Summary of the White Paper on Manufacturing Industry (Monodzukuri) 2013

Presentation

Ministry of Economy, Trade and Industry (METI)

Ministry of Health, Labour and Welfare (MHLW)

Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Chapter 1　Challenges Facing Japan's Manufacturing Industries and their Future

(1) Recognition of the Current Situation: Fluctuations in the manufacturing industries that have supported the Japanese economy

- Manufacturing industries have been Japan's key industries, maintaining domestic employment and supporting trade. In the 1980s, Japan's manufacturing industries boasted overwhelming international competitiveness, and were intoxicated by the expression, "Japan as No. 1." However, due to the prolonged appreciation of the yen and changes in the domestic and overseas manufacturing environments, the export capacity of the Japanese manufacturing industry has deteriorated, mainly in the electronics (electrical machinery and consumer electronics) sector. Although business conditions are improving at present, backed by the correction of the yen's appreciation and expectations for an exit from deflation, Japan recorded its largest ever trade deficit of 6.9 trillion yen in 2012, partly due to an increase in imports of mineral fuels (natural gas and crude oil, etc.) (Chart 1-1).
- Although overseas production has expanded mainly in the automobile industry, domestic production has leveled off. In particular, capital investment has been sluggish in the electronics industry both within and outside of Japan (Chart 1-2). Medium- and long-term deterioration in competitiveness cannot be denied. Overseas business expansion has diversified, and design and R&D bases, in addition to mass production bases, may be moved to foreign countries (Chart 1-3). We need to keep an eye on this trend to ensure that the key functions of Japanese companies - the source of their competitiveness - are not also moved overseas.

(2) Problems and Future Direction:

(i) Need to "develop a location environment" to bring out the maximum competitiveness

- Japanese manufacturing is rather expensive compared to other countries due to the effect of exchange rates, energy constraints, delays in concluding economic partnerships, and regulations have become hindrance in business location. Japan is superior to other major countries in terms of its technological and industrial clusters, but its location environment is inferior. (Chart 1-4).
- There is an urgent need in correcting this high-cost structure, review the regulations inside Japan and form economic partnerships, such as the TPP, the ASEAN Framework for Regional Comprehensive Economic Partnership (RCEP), and the Japan - China – Republic of Korea Free Trade Agreement (FTA). Though the drastic improvement of a location environment, Japan should aim at the country where companies are able to engage in business most actively in the world.

(ii) Need to strengthen and maintain technology and facilities which are the source of companies' potential competitiveness

- To use a biological analogy, technology corresponds to the human brain and facilities to muscle; and these are sources of Japan's competitiveness. Companies' R&D activities have declined both quantitatively (Chart 1-5) and qualitatively. Even advanced technologies sometimes fail to be commercialized. In addition, domestic capital investment has declined by around 30% since 1990. Some industries have successfully maintained the strength of their facilities through maintenance and repair, while others have lost ground due to speedy investment by emerging countries (Chart 1-6).
- First of all, changes to the business environment are required to encourage R&D and capital investment (which contributes to enhancing the incubation functions of domestic facilities (maturing production technology and developing new products, etc.)). Furthermore, promoting research and product development fully based on the needs of customers and society, as well as streamlining and preparation of the regulations which enable prominent technologies to lead to new businesses are important.

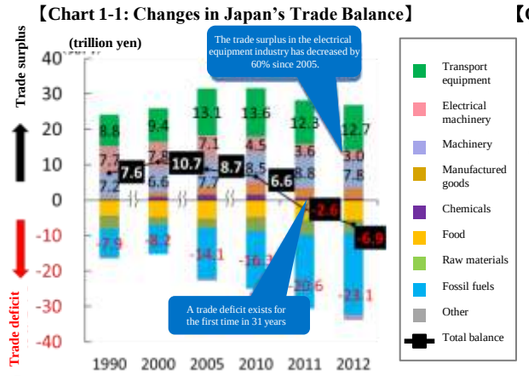
(iii) Necessity of transformation of the current business model to the one in which companies demonstrate their competitiveness

- Japan's traditional business model, which rests on the belief that high-performance, high-quality products sell well, has reached its limit. A select group of Japanese companies maintains large market shares and is recognized as indispensable throughout the world, while companies in fields experiencing commoditization due to new emerging country entrants have found themselves in price competitions and are losing market share (Chart 1-7). Although scale merits are required, a multiple number of Japanese companies exist in the same industry and their competitiveness is dispersed (Chart 1-8). They are exhausted in a domestic war of attrition.
- In the fields where commoditization has progressed, companies should shift to new business models which proactively utilize external resources (outsourcing) rather than adhering to self-sufficient policies, otherwise they should seek to become "global major" companies through business restructuring, etc. to ensure globally competitive businesses. It is important to create and foster very competitive global top niche companies by properly selecting business fields in which their technology can be employed to best advantage, while avoiding falling into a competition on scale.

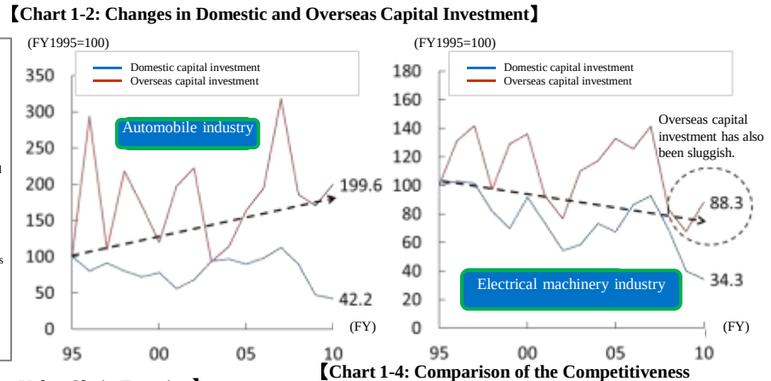
(iv) Need to "facilitate renovation of industry" to promote more effective utilization of inefficiently employed management resources and strengthen competitiveness

- Japan's business start-up and closure rates are lower compared with western countries. Many Japanese companies hold inefficient businesses and don't make use of their human resources, facilities, and other management resources. Industrial renovation has not made progress.
- Development of the business environment is needed to encourage companies to transform their business by effective utilization of management resources in the unprofitable sectors, or by entering new fields (such as regenerative medicine, renewable energy, and collaborative areas between agriculture, commerce, and industry), and promoting collaboration among SMEs (effective use of regional resources, etc.). Japanese business management is inferior in its capabilities to act and to plan strategy (Chart 1-9). In order to promote renovation, brave decisions and actions by corporate management are requested.

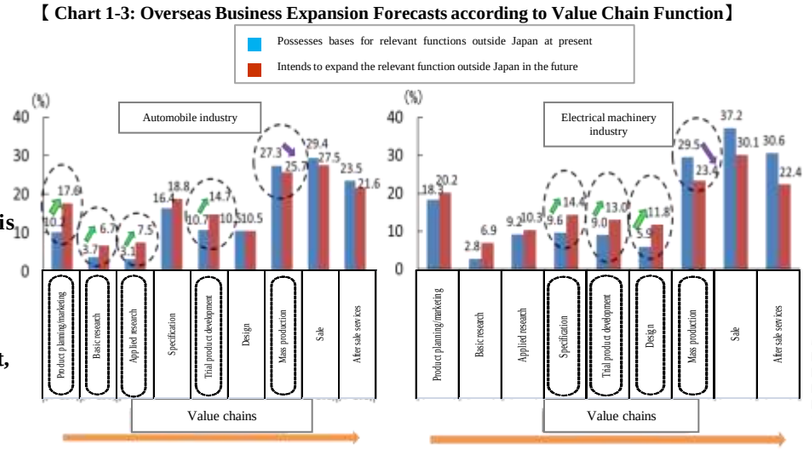
【Chart 1-1: Changes in Japan's Trade Balance】



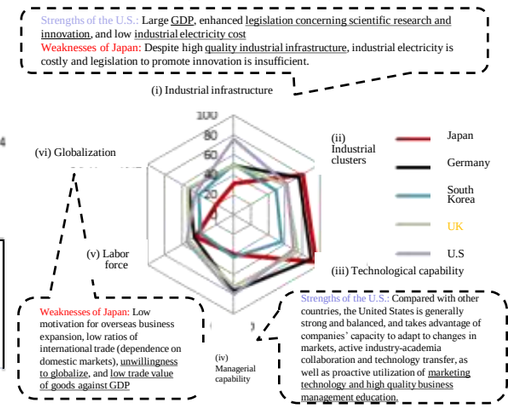
【Chart 1-2: Changes in Domestic and Overseas Capital Investment】



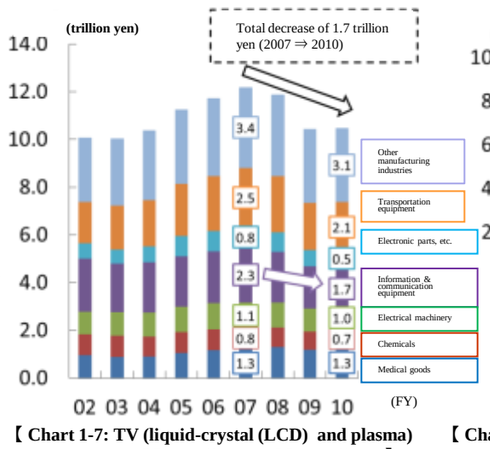
【Chart 1-3: Overseas Business Expansion Forecasts according to Value Chain Function】



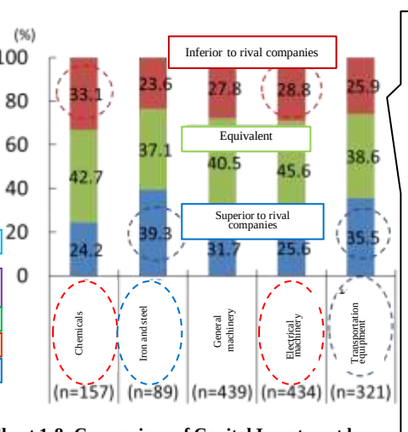
【Chart 1-4: Comparison of the Competitiveness of Manufacturing Industries of Major Countries】

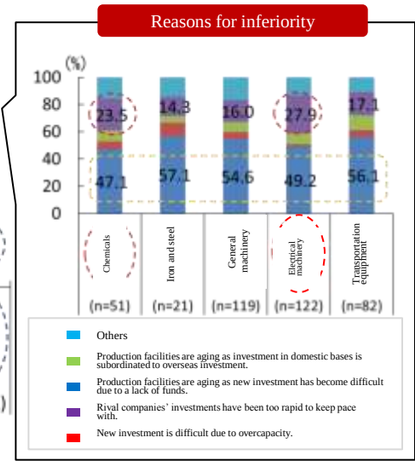


【Chart 1-5: Changes in R&D Expenses by Industry】

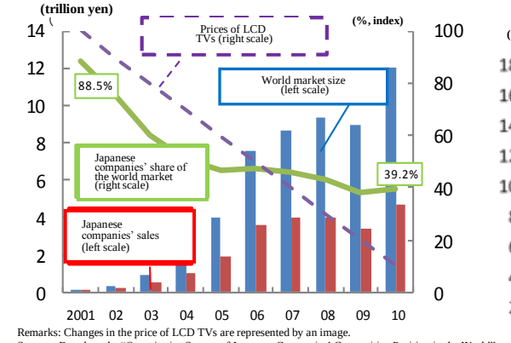


【Chart 1-6: Superiority of Individual Companies' Domestic Production Facilities to Those of Rival Companies】

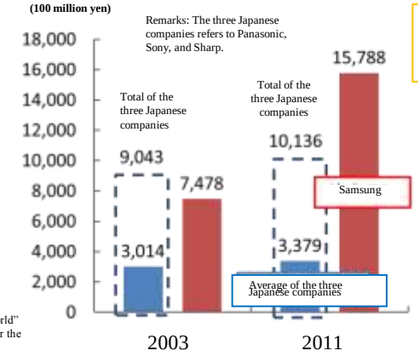




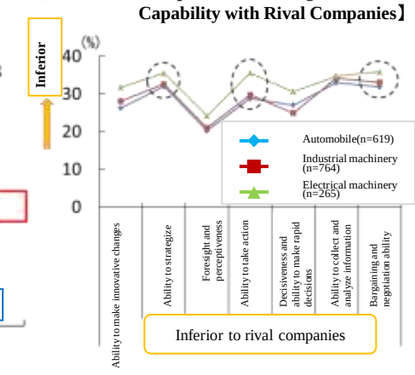
【Chart 1-7: TV (liquid-crystal (LCD) and plasma) Market Size and Market Share】



【Chart 1-8: Comparison of Capital Investment by Japanese and South Korean Electronics Companies】



【Chart 1-9: Comparison of Managerial Capability with Rival Companies】



Chapter 2　Fostering Human Resources in Manufacturing to Achieve a Society Where all Members Participate

- **Even in 2030, when the total population is expected to have decreased by 10 million from its current level, we will be able to avoid a significant decrease in the number of employees if we can successfully realize economic growth and progress in workforce participation. It is indispensable to build such a society where all members participate in and effectively implement capacity building contributing to the enhancement of labor productivity.**
- **A report compiled by the Study Group on Employment Policy estimates that the number of workers in the manufacturing sector can remain at the level of 9.87 million in 2030 if economic growth and workforce participation progress properly. Fostering human resources in manufacturing is a very important issue.**

(1) Skilled Female Workers (Females account for approximately 30% of workers in manufacturing, lower by around 10% compared to the ratio across all industries.)

- **Factors that hinder activities of female skilled workers could be the "need to consider the burdens of housework and childcare" and "fewer female workers who wish success at work" at large companies, together with "fewer duties suitable for the female skilled workers" at SMEs (Chart 2-1).**
- **More than 90% of companies provide their skilled female workers with the same training that is provided to skilled male workers. There seems no specific bottleneck for skilled female workers, and manufacturing industries could provide women with better working environments (Chart 2-2).**
- **In order to encourage women to find jobs in the manufacturing industries, where the ratio of female employees to male employees is lower at present, it is important to develop working environments comfortable for women and to make efforts to progress with capacity building of female skilled workers.**

(2) Skilled Elderly Workers (While the total number of workers in the manufacturing industries is expected to decline by around two million over the next ten years, the number of those aged 60 or older will increase by 200,000 or more.)

- **Most companies consider it advantageous to utilize elderly skilled workers and many cite such merits as "they can hand down their skills to younger people" and "the company can secure skills and maintain the quality of their products."**
- **Nearly 40% of companies have failed to facilitate the transfer of skills from older to younger workers, often due to such reasons as "lack of a clear method of passing on know-how and skills" and "lack of time and extra human capacity for passing on know-how and skills" (Chart 2-3).**
- **Companies should proactively provide training to existing workers to enable them to adapt their skills to technological innovation so as not the skills of elderly skilled workers become obsolete. At the same time, support is needed to transfer the skills to younger people by utilizing the National Trade Skill Test system as well as the Monodzukuri (Manufacturing Industry) Meister system, under which skilled workers provide practical instruction to the young.**

(3) Non-permanent Skilled Workers (Temporary workers account for around 20% of all employees in the manufacturing industries.)

- **Only a small number of companies answered that they are "focusing on implementing education and training, and supports such efforts" or "focusing on career development in the medium- and long-term, and offers the support" with regard to all of their part-timers, contract workers, and dispatched workers. Compared to part-timers and contract workers, dispatched workers have even fewer chances to receive education and training or career development support (Chart 2-4 and Chart 2-5).**
- **The education, training and career development support offered by companies to non-permanent workers are generally insufficient. It is important to encourage workers to utilize career consulting services to enable them to think about their own careers and make efforts to build their capacities.**
- **It is also important to provide know-how to help each company create training curricula, to offer comprehensive assistance to their systematic efforts for career progression including in-house human resource fostering (Career Progression Subsidy), and to support such business operators who provide vocational training to non-permanent young workers or who try to employ them as permanent workers after the training and retain them (Grant for Fostering and Retaining Young Workers (Youth Challenge Grant)).**

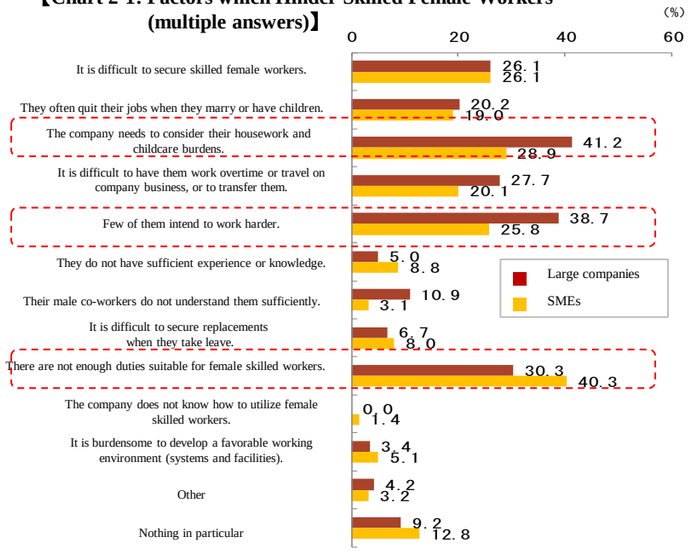
(4) Future Direction

- **In addition to the above, the capacities obtained by female and non-permanent workers through vocational training and daily work should be properly evaluated not only within their respective companies but also beyond them, and lead them to find jobs (Job Card system and Vocational Ability Evaluation Standards).**

(5) Government Measures to Promote and Support the Fostering Human Resources in Manufacturing to Achieve a Society Where all Members Participate

- **Measures to foster manufacturing workers**
  (i) Public vocational training (training for displaced workers, incumbents, and school graduates) (Chart 2-6)
  (ii)Career development support (subsidy for business operators, utilization of the Job Card system, and promotion of career consulting services)
- **Measures to evaluate skills (National Trade Skill Tests: skill tests are available for 128 job categories as of April 1, 2013; there is a total of about 4.9 million Certified Skilled Workers)**
- **Infrastructure development to become a Monodzukuri (manufacturing)-based nation**
  (i) **Fostering a skill-oriented mindset by according honor and recognition to Award for Outstandingly Skilled Workers.**
  (ii) **Promotion of occupational skills by organizing various skill competitions (participation in WorldSkills Competition and International Abilympics（Vocational Skills Contest for the Disabled Persons）, holding National Skills Competition , National Abilympics（Vocational Skills Contest for the Disabled Persons）, National Skills Grand Prix, and Youth Monodzukuri (Manufacturing Industry) Skills Competition)**

【Chart 2-1: Factors which Hinder Skilled Female Workers (multiple answers)】

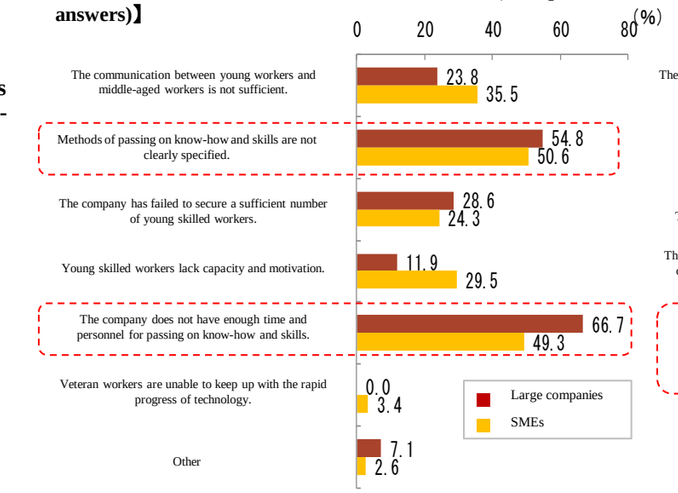


Source: "Survey on Securing and Fostering Skilled Workers to Achieve a Fully Participatory Society (2012)," Japan Institute for Labour Policy and Training

【Chart 2-2: Working Skilled Female Workers】

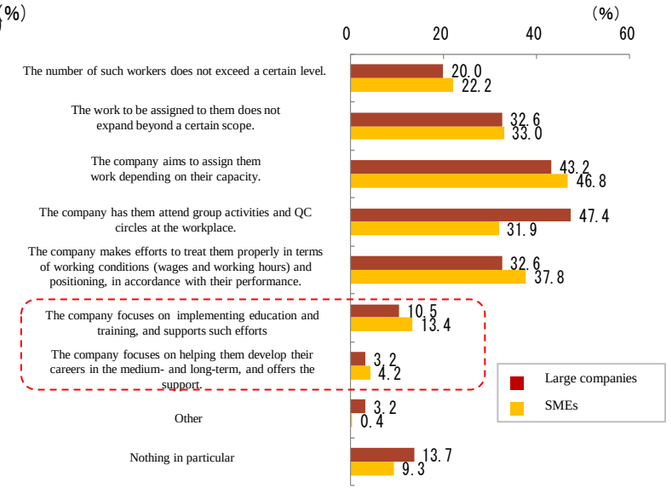
A skilled worker doing assembly work

【Chart 2-3: Reasons for Failure to Transfer Skills (multiple answers)】



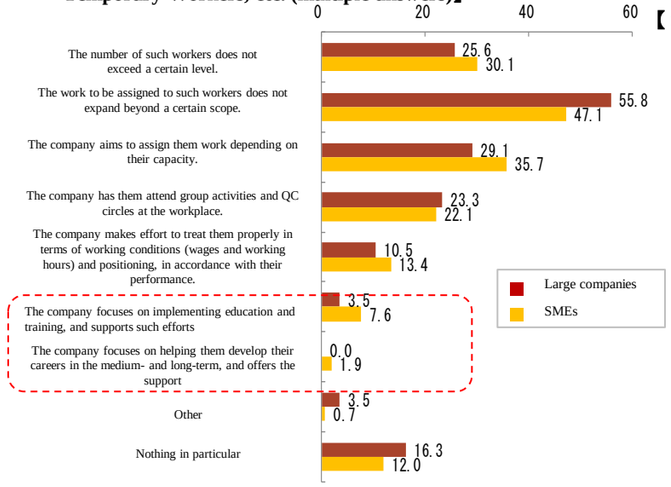
Source: "Survey on Securing and Fostering Skilled Workers to Achieve a Fully Participatory Society (2012)," Japan Institute for Labour Policy and Training

【Chart 2-4: Matters to Take into Consideration in Utilizing Part-Timers and Contract Workers, etc. (multiple answers)】



Source: "Survey on Securing and Fostering Skilled Workers to Achieve a Fully Participatory Society (2012)," Japan Institute for Labour Policy and Training

【Chart 2-5: Matters to Take into Consideration in Utilizing Temporary Workers, etc. (multiple answers)】



Source: "Survey on Securing and Fostering Skilled Workers to Achieve a Fully Participatory Society (2012)," Japan Institute for Labour Policy and Training

【Chart 2-6: Training for Displaced Workers at the Polytechnic Center】

Training for the technical metalwork course

Chart 3　Education, Research and Development to Support the Foundations of Japan's Manufacturing Industries

(1) Efforts by Universities (Engineering), Colleges of Technology, Specialized Upper Secondary Schools, and Specialized Training Colleges to Foster Manufacturing Human Resources (Chart 3-1)

- Universities (engineering) provide practical engineering education in collaboration with industries.
- Colleges of technology provide experience-oriented specialized education with a focus on experiments and practical training sessions (Chart 3-2).
- Specialized Upper Secondary schools work on unique projects to foster future specialists in collaboration with universities or research institutes (Chart 3-3).
- Specialized training colleges make efforts to enhance practical and professional knowledge and technology in collaboration with local industries and to develop new learning systems to foster core professionals in each growth field.
- Since FY2012, MEXT has supported the efforts by universities to foster capabilities required for global human resources and educational collaboration with foreign universities. Colleges of technology are carrying out programs by dispatching their students to overseas companies to develop international sensibilities.
- As measures to restore manufacturing industry in the areas affected by the Great East Japan Earthquake, MEXT supports the efforts to promote industrial recovery conducted by universities.

(2) Enhancement of Educational/Cultural Capacity to Foster Manufacturing Human Resources

- The new Courses of Study (school curriculum guidelines) continue to focus on manufacturing education and improve the teaching contents of technology and home economics classes. The government is comprehensively pushing ahead with enhancements in science and mathematics education that will underpin science and technology.
- Preparation of teaching materials for practical career education and establishment of the system which helps students to be independent socially and vocationally at the higher education phases.
- The National Museum of Emerging Science and Innovation (Miraikan) provides opportunities for visitors to think about a sustainable social system, etc. While The National Museum of Nature and Science, Tokyo, holds exhibitions and provides educational support activities to increase people's interest in manufacturing industries (Chart 3-4).
- Efforts to hand over manufacturing traditions to future generations are made by fostering successors to important intangible cultural properties and protecting selected conservation techniques.

(3) Promotion of Research and Development to Enhance Industrial Strength

(i) Research and development in fundamental manufacturing industry technologies

- The development of measurement and analysis techniques/equipment is promoted to dramatically improve the performance and reduce the cost of fuel cells, etc.
- Joint use of the Super Photon ring-8GeV (SPring-8), the SPring-8 Angstrom Compact Free Electron Laser (SACLA), and the Japan Proton Accelerator Research Complex (J-PARC) are promoted to support research and development in manufacturing industries by utilizing quantum beam and photon science and technology.
- The K computer, which has the world's highest level computational performance, was completed in June 2012, and was started operations for researchers and engineers shared from the end of September 2012. One of the results of research utilizing the K computer was awarded the Gordon Bell Prize in November 2012 (Chart 3-5).
- In response to societal needs, research and development on materials including nanoscale new material creation and structural control has been conducted.

(ii) Promotion of Research and Development Based on Collaboration between the Government, Industry, and Academia (Chart 3-6)

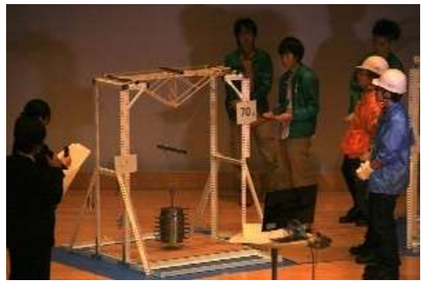
- MEXT launched initiatives to create ventures from universities targeting the global market in FY2012 (Fig. 3-7).
- Building platforms where the government, industry and academia can share human resources, facilities, and intellectual property to engage in innovative R&D activities are promoted. The development of commercialization by the companies that utilize technology owned by universities is also promoted.
- The environment is prepared for universities to implement collaborative activities between industry and government, through deploying coordinators, etc.
- Efforts to achieve the excellent concepts that contribute to the creation of regional innovations in the affected areas are supported.

【Chart 3-1: Number of New Graduates Who Successfully Found Jobs (FY2011)】

	Upper secondary schools (engineering-related courses)	Colleges of technology	Universities (engineering-related departments)
Number employed	51,086	5,854	43,905
Number of workers engaged in production processes or labor services (percentage)	32,235 (63.1%)	37 (0.6%)	262 (0.6%)
Number of workers engaged in professional or highly-technical tasks (percentage)	4,801 (9.4%)	5,450 (93.1%)	32,480 (74.0%)

Sources: MEXT "School Basic Survey"

【Chart 3-2: Durability determination (Colleges of technology Design Competition)



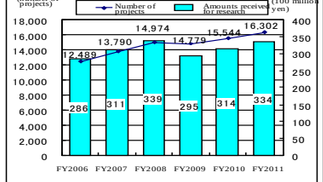
【Chart 3-3: Creation of a Machining Center Program as a Cooperative Company】

【Chart 3-4: Participants Making a Paper Plane (National Museum of Nature and Science, Tokyo)】

【Chart 3-5: The K Computer】

【Chart 3-6: Changes in the Number of Joint Research Projects at Universities, etc.】

Joint research projects with private companies

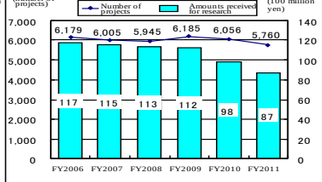


Amounts received for joint research projects with private companies

(million yen)

	2006	2009	2010	2011
National universities, etc.	23,226	24,070	25,468	26,522
Public universities, etc.	1,309	1,383	1,446	1,637
Private universities, etc.	4,051	3,998	4,493	5,274
Total	28,585	29,451	31,407	33,433

Commissioned research projects from private companies

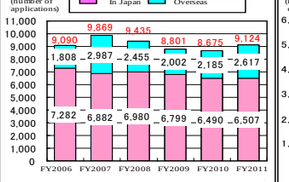


Amounts received for commissioned research projects from private companies

(million yen)

	2006	2009	2010	2011
National universities, etc.	3,857	4,623	3,793	2,874
Public universities, etc.	819	885	622	653
Private universities, etc.	7,030	5,719	5,349	5,141
Total	11,706	11,227	9,765	8,668

Number of patent applications



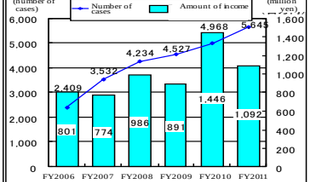
* Figures in red are the total numbers.

Number of patent applications

(number of applications)

	2006	2009	2010	2011
National universities, etc.	7,003	6,652	6,373	6,836
Public universities, etc.	369	539	578	606
Private universities, etc.	1,718	1,610	1,724	1,682
Total	9,090	8,801	8,675	9,124

Number of cases in which patent rights have been exercised and amount of income



Amounts of income arising from the exercise of patent rights

(million yen)

	2006	2009	2010	2011
National universities, etc.	567	638	1,135	885
Public universities, etc.	18	39	38	39
Private universities, etc.	217	214	272	167
Total	801	891	1,446	1,092

【Chart 3-7: Total Number of University Ventures】