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Presentation of the White Paper on Manufacturing Industries (Monodzukuri)

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Ministry of Economy, Trade and Industry (METI)
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Chapter 1 Challenges That Japan’s Manufacturing Industry Faces and Its Future

<1) Background: Current Status of Japan’s Manufacturing Industry

(i) Improvement of business performance in Japan’s manufacturing industry

- Stock prices are rising and corporate profits are improving, and there is a growing movement towards raising wages (trends towards a virtuous economic cycle). The positive effects of Abenomics have been permeating into Japan’s manufacturing industry, which had long been forced into fierce competition (Fig. 1-1).

(ii) Roles expected of Japan’s manufacturing industry amid the shrinkage in the current account, and population decline accompanied by a falling birth rate

- In the meantime, the surplus in the current account has continued to decrease for three consecutive years. In particular, the largest ever trade deficit was recorded (Fig. 1-2 and Fig. 1-3). This has mainly been caused by an increase in fuel imports and diminished surplus in the electronics industry, but export recoveries, in particular, are not likely to recover easily, despite the current depreciation of the yen. Overseas relocation of manufacturing bases has also had negative impacts.

- Furthermore, there are concerns over the possible shrinking of the domestic market, a decrease in the working-age population and a labor shortage due to population decline from a falling birth rate. It is hoped that the manufacturing industry will maintain its base in Japan, increase per capita productivity, and manufacture high-value-added products, thereby increasing earnings both inside and outside of Japan.

<2) Future Direction: Toward Strengthening the Competitiveness of Japan’s Manufacturing Industry

(i) Improvement of domestic production bases and export power, and infrastructure development for increasing earnings internationally

- (a) Improving and maintaining domestic production bases that support exports

- Expectations are high that export will increase in the future as a result of the stabilization of exchange rates and recovery of business conditions for export destinations (Fig. 1-4). Furthermore, in addition to a trend towards a weak yen, the trend of moving manufacturing activities overseas has come to be reevaluated, and companies have been showing their willingness to increase their domestic manufacturing capacity and otherwise expand domestic investment (Fig. 1-5).

- In order to achieve these positive trends, attractiveness of doing business in Japan needs to be improved (measures against relatively high energy costs and the issue of the double marginal tax rates may be discussed), in addition to the work that is needed toward the upgrading domestic production bases and the creation of new markets (Fig. 1-6).

- (b) Fostering new exporters

- It is necessary not only to maintain exports of automobiles and similar products, but also to encourage a broader range of products manufactured by manufacturers of assembled products and large enterprises. The government needs to offer support to companies at the top of global niche markets that focus on export but also needs to broadly cover domestic supply chains, and to assist in the creation and development of venture companies in the manufacturing industry, for the benefit of the whole nation, including local economies (Fig. 1-7).

- (c) Bringing in global demand and promoting the capitalization of earnings from overseas in order to maintain the current balance

- The flow of investment and production overseas is inevitable in some business sectors and processes in order to increase earning power in a growth market. The shrinkage of surplus in the current account continues, due largely to the continued expansion of the trade deficit, despite the fact that the surplus in the income account is expanding (due to such reasons as an increase in investment earnings thanks to overseas business expansion in the manufacturing industry (Fig. 1-8) and the deficit in the service account is decreasing (due to such reasons as an increase in royalty earnings as a result of overseas business expansion).

- The public and private sectors need to cooperate to eliminate various barriers so as to ensure that wealth acquired through such accelerating overseas business expansion will reliably return to Japan for domestic investment.

(ii) Improvement of earning power despite changes in the business environment

- (a) Building profitable business models

- Companies need to respond to changes in the business environment in order to continue manufacturing high value added products domestically. Manufacturing methods and the structure of supply chains are changing significantly (polarization between high value added fields and low value added activities, reduction in the introduction of automatic machines and robots) (Fig. 1-9) and with the advancement of modularization, as is observed in the manufacturing of automobiles. With products themselves losing added value, companies must seek an ideal business style that goes beyond simply manufacturing products.

- In such conditions, it is necessary to build a business model that is profitable within the supply chain (such as one that fosters SMEs and medium-sized enterprises that can also participate in the business from the region or the conventional affiliates, or one that takes advantage of intellectual property and international standardization strategically) and establish a highly profitable business model (increasing the added value of business and changing business models, e.g. by combining manufacturing with the provision of services or through design and branding) (Fig. 1-10).

- (b) Training human resources in response to changes in the business environment

- It is necessary to train and ensure sufficient numbers of (i) personnel who lead innovation including in production techniques and marketing, (ii) personnel working with a proper division of labor between machinery and people, and (iii) managerial personnel (executives) who can enhance corporate value through overseas business expansion, M&As and in other ways. (Fig. 1-11).

- (c) Utilizing IT and external resources

- It is necessary to promote IT investment and utilize external managerial resources (through M&As, etc.), which may increase earnings.
Chapter 2 Fostering and Securing Manufacturing Human Resources which Support the Growth Strategy

1) Fostering Human Resources when Advancing into New Fields: The Challenge of Securing Human Resources Responsible for New Businesses

- According to a recent survey, around 45% of manufacturing companies with 30 or more employees are trying to develop new lines of business (this includes companies that have made such efforts previously and those merely considering the possibility; the same applies hereinafter).
- Approximately 45% of companies developing new lines of business are doing so in new business fields, such as new energy and environmental technology, health, medicine, or welfare, or next-generation automobiles, in accordance with the growth strategy (Fig. 2-1 and Fig. 2-2).
- Around 65% of companies developing new lines of business have experienced significant technological changes and are making various efforts to integrate and apply new technologies through learning at in-house study sessions, partnerships with academia or involvement with research institutions (Fig. 2-3).
- Many companies developing new lines of business consider training for acquiring broad knowledge concerning multiple technologies and skills, training for acquiring specialized knowledge corresponding to new technologies, and training for acquiring skills necessary for processing new products to be necessary for full-time technical employees. However, they often fail to provide training despite their awareness of its necessity (Fig. 2-4).
- The most common issue in developing new lines of business is difficulty in finding personnel capable of managing the new businesses (Fig. 2-5).
- Possible measures for fostering the human resources required when companies advance into growth fields may include (i) enhanced training for business operators, (ii) promotion of skill transfer from skilled workers to young technicians, (iii) training which responds to the needs of companies developing new lines of business, and (iv) improvement of vocational ability evaluation, which is significant in fostering human resources.

2) Fostering Human Resources which Support the Growth Strategy through Regional Collaborative Efforts: The Challenge of Finding Organizations that Satisfy Specific Needs of Companies

- More than half of companies surveyed have collaborated or are considering collaboration with other companies or local organizations to collect information on business activities or acquire new technologies.
- In particular, many companies cited universities or other public educational or research institutions as collaboration partners (Fig. 2-6).
- More than half of companies surveyed responded that they had collaborated with public vocational training institutions to receive or provide training and seminars or for recruitment activities.
- Efforts cited as necessary to enhance the capacity of full-time technical employees through local collaboration include preparation of vocational training courses corresponding to company needs and invitation of skilled workers to lecture at company training sessions (Fig. 2-7).
- The most commonly cited issue in advancing regional collaborative efforts is the difficulty in finding appropriate partner companies or local organizations.
- Possible measures for fostering manufacturing human resources in local communities may include (i) strengthening information provision concerning local training resources, and (ii) development of training courses in cooperation with relevant local organizations.

3) Future Direction

- Many growth fields are types of manufacturing or are closely related thereto. It will be important to offer public support so that workers can develop their capacities while manufacturing shifts from mature industries and advances into growth industries.
- The fact that the manufacturing industry tends to concentrate in certain regions is advantageous in fostering human resources. The provision of information and support for collaboration needs to be promoted in line with company needs so that local communities can foster manufacturing human resources necessary both to the communities themselves and to support the growth strategy.

4) Government Measures to Promote and Support the Fostering of Manufacturing Human Resources which Bolster the Growth Strategy

- Provision of more effective manufacturing training (training by Polytechnic Centers based on the need for training in growth industries, etc.)
- Measures to cope with the reluctance of young people to engage in manufacturing (Monodzukuri Meister System, various types of awards and competitions, etc.) (Fig. 2-8)
- Improvement vocational ability evaluation from the perspectives of both individuals and companies (National Trade Skill Test System, etc.)

Source: The graphs above are from the “Survey on New Business and Human Resource Development in the Manufacturing (Manufacturing) Industry,” conducted by the Japan Institute for Labour Policy and Training (2013).
Chapter 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 (Fig. 3-1)

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- Efforts by universities (engineering) provide practical engineering education in collaboration with industry. Efforts by universities, etc. to foster human resources in science and technology fields will be promoted strategically, including initiatives to improve the international status of Japanese university education.
- Colleges of technology provide experience-oriented specialized education with a focus on experiments and practical training sessions (Fig. 3-2). In FY2013, a model core curriculum was introduced and globalization efforts were initiated.
- Specialized upper secondary schools work on various unique projects, such as training technicians, etc. to support local traditional industries and providing opportunities for long-term practical on-site learning activities at companies (Fig. 3-3).
- Specialized training colleges strive to enhance practical and professional knowledge and technology in collaboration with local industries. In close collaboration with companies, MEXT certifies vocational and practical courses in professional training colleges that aim to ensure the quality of practical vocational education.
- MEXT has been offering support to university efforts to foster capabilities required for global human resources and to collaborate with foreign universities. It has also been assisting universities that promote internationalization since FY2014. Colleges of technology are carrying out overseas internship programs.

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

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- In order to enhance science and mathematics education to support Japan science and technology, human and material support has been offered, including the placement of assistants in science classes with observation and experimentation, enhancement of teacher quality and leadership, and improvement of science education equipment, etc.
- Efforts have also been made to support universities seeking to develop environments favorable to enabling female researchers to balance research activities and family life, such as the responsibilities of childcare, child rearing and providing care to elderly family members, and to encourage female lower and upper secondary school students to take science courses (Fig. 3-4).
- Internship programs have been promoted to enhance elementary and secondary school career and vocational education.
- Universities will work with industry to develop and implement customized vocational education programs for adult re-training and simultaneously provide scholarships to assist in the re-studying of young people.
- The National Museum of Emerging Science and Innovation (Miraikan) provides opportunities for its visitors to think about a sustainable system. The museum holds exhibitions and provides educational support activities to increase people's interest in manufacturing industries.
- Efforts to transmit manufacturing traditions to future generations are made by fostering successors to important intangible cultural properties, protecting selected conservation techniques, etc.

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

(i) Research and development in fundamental core manufacturing industry technologies

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- The government has promoted the development of measurement and analysis techniques/equipment, which are expected to improve diagnostic technology, alleviate the suffering of patients, and reduce medical costs.
- Shared use of the large-scale synchrotron radiation facility (SPRing-8), the X-ray free electron laser facility (SACLA), and the large-scale proton accelerator facility (J-PARC) are promoted to support research and development in manufacturing industries by utilizing quantum beam and photon science and technology (Fig. 3-5).
- The “K computer,” which has the world’s highest level computation performance, started operations for researchers and engineers shared from the end of September 2012. By maximizing utilization of the K computer, epochal results strengthening Japan’s industrial competitiveness have been achieved, such as increased sophistication in novel pharmaceutical development processes and innovation in manufacturing processes (Fig. 3-6).

(ii) Promotion of Research and Development Based on Collaboration between the Government, Industry, and Academia (Fig. 3-7)

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- The government has been carrying out initiatives to establish innovation platforms to promote challenging and high-risk R&D, aiming at generating disruptive innovations to realize future visions as well as innovations based on local resources.
- MEXT launched initiatives to startup companies from universities FY2012, which can lead the global markets.
- Efforts to achieve excellent concepts that contribute to the creation of regional innovations in each local community are supported.