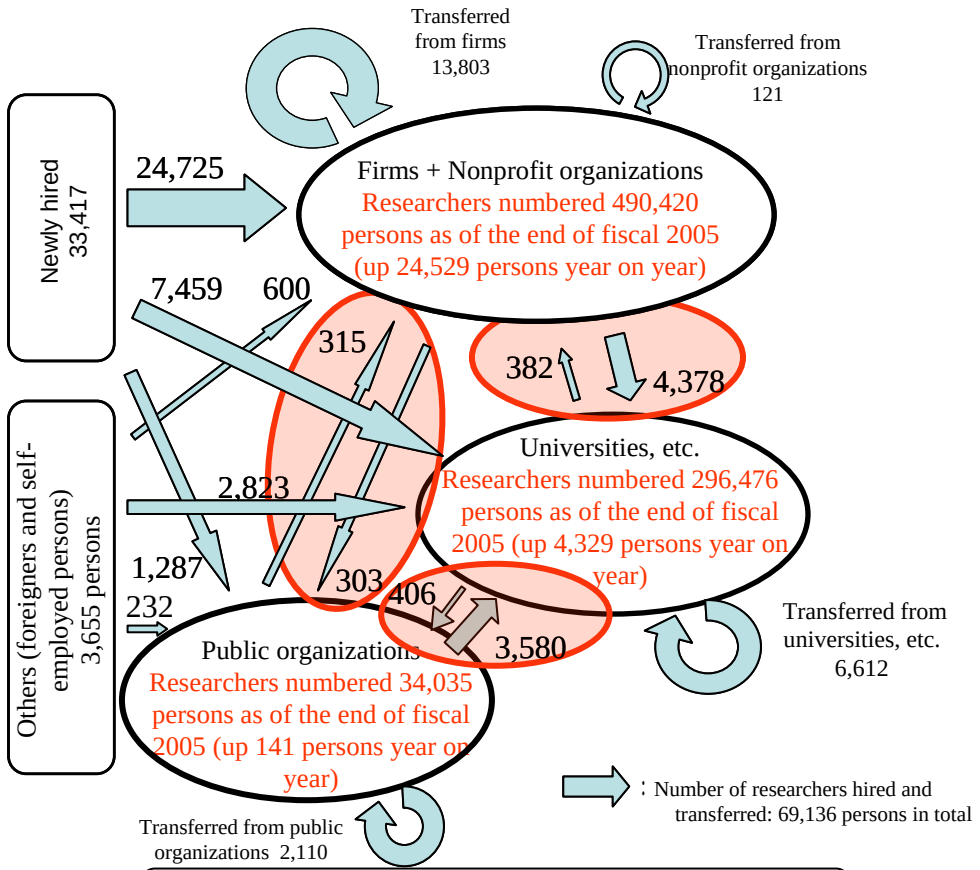
- The mobility of researchers in Japan is low compared to other countries.
- While business-academia collaboration develop, the scale of mobility of human resources is small among industry, academia, and government.

Expected Frequency of Transfers of Researchers during a Lifetime



Source: National Institute of Science & Technology Policy "Study for Evaluating the Achievements of the S&T Basic Plans in Japan -Highlights- (March, 2005)"」

Status of Mobility of Researchers between Various Organizations

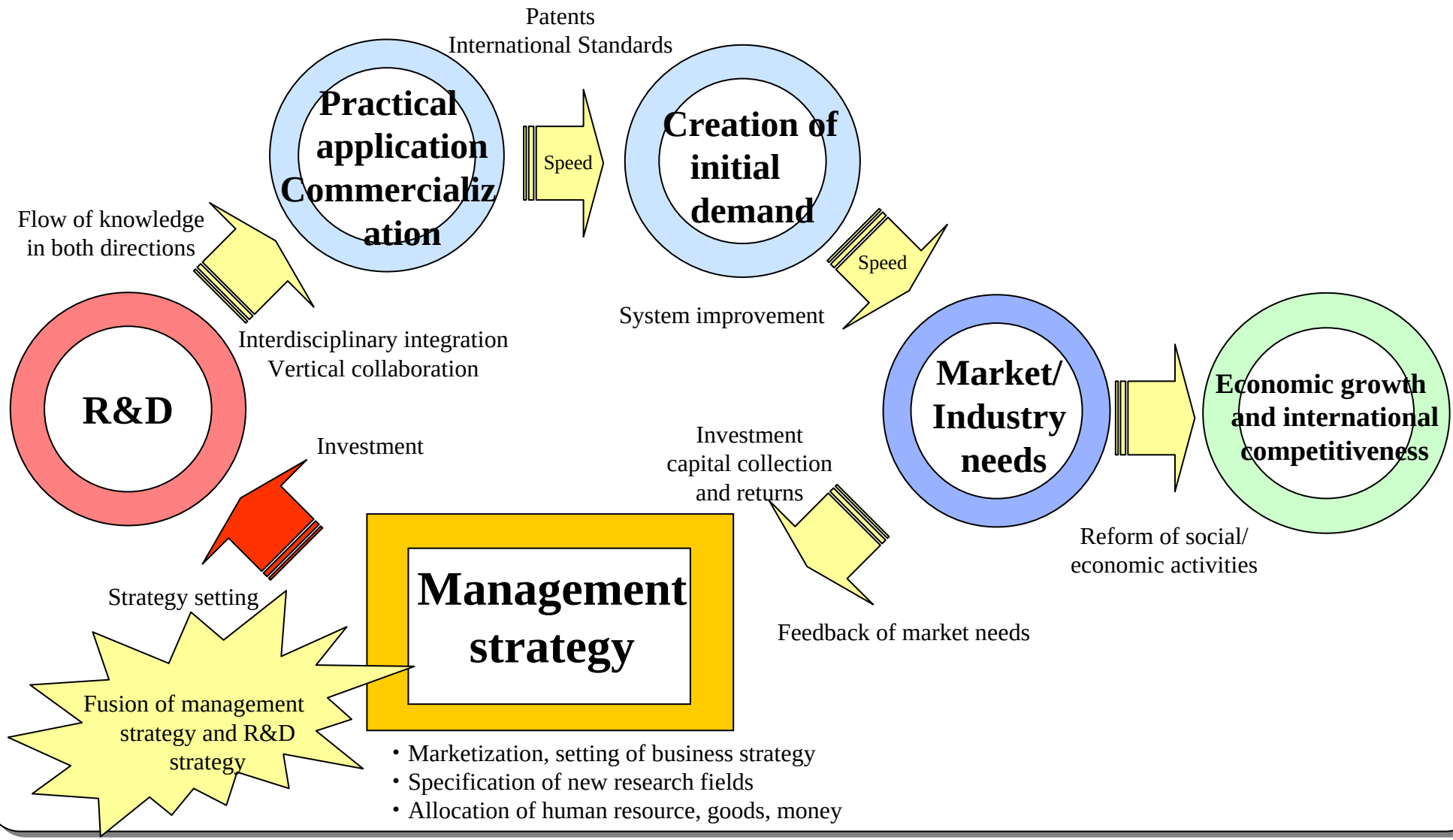


Source: Prepared by Technology Research Section based on the data of "Report of Survey of Science and Technology Research" by Statistics Bureau of the Ministry of Internal Affairs and Communications

2. Direction of the Promotion of Innovation

Virtuous Circle of Research and Markets

Social-Economic Innovation Driven by Technology



Points of Innovation Superhighway