Summary of the White Paper on Manufacturing Industries (Monodzukuri) 2010

June 2010
Ministry of Economy, Trade and Industry
Ministry of Health, Labour and Welfare
Ministry of Education, Culture, Sports, Science and Technology

Chapter 1: Status of Manufacturing Industries in Japan in correlation with changes in domestic and overseas economies

(1) Production

- Since fiscal 2009, the output of manufacturing industries has been recovering, although it still remains lower than the previous economic troughs, being up to the level equivalent to 85% of the peak period in 2007 (the peak of the economic boom). (Chart 1-1)

(2) Trends by industry

- The current recovery of output has been brought about as a result of the effects of economic measures and is also sustained by strong demand in China and other Asian nations. Comparison with previous economic recovery periods by industry demonstrates that the current increase in production is being lead by transport machinery. (Chart 1-2)

(3) Capital investment

- In contrast with regard to capital investment, the utilization level remains low due to the low level of production and it has not yet reached a level where the capital investment would be recovered. (Chart 1-3)
- Another prevailing trend is to select investment purposes in the light of the level of the market recovery by, for example, developing new products and making products more sophisticated at domestic bases and taking measures for capacity expansion at overseas bases. (Chart 1-4)

(4) Employment

- The unemployment rate reached a record high of 5.6% in July 2009 and thereafter gradually declined to 5.0% in March 2010. The active job opening to applicant ratio reached a record low at 0.42 in August 2009 and thereafter rose to 0.49 in March 2010. In spite of this movement towards recovery, the job market still remains quite severe. (Chart 1-5)
- The excess employment sentiment of enterprises that expanded rapidly in the first half of 2009 has thereafter gradually shrunk.
- The proportion of enterprises which had implemented some form of employment adjustment was nearly 50% in the second quarter of 2009.In particular, the proportion reached 70% in manufacturing industries. However, thereafter, it has been on the decrease. (Chart 1-6)
- In order to improve the employment situation that still remains severe, the government formulated the “Emergency Package of Employment Measures ” in October 2009 and the “Emergency Economic Countermeasures for Future Growth and Security” in December of the same year. Measures to be undertaken by the Ministry of Health, Labour and Welfare are as follows:

(1) Measures to maintain and create employment

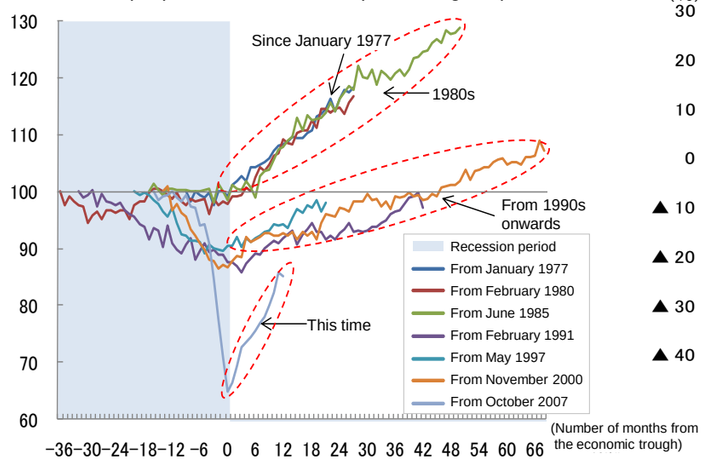
a) Easing the conditions for the subsidies for employment adjustment and for small and medium-sized enterprises for emergency employment stabilization

b) Providing free vocational training for those who are not eligible to receive unemployment benefits, and providing training and livelihood support benefits during such training periods

(2) Strengthening support for the poor and needy (e.g., implementation of the “one-stop service day” on a trial basis)

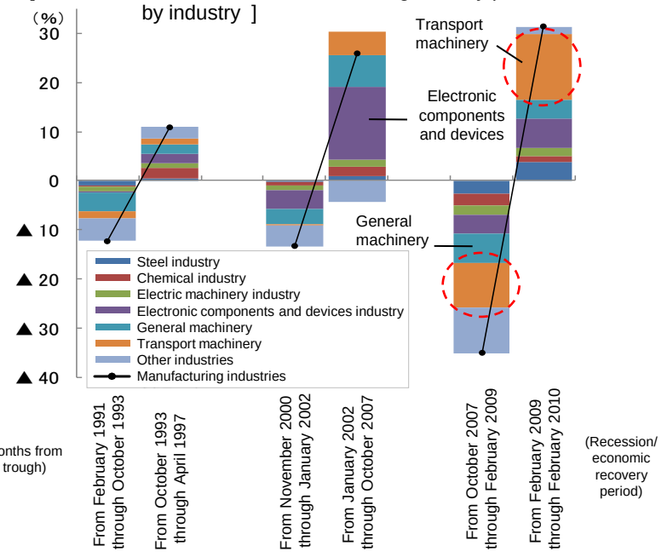
(3) Strengthening support for new graduates (e.g. ,promoting the deployment of career counselors at high schools and universities)

[**Chart 1-1** Changes in production volume from the recession]
(output at each economic peak being 100)

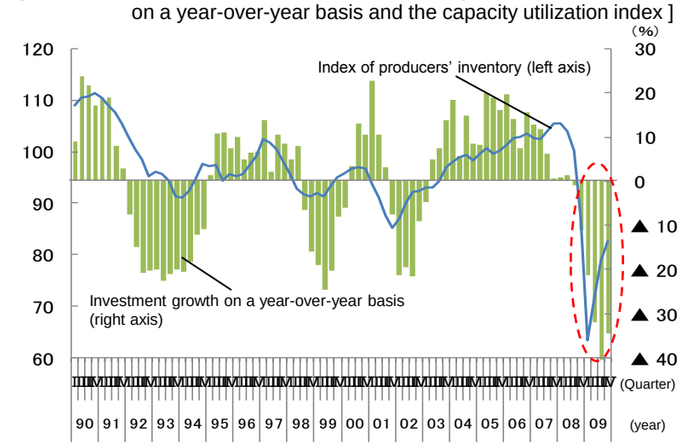


Source: “Industrial Production Index,” Ministry of Economy, Trade and Industry.
For descriptive purposes, February 2009 was set as 0 month.

[**Chart 1-2** Contribution of manufacturing industry production index by industry]

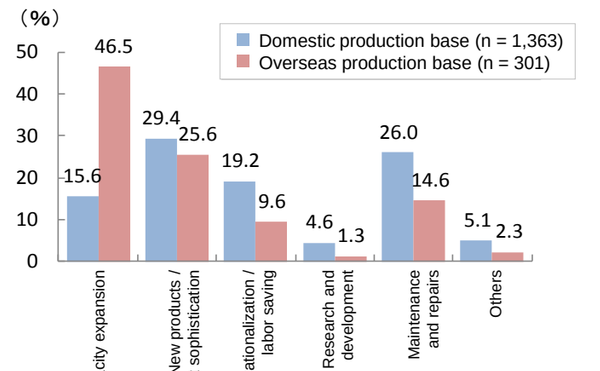


[**Chart 1-3** Correlation between the investment growth on a year-over-year basis and the capacity utilization index]



Source: “Industrial Production Index”, Ministry of Economy, Trade and Industry;
“Corporate Survey,” Ministry of Finance

[**Chart 1-4** priorities in capital investment in fiscal 2010]



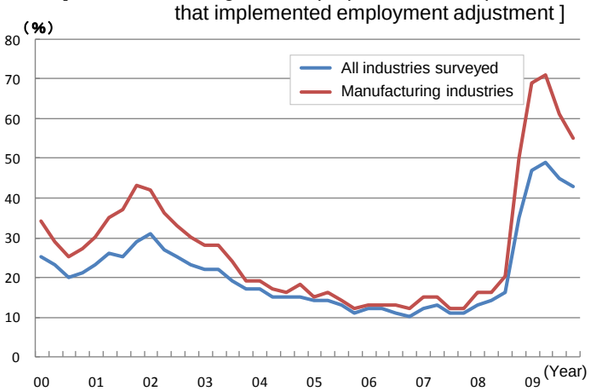
Source: Survey by the Ministry of Economy, Trade and Industry (February 2010)

Note: Data were taken from companies that indicated that their capital investment in fiscal 2010 would “increase” or “increase in some areas and decrease in other areas” compared to that in fiscal 2009.

[**Chart 1-5** Changes in the unemployment rate and the active job opening to applicant ratio]

Note: Seasonally adjusted value
Source: “Labour Force Survey,” Ministry of Internal Affairs and Communications;
“ Employment Statistics,” Ministry of Health, Labour and Welfare

[**Chart 1-6** Changes in the proportion of enterprises that implemented employment adjustment]



Source: “Survey on Labour Economy Trends,”
Ministry of Health, Labour and Welfare

Chapter 2: Challenges and Prospects facing Japan's Monodzukuri industries

- Restructuring the business strategy in Monodzukuri industries in Japan in order to respond to international structural changes

(1) Manufacturing industries in Japan face structural changes in the global economy

- Having gone through the Lehman shock, on-going environmental changes facing the manufacturing industries in Japan since the beginning of this century have become evident.

  • While markets in developed nations become mature, emerging nations have increased their shares of GDP and have also increased their role as both production bases and markets . (Chart 2-1)

  • On the other hand, with regard to the intermediate goods for which Japan is said to keep a strong competitive edge, South Korea and China have gradually been raising their competitiveness. As a result of the progress in global supply chains, Japan's "edge" is being threatened. (Chart 2-2)

  In the light of these environmental changes, restructuring of business strategy is called for, in order to win the demand from new growing markets in emerging nations and, at the same time, to maintain and strengthen manufacturing industries in Japan as supply bases for sophisticated parts and products by making the best use of its advanced manufacturing (monodzukuri) capability.

(2) Restructuring of the manufacturing (monodzukuri) structure in Japan in order to respond to changes in global markets

- Vis-à-vis growing emerging markets, Japanese companies intend to promote localization of product development and applied design (model changes). (Chart 2-3) It is important to establish a structure to supply products whose value and price will meet the needs of markets, including coordination with local companies in terms of procurement and the use of sales networks.
- The main competitors for Japanese companies in emerging markets are companies from China, South Korea and Taiwan, which are increasing their roles.
  At the same time, competition among Japanese companies is still going on while overseas companies are raising their competitiveness through restructuring measures. (Chart 2-4)
- In order to add value by making the best use of technological capabilities, it is necessary for companies to ensure the superiority of their own technologies. However, there are many cases of technology leakage, not only through products but also through people, such as employees and retirees. (Chart 2-5) Education and training of human resources is also necessary to apply the standards. (Chart 2-6)
- In order for manufacturing industries in Japan to remain as supply bases of sophisticated parts and products, it is essential to raise the competitiveness of their location and take advantage of the strength of domestic bases in terms of preventing technology leakage and ensuring coordination, as well as to take various innovative measures to expand the range of income sources, including services, and to increase the appeal of products to raise their value so as not to be trapped in the price competition. (Chart 2-7) In monodzukuri industries based on domestic tradition and cultures,, such as traditional crafts, efforts are urgently required to develop international markets to expand their reach, to promote their branding, and to secure and educate successors.

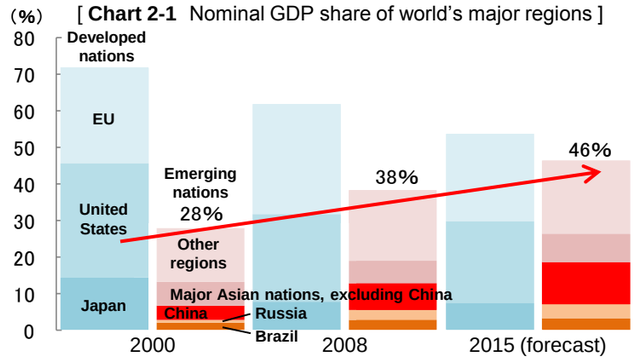
(3) Initiatives by manufacturing industries with a view to adapting to change and developing next-generation industries

- Initiatives with a focus on keeping the core technologies are important in order to take the initiative in next-generation industries. (Chart 2-8) In this context, it is important that companies should formulate a research and development strategy in reference to a medium-term outlook. (Chart 2-9)
- It is also important to create an environment that would allow development of next-generation industries ahead of the rest of the world, including a scheme of financial assistance for next-generation industries and a program of demonstration experiments.

(4) Manufacturing industries in Japan are required to deal with resource and environmental constraints

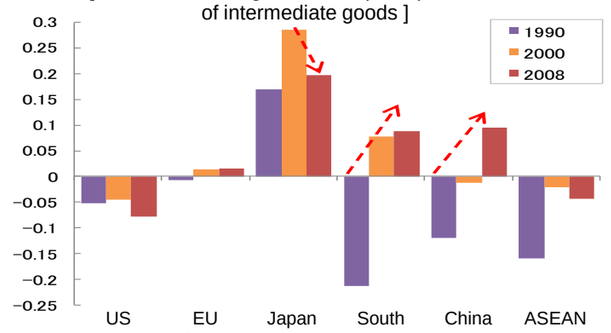
- With economic developments in emerging nations, it is expected that the world consumption of resources and energy will further increase and that, at the same time, constraints will become more stringent in order to contain global warming. Against this background, manufacturing companies in Japan intend to reduce overall investment, partly due to the effects of global recession, while maintaining and increasing investment for the purposes of responding to environmental constraints. (Chart 2-10, 2-11)
- Also, while not a few companies are of the opinion that environmental constraints would raise their competitiveness, many companies, including small and medium-sized enterprises, recognize that environmental constraints pose a risk to their business management.

[**Chart 2-1** Nominal GDP share of world's major regions]



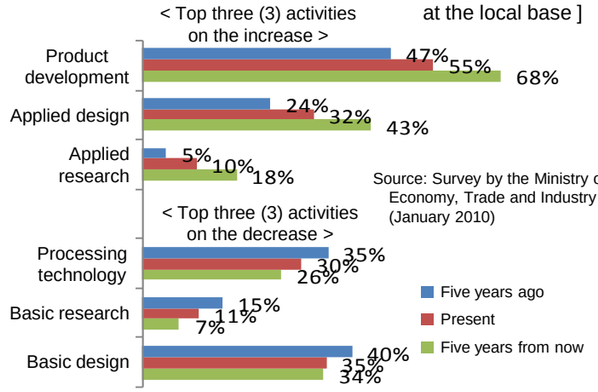
Source: "World Economic Outlook Database, April 2010" on a US$ basis, IMF
Major Asian nations/regions excluding China refer to: ASEAN, India, South Korea and Taiwan.

[**Chart 2-2** Changes in the export specialization index of intermediate goods]



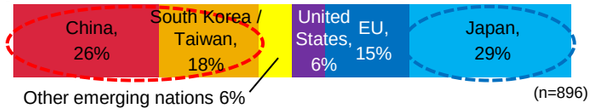
Source: "RIETI-TID 2009"
Export Specialization Index:
(exports – imports of intermediate goods) / (exports + imports of intermediate goods)

[**Chart 2-3** Development and design activities being carried out at the local base]



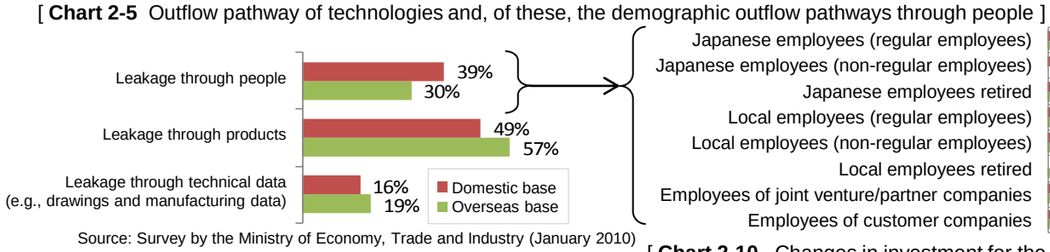
Source: Survey by the Ministry of Economy, Trade and Industry (January 2010)

[**Chart 2-4** Biggest competitors in emerging markets]



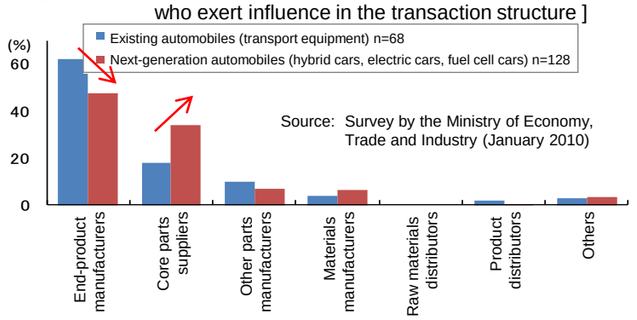
Source: Survey by the Ministry of Economy, Trade and Industry (January 2010)

[**Chart 2-5** Outflow pathway of technologies and, of these, the demographic outflow pathways through people]



Source: Survey by the Ministry of Economy, Trade and Industry (January 2010)

[**Chart 2-8** Changes in parties who exert influence in the transaction structure]

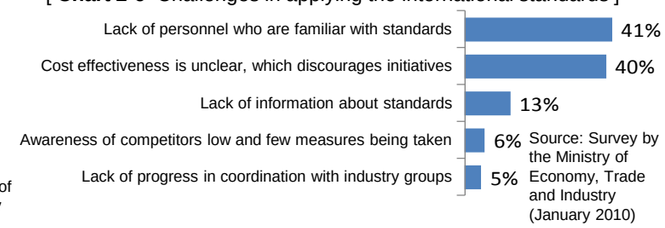


Source: Survey by the Ministry of Economy, Trade and Industry (January 2010)

[**Chart 2-9** Example of initiatives undertaken with a view to taking the initiative in terms of core technology]

➢ GS Yuasa Corporation has taken an active approach to the development of core technologies, including lithium-ion battery materials and structures, and to getting them patented. It has invested in a company established jointly with assembly manufacturers to produce lithium batteries for automobiles and has a 51% stake.

[**Chart 2-6** Challenges in applying the international standards]



Source: Survey by the Ministry of Economy, Trade and Industry (January 2010)

[**Chart 2-7** Initiatives to make the best use of technological capabilities to raise revenues]

(1) Take advantage of coordination capabilities between domestic supply chains

➢ In cooperation with partner companies, core components, such as engines, that affect performance and emissions performance and fuel efficiency, are being produced domestically on an exclusive basis. Body assembly is done in areas where there exists a large demand. (Komatsu Ltd.)

(2) Strengthen services and other downstream businesses

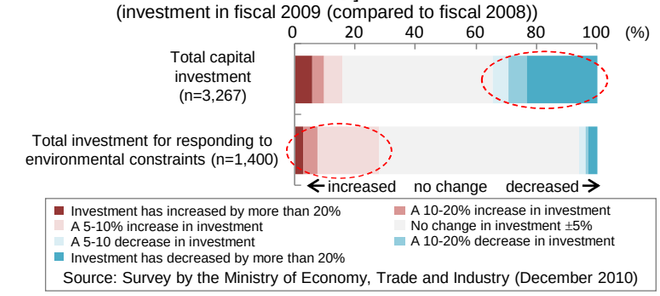
➢ In order to expand and strengthen the services and operation business concerning its motor business, the company set up services stations in various parts of the world. (Mitsubishi Heavy Industries, Ltd.)

(3) Innovative measures to increase the appeal of products to raise their value

➢ Retail sales with counseling services facilitates gaining the understanding of consumers and, at the same time, establishes itself as a luxury brand. (Shiseido Co., Ltd.)

➢ Ergonomics is introduced into machine tools to enhance the operability and visibility. Yamazaki Mazak Corporation)

[**Chart 2-10** Changes in investment for the purposes of responding to environmental constraints]
(investment in fiscal 2009 (compared to fiscal 2008))



Source: Survey by the Ministry of Economy, Trade and Industry (December 2010)

[**Chart 2-11** Improvement of energy and resources savings through cooperation between enterprises]

➢ 19 companies involved in LCD panel production operate in *Sharp Green Front Sakai* at the factory of Sharp Corporation in Sakai City. Through the accumulation effect and coordination between enterprises, the use of energy as well as the production management information within the complex has been centralized, thereby increasing its efficiency.

Chapter 3: Employment strategy and development of human resources for sustainable recovery

(1) Environmental changes facing monodzukuri industries

- With regard to specific challenges facing enterprises in Japan, a great number of enterprises pointed out that “product prices have gone down” compared to three years ago, that “competition in terms of product quality has intensified,” and that “the needs of customers have diversified.” It is evident that they find themselves in a difficult situation where, while product prices have dropped, quality competition has become more severe. (Chart 3-1)
- At the top of the list of factors to be evaluated in comparison with other enterprises of the same size in the same industry are those relevant to the improvement and the exercise of capabilities of skilled workers, such as flexibility to meet detailed specific conditions set by the order, product quality, and the quality of skilled workers. (Chart 3-2)

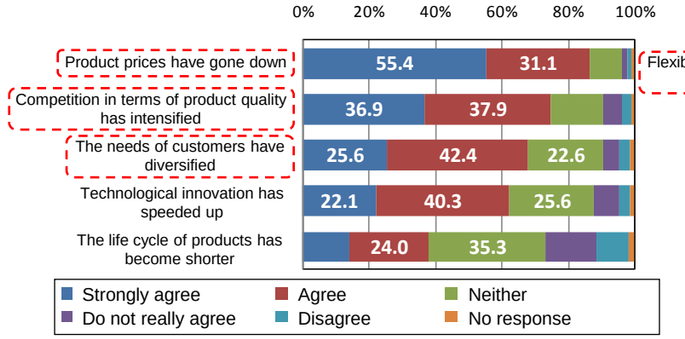
(2) Capabilities to be expected from monodzukuri workers and development of human resources

- The majority of enterprises feel the number of managers/supervisors, cross-trained workers, technically skilled workers and highly skilled workers is insufficient. (Chart 3-3)
- The skill level companies expect from skilled workers is high. At the moment, 40 – 50% of enterprises evaluate that the capabilities of these workers have not reached a satisfactory level. (Chart 3-4)
- In terms of the knowledge and skills companies expect from skilled workers, individual skills in individual fields are not sufficient. Capabilities to manage the whole production line, including knowledge and skills to rationalize the production process, are valued. (Chart 3-5)
- In terms of initiatives being undertaken for the purposes of developing the capabilities of skilled workers, focus is placed on “encouraging improvement and suggestions” concerning the production line and “technical education” in many cases, demonstrating high expectations in these areas. (Chart 3-6)
- With regard to the use of non-regular skilled workers, up to 30% of enterprises make efforts in terms of their job placement and terms and conditions by, for example, assigning a job according to their capabilities and offering terms and conditions according to their work to be done. However, only a few enterprises provide these workers with mid- to long-term career prospects. (Chart 3-7) It is therefore necessary to develop career prospects for overall non-regular workers from a mid- to long-term perspective by appropriately evaluating their vocational capabilities and by making use of their capabilities for as long as possible.

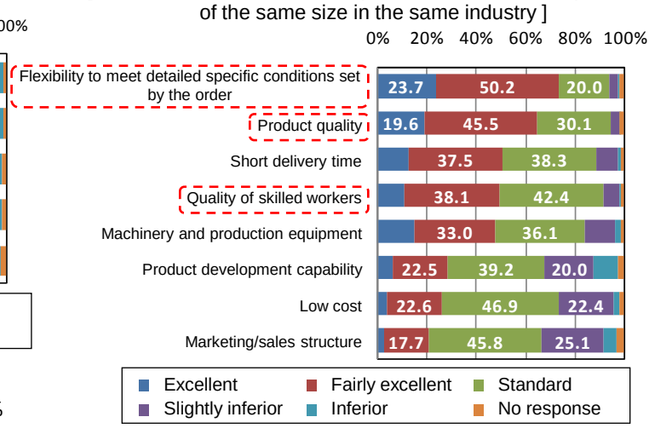
(3) Skill development measures related to monodzukuri

- Public job training programs are designed to provide training aimed at developing and training highly skilled workers who may become core human resources in monodzukuri industries in the future and training for the existing workers to respond to new technologies and improve the production process.
- The skills test is a national certification program to test and certify skills of workers on certain criteria. It is designed to motivate workers, including monodzukuri workers, to acquire skills and has contributed to improving the stoical status of workers.
- The “job card system” has been launched to help “freeters” and those who have little experience of working as full-time workers to raise their awareness through comprehensive career counseling, identify the issues they face, and find full-time employment, by providing these people with an opportunity for practical vocational training comprising job training at companies and lectures as well as by summarizing evaluations from companies and their job experiences in a job card. Efforts will be made to further promote the system in monodzukuri and other areas.
- Other programs include the introduction of the National Skills Competition to raise the social awareness of skilled workers by fostering an atmosphere of respect for skilled workers. (Chart 3-8)

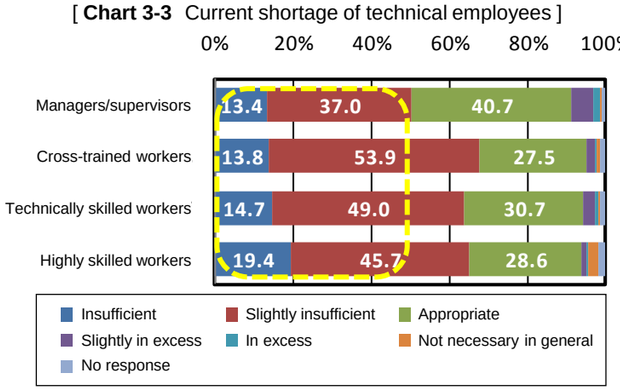
[**Chart 3-1** Environmental changes from 3 years ago to date]



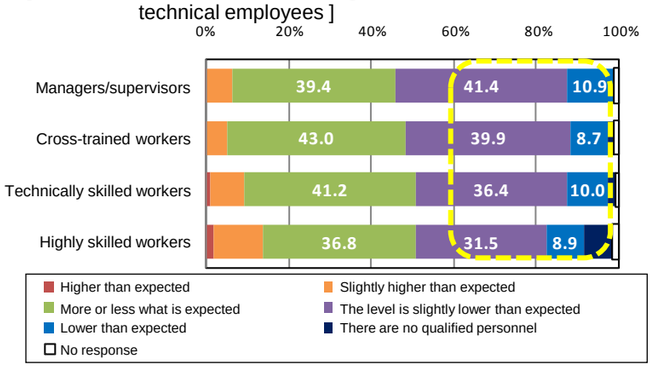
[**Chart 3-2** Evaluation in comparison with other enterprises of the same size in the same industry]



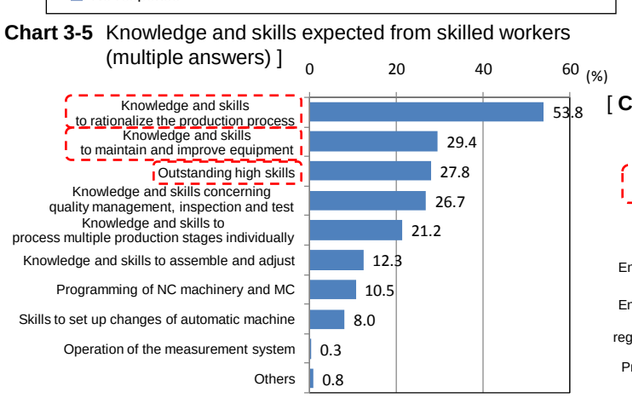
[**Chart 3-3** Current shortage of technical employees]



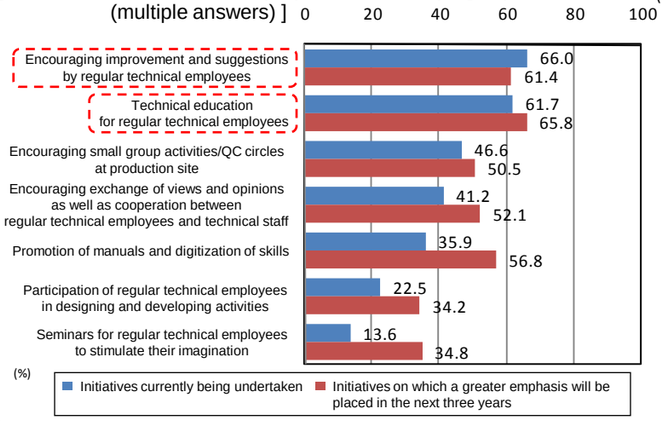
[**Chart 3-4** Evaluation of the average level of skill of technical employees]



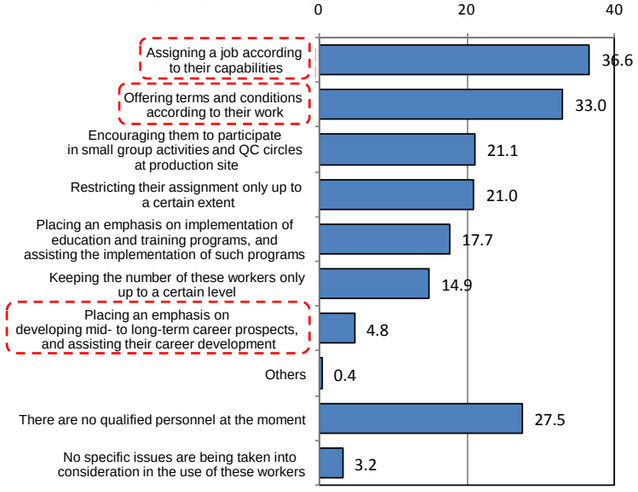
[**Chart 3-5** Knowledge and skills expected from skilled workers (multiple answers)]



[**Chart 3-6** Initiatives for the purposes of developing capabilities (multiple answers)]



[**Chart 3-7** Issues being considered in the use of non regular technical workers at manufacturing site (multiple answers)]



[**Figure 3-8** National Skills Competition 2008]

[Participant in the competition (automotive sheet metal job)]

Source for Charts 3-1 to 3-7: The Survey on the Human Resource Development and Succession of Skills (2009), The Japan Institute for Labour Policy

Chapter 4: Current state of, and challenges in relation to, the education, research and development to support the basis of monodzukuri

(1) Social changes and the importance of career and vocational education

- Difficulties facing young people in making a smooth transition from school to becoming a member of society/taking up employment have become clear, including high unemployment among young people, an increase in the number of people in irregular employment, and lack of progress in bringing down the early job-leaving rate. (Chart 4-1)
- New graduates will subsequently have fewer opportunities to develop their vocational capabilities once they have taken up irregular employment and/or if they neither proceed to higher education nor find a job. More than 70% of companies also acknowledge the challenges they face in terms of human resource development. Support for life-long career development of adult professionals is an important issue to be addressed.
- Lack of awareness of vocational education has been pointed out as a problem across society. In the light of the circumstances in which today's children and young people find themselves, it is necessary to raise awareness across society of vocational education.
- It has been pointed out that the level of basic skills of children and young people as professionals has lowered and that many of them are more likely to postpone the selection and the decision of their eventual style of life and work. (Chart 4-2)
- It is important to encourage the social and vocational independence of young people and, at the same time, to make use of available resources at individual schools to develop human resources corresponding to trends in both quality and quantity in monodzukuri areas. (Chart 4-3)

(2) Ongoing monodzukuri education initiatives

- Educational programs on monodzukuri are included in the subjects taught at elementary schools, junior and senior high schools, and schools for special needs education.Vocational experience programs are carried out especially at junior high school. Education on scientific technologies and mathematics has been strengthened in the school curriculum. For example, personnel supporting the observation and experiment activities in an elementary school's science class are assigned to schools. Curriculum development focused on science and mathmonkaematics is promoted at senior high schools. (Chart 4-4)
- Specialized vocational high schools support unique educational programs developed in coordination with universities and research institutions and carry out practical programs to develop monodzukuri human resources in cooperation with local industries.
- Colleges of Technology carry out practical and creative programs focused on experiments and practical training in the five-consecutive-year curriculum. (Chart 4-5)
- Specialized training colleges implement practical vocational education programs in cooperation with local industries in order to develop human resources that could underpin local industries.
- The core curricula are being formulated/considered in order to structure educational programs at university and to ensure the quality as well as the international applicability of these programs. Measures to develop the competency necessary for technical workers and programs to ensure the quality of these technical workers are also being considered.

(3) Progress in consideration of career education and vocational education

- The Special Committee for Career Education and Vocational Education set up by the Central Council for Education considered possible forms of career education and vocational education to be implemented at schools in the future. In the Council's progress report compiled in July 2009, the following three (3) issues were identified as the basic direction of reforms: (1) in order to acquire the capabilities necessary for social and vocational independence, from the standpoint of career education, substantial improvement should be made in education in a systematic manner covering everything from compulsory education through higher education; (2) organize vocational education in a systematic manner and, at the same time, increase the applicability of such education; and (3) in order to make it possible to improve vocational competency and to make a career change at any time, enhance and improve programs to support career development from the viewpoint of lifelong learning.

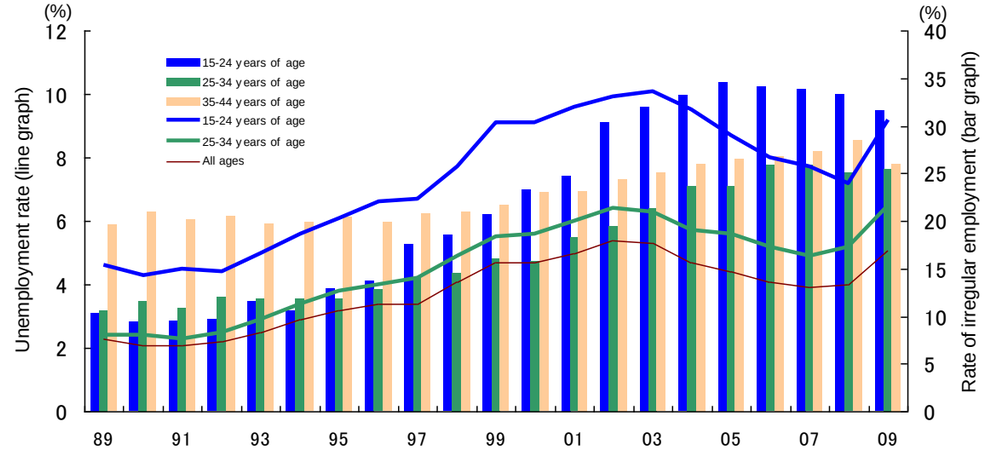
(4) Research and development of monodzukuri basic technologies

- In order to achieve innovation based on monodzukuri, it is important to carry out research and development of value creating monodzukuri basic technologies unique to Japan, through research and development of advanced measurement and analysis technologies/equipment and highly accurate simulation technologies, as well as by developing and making use of a large scale cutting-edge research and development infrastructure. (Chart 4-6)

(5) Promotion of research and development based on collaboration between government, industry and academia

- Measures are being undertaken to ensure that the results of research at universities are made use of in society in practical ways, through support for industry-academia joint research programs and increased cooperation between government, industry and academia at university.
- The creation of "Knowledge Clusters" with universities and other public research institutions at the centre is being promoted in order to ensure that research and development activities correspond to the needs of companies and to achieve advancement of local industries and development of new products. (Chart 4-7)

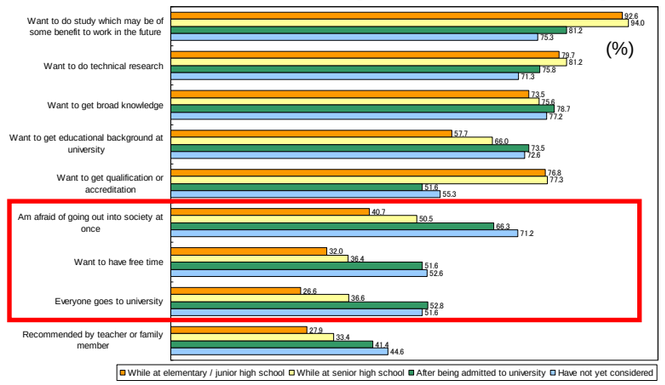
[**Chart 4-1** Unemployment rate among young people and changes in rates of irregular employment (by age group)]



* The rate of irregular employment is the proportion of those employed on a non-full-time basis in non-agricultural workers (excluding executives). People of 15-24 years of age at school are excluded.

Source: Unemployment rates are taken from the "Labour Force Survey," Ministry of Internal Affairs and Communications Statistics Bureau; rates of irregular employment are taken from the "special survey of the Labour Force Survey" (February survey) and the "Labour Force Survey (survey results)" (January – March survey), Ministry of Internal Affairs and Communications Statistics Bureau

[**Chart 4-2** Reasons for going to university (depending on the time when consideration was given to future occupation)]



Source: "2005 survey sponsored by the Ministry of Trade, Economy and Industry – Survey of University Students Looking Back at Their Post-High School Graduation Plans," Benesse Educational Research and Development Center

[**Chart 4-3** Number of graduates employed by occupation (fiscal 2008)]

	High school (technical subjects)	Specialized vocational high school	University (engineering and related departments)
Number of employed	53,562	5,610	54,578
Number of workers involved in production process/labor work	40,337	24	223
Number of professional and technical workers	5,370	5,171	43,457
Proportion of workers involved in production process/labor work	75.3%	0.4%	0.4%
Proportion of professional and technical workers	10.0%	92.2%	79.6%

Source: "School Basic Survey", Ministry of Education, Culture, Sports, Science and Technology

[**Chart 4-4** Example of monodzukuri practice as part of the subject "Industrial Arts and Home Making"]

[Junior high school student seriously engaged in precision woodworking]

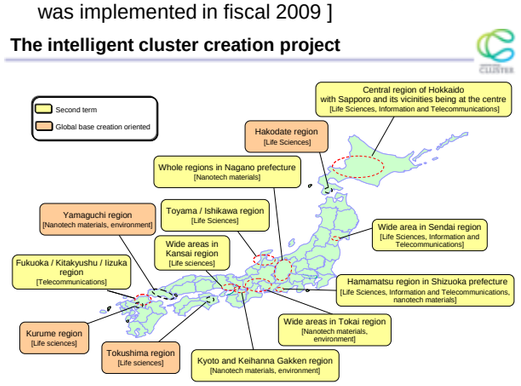
[**Chart 4-5** Specialized vocational high school robot contest ("Robo Con")]

[Robots at contest]

[**Chart 4-6** Development of a single particle analyzer]

[Single particle analyzer]

[**Chart 4-7** Regions where the intelligent cluster creation project was implemented in fiscal 2009]



Source: Survey by the Ministry of Education, Culture, Sports, Science and Technology