The Lisbon Strategy in a knowledge society without borders

A Estratégia de Lisboa numa sociedade do conhecimento sem fronteiras

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EIJI OGAWA

SCHOOL OF COMMERCE AND MANAGEMENT, HITOTSUBASHI UNIVERSITY

"INNOVATION 25" PLAN IN JAPAN+

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1. Introduction

The Japanese economy has experienced the so-called "Lost Decade" in 1990s and thereafter where the bubbles of asset prices had burst and declined and at the same time economy continued stagnation and slump. Moreover, the economy went into the deflation of prices. During the "Lost Decade", technology or total factor productivity has decreased and has been relatively lower than the period before the bubble burst and the United States and European countries. The prolonged economic slump might have forced Japanese companies to rush into restructuring them and discouraged Japanese companies to invest in their R&D and Information Technology to reduce the total factor productivity in Japan.

On one hand, the Japanese economy faces a severe long-run problem related with declining and ageing population in Japan. The declining and aging population needs to increase productivity of labor in order that the fewer working population should support all of the population. Accordingly, Japanese economy has to increase productivity of labor, which is expected to attribute to improvements in production technology or total factor productivity in the Japanese economy where marginal products of capital is no longer higher.

In a situation, Prime Minister Shinzo Abe is taking a long-term strategy initiative of the Japanese government for the creation of innovation contributing to the Japanese economic growth with an eye on the year 2025. He calls it as "Innovation 25" Plan. He established a minister in charge of innovation and an "Innovation 25" Strategy Council and appointed Ms. Sanae Takaichi, the Minister of State for Innovation, as in charge, in order that the Japanese government should intensively promote the decision of "Innovation 25" Plan that the "Innovation 25" Strategy Council has been discussing from October 2006 to June 2007.

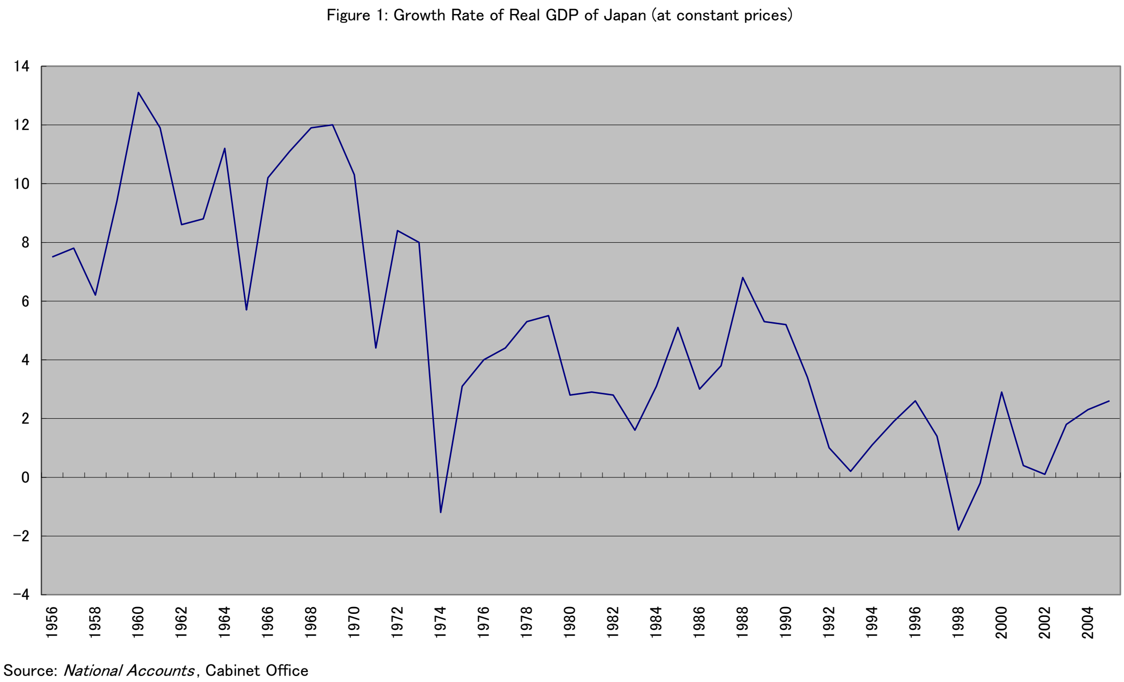
At first, this paper focuses on the total factor productivity to explain the lower economic growth in the "Lost Decade" in 1990s and thereafter. It is to identify what factors have caused the lower growth of total factor productivity by looking at some facts related with investments into Information Technology and R&D. Moreover, Japanese companies' innovative activities are focused on to investigate what factors are important for innovation in Japan.

Next, regarding "Innovation 25" Plan, this paper explains an overall image for the long-term strategy initiation of "shape and innovation that society should aim for in 2025." The "Innovation 25" Strategy Council will decide the overall image as an Interim Report at the end of February 2007. Some expected merits and difficulties are pointed out.

2. Current Situation of Japanese Economic Growth

When we look at long-term statistics on growth rates of real GDP of Japan in Figure 1, it is found that the growth rates of real GDP have been diminishing over time. The Japanese economy has three stages from higher growth rates in 1960s through medium growth rates in 1970s and 1980s to lower growth rates in 1990s and thereafter. Especially 1990s and thereafter is called as a "Lost Decade" during when we experienced a burst of bubbles of asset prices and the resulted prolonged economic stagnation and slump.

Figure 1: Growth Rate of Real GDP of Japan (at constant prices)



Source: *National Accounts*, Cabinet Office

Hayashi and Prescott (2002) assumed the following aggregate production function to clarify effects of technology or Total Factor Productivity (TFP) on the lower growth rate during the "Lost Decade".

$$Y = AK^{\theta}(h \cdot E)^{1-\theta} \tag{1}$$

where Y: aggregate output, A: total factor productivity, K: aggregate capital, E: aggregate employment, h: hours per employee.

They divided equation (1) by the working-age population N to obtain the following equation:

$$y = A^{1/(1-\theta)} h \cdot e \cdot x^{\theta/(1-\theta)} \tag{2}$$

where $y \equiv Y/N$, $e \equiv E/N$, $x \equiv K/Y$.

They decomposed output per adult y into four factors: the TFP factor $A^{1/(1-\theta)}$, the workweek factor h, the employment rate factor e, and the capital intensity factor $x^{\theta/(1-\theta)}$. They supposed that the capital share parameter θ is set at 0.362 to make calibration. Table 1 shows contributions of each of the four factors to the growth rate of output per adult. It is clear that the growth rate of TFP factors fluctuated during the whole period from 1960 to 2000 while the growth rates of the other three factors are relatively stable over the whole period. Moreover, the growth rates of output per adult have stronger correlation with those of TFP factors. The growth rate of TFP factors was 0.3% in the "Lost Decade" from 1991 to 2000 when the Japanese economy had no more than 0.5% of growth rate of output per adult.

Table 1: Accounting for Japanese Growth per Person Aged 20-69

		Factors			
Period	Growth rate	TFP factor	Capital intensity	Workweek length	Employment rate
1960–1973	7.2%	6.5%	2.3%	−0.8%	−0.7%
1973–1983	2.2%	0.8%	2.1%	−0.4%	−0.3%
1983–1991	3.6%	3.7%	0.2%	−0.5%	0.1%
1991–2000	0.5%	0.3%	1.4%	−0.9%	−0.4%

Source: Hayashi and Prescott (2002)

Jorgenson and Motohashi (2005) analyzed effects on Information Technology (IT) on the TFP in Japan by comparing with those in the United States. They supposed that aggregate output consists of non-IT investment goods, computer investment, software investment, investment in communications equipment, consumption of non-IT goods and services, and consumption of IT capital services by governments and households while aggregate input consists of non-IT capital services, computer services, software services, communications equipment services, and labor services to represent the following production possibility frontier:

$$Y(I_n, I_c, I_s, I_t, C_n, C_c) = A \cdot X(K_n, K_c, K_s, K_t, L) \qquad (3)$$

where Y: aggregate output, I_n: non-IT investment goods, I_c: computer investment, I_s: software investment, I_t: investment in communications equipment, C_n: consumption of non-IT goods and services, C_c: consumption of IT capital services by governments and households, X: aggregate input, K_n non-IT capital services, K_c: computer services, K_s: software services, K_t: communications equipment services, L: labor services, A: total factor productivity.

Table 2 shows the sources of economic growth in Japan and the United States. They pointed out that the difference in growth rates between Gross Domestic Income (GDI) and GDP is equal to the growth rate of TFP while the growth rate of GDI is decomposed into the contribution of IT capital, non-IT capital, and labor services. They found that decreases in growth rate of GDP are attributed to those of TFP as well as those of labor from 1980s to 1990s-early 2000s. The decreases in Japanese TFP were smaller than those in the United States especially during the IT bubble period from 1995 to 2003.

Jorgenson and Motohashi (2005) decomposed the TFP growth into information technology and non-information technology growths. The contributions of both information technology and non-information technology growths to the TFP growth are shown in Table 3. The growth rate of information technology has been stable from 1975 to 2003 in Japan. In contrast, growth rate of non-information technology has been decreased from 1.35% in 1975-90 through 0.48% in 1990-95 to 0.10% in 1995-2003. The decreases in growth rate of non-information technology reflect in the decreases in TFP growth rate. On the other hand, the United States have experienced increases in both the information technology and the non-information technology. Moreover, the growth rates of information technology are almost the same between Japan and the United States while the growth rate of information technology is smaller than that of non-information technology.

In summary, the decreases in Japanese economic growth have been caused by the decreases in TFP in the "Lost Decade." The decreases in TFP have reflected the non-information technology rather than the information technology.

Table 2: Sources of GDP

(JAPAN)

	1975-90	1980-90	1990-95	1995-03
Gross Domestic Product	4.03	3.97	1.64	1.28
Contribution of Information Technology	0.43	0.55	0.22	0.47
Computers	0.22	0.29	0.11	0.19
Software	0.13	0.18	0.08	0.22
Communications Equipment	0.08	0.09	0.03	0.06
Contribution of Non-Information Technology	3.61	3.42	1.41	0.81
Gross Domestic Income	2.46	2.71	0.84	0.83
Contribution of Information Technology Capital Services	0.36	0.44	0.29	0.54
Computers	0.18	0.21	0.13	0.22
Software	0.12	0.16	0.12	0.20
Communications Equipment	0.07	0.07	0.04	0.11
Contribution of Non-Information Technology Capital Services	1.01	1.08	0.77	0.62
Contribution of Labor Services	1.09	1.19	-0.22	-0.32
Total Factor Productivity	1.57	1.25	0.80	0.45

Notes: Average annual percentage rates of growth. The contribution of an output or input is the rate of growth, multiplied by the value share.

(US)

	1948-73	1973-89	1989-95	1995-03
		Outputs		
Gross Domestic Product	4.00	2.99	2.43	3.56
Contribution of Information Technology	0.11	0.35	0.37	0.59
Computers	0.03	0.18	0.15	0.32
Software	0.02	0.08	0.15	0.17
Communications Equipment	0.07	0.09	0.08	0.09
Contribution of Non-Information Technology	3.88	2.64	2.06	2.97
		Inputs		
Gross Domestic Income	3.07	2.68	2.13	2.56
Contribution of Information Technology Capital Services	0.16	0.38	0.49	0.88
Computers	0.04	0.20	0.22	0.49
Software	0.02	0.07	0.16	0.22
Communications Equipment	0.09	0.11	0.10	0.17
Contribution of Non-Information Technology Capital Services	1.80	1.11	0.71	1.01
Contribution of Labor Services	1.11	1.18	0.93	0.67
Total Factor Productivity	0.93	0.31	0.31	0.99

Source: Jorgenson and Motohashi (2005)

Table 3: Decomposition of TFP Growth

(JAPAN)

	1975-90	1990-95	1995-03
Total Factor Productivity Growth	1.57	0.80	0.45
	Contributions to TFP Growth:		
Information Technology	0.23	0.32	0.36
Computers	0.13	0.18	0.23
Software	0.05	0.10	0.04
Communications Equipment	0.05	0.04	0.09
Non-Information Technology	1.35	0.48	0.10

(US)

	1948-73	1973-89	1989-95	1995-03
Total Factor Productivity Growth	0.93	0.31	0.31	0.99
Information Technology	0.05	0.20	0.23	0.46
Computers	0.02	0.13	0.13	0.31
Software	0.00	0.03	0.06	0.06
Communications Equipment	0.03	0.05	0.04	0.08
Non-Information Technology	0.88	0.11	0.08	0.53

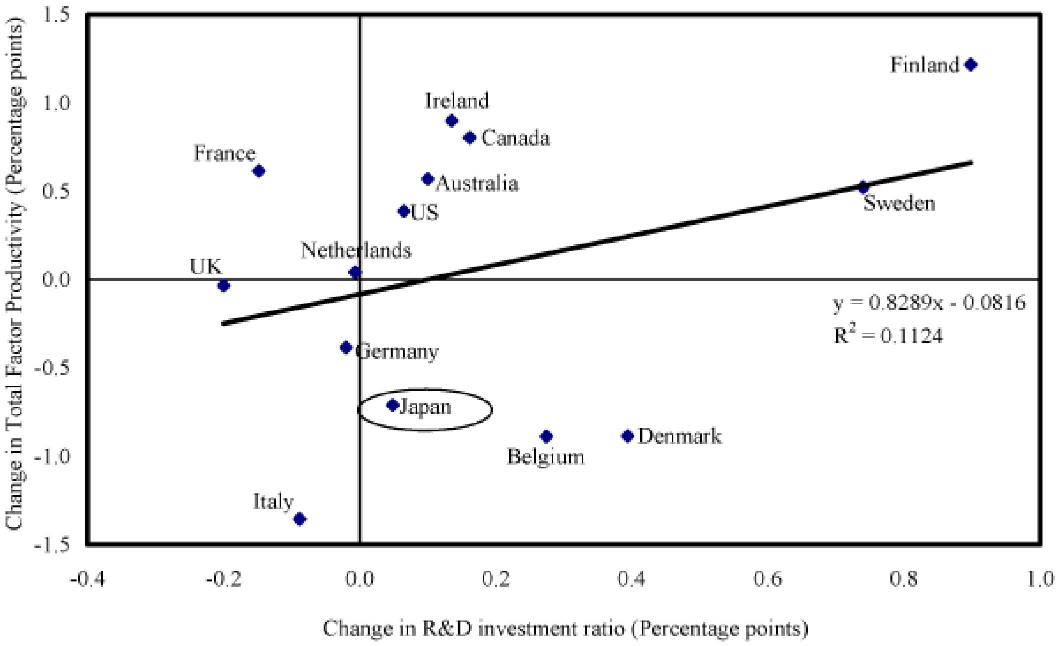
Source: Jorgenson and Motohashi (2005)

It is important that innovations spawned by R&D activities should lead to improvements in productivity (TFP). Figure 1 shows relationship between the TFP and a ratio of R&D investment to GDP for industrialized countries in terms of changes from average of “1990 to 1995” to average of “1996 to 2001.” We can find a moderately positive relationship between the TFP and R&D investment among the industrialized countries. However, increases in the ratio of R&D investment to GDP in Japan since the 1990s have been accompanied by a decline in the growth of TFP. The R&D has not contributed to growth of TFP in the recent years. Although changes in TFP cannot be attributed solely to innovation, this trend indicates the possibility that improvements in productivity commensurate with the amount of R&D investment have not been realized.

Figure 1: Relationship between the R&D investment ratio and TFP

Appended Figure 3-32 Relationship between the R&D investment ratio and Total Factor Productivity (TFP)

R&D investments of Japan are not efficiently leading to increase in productivity



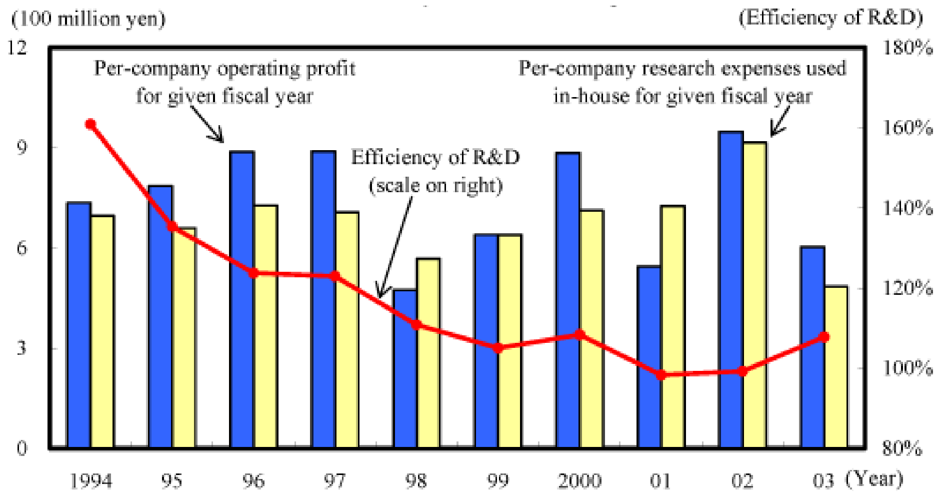
Source: *OECD Factbook 2005 and Main Science and Technology Indicators 2004*, OECD.
Notes: 1. The R&D investment ratio is the ratio of R&D investment to GDP.
2. Changes shown here are between the average of "1990 to 1995" and the average of "1996 to 2001."

Source: Cabinet Office of Government of Japan (2005)

The Cabinet Office (2005) pointed out the facts probably indicate lower efficiency of R&D investment in Japan including that conducted by the private sector. An index that measures the efficiency of R&D investment calculated by dividing cumulative operating profit over five years by cumulative R&D costs over five years displays an immediate, albeit small, rise upon the recovery of corporate profits due to the economic recovery, but the long-term trend is downward as shown in Figure 2. From these statistical patterns, it could be concluded that the efficiency of research and development by Japanese companies is declining in comparison with the past.

Figure 2: Movements of efficiency of R&D in Japanese manufacturing

Figure 3-4-2 Trends in the efficiency of research and development (manufacturing industries)



Notes: 1. Survey of Scientific and Technological Research, Ministry of Internal Affairs and Communications.
2. Efficiency of R&D in a given fiscal year is calculated as (per-company cumulative operating profit over the past five years counted from the given fiscal year) / (per-company cumulative research expenses (on an expenditure basis) used in-house over the past five years counted from the given fiscal year).

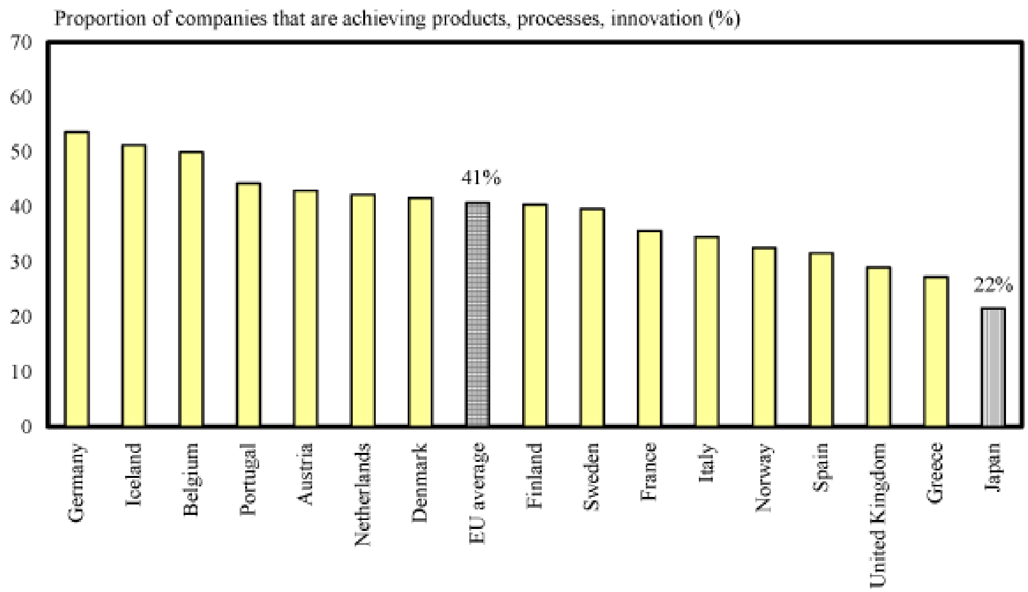
Source: Cabinet Office of Government of Japan (2005)

3. Japanese companies' innovative activities

The Cabinet Office of Government of Japan (2005) used the "National Innovation Survey" of the Science and Technology Policy Bureau, Ministry of Education, Culture, Sports Science and Technology to outline the current situation of Japanese companies' innovative activities. According to this survey, more than 20% of those companies examined that had more than ten employees had achieved either product innovation (i.e., the introduction to the market of a product that is either new in some way or substantially improved) or process innovation (i.e., the introduction of a process, including a method of providing a service or distributing a product, that is either new in some way or substantially improved) in the three-year period from 1999 to 2001 This percentage is regarded as the percentage of companies that have achieved innovation in the Cabinet Office (2005). To compare the results of the survey with the status of innovation in other countries, reference was made to a similar survey conducted in the European Union (EU). According to this, 40% of companies in EU member countries had achieved innovation, which means that at least judging from these two surveys, innovative activities by Japanese companies are not particularly extensive. Figure 2 shows the comparisons in innovative activities of Japanese companies with companies in each of EU member countries.[1]

[1] It should be noted that the National Innovation Survey and the EU's "Third Joint Innovation Survey" differed in their methodologies in that the former performed sampling with replacement to the population represented by the number of companies,

Figure 2: International Comparison of Companies' Innovative Activities



Notes: 1. *National Innovation Survey 2003*, National Institute of Science and Technology Policy, Ministry of Education, Culture, Sports, Science and Technology; Innovation in Europe, Eurostat.
2. The survey period was 1999-2001 for Japan and 1998-2000 for the European countries.
3. The "EU average" is the average of the 12 countries that were EU member states at the time of the survey.

Source: Cabinet Office of Government of Japan (2005)

According to the above National Innovation Survey, the reasons why companies did not engage in some type of innovative activities or follow through with such activities include staff shortages, inadequate information about technology and markets, and organizational rigidity, which indicates that success in innovation will be affected by disparities in the managerial and organizational initiative of companies, including human resources development.

The Cabinet Office conducted the National Innovation Survey (December 2004). The survey results show problems involved in improving competitiveness by understanding the relationship between managerial and organizational initiative and success in innovation and the relationship with companies' profitability and productivity.

In the Survey, companies were asked whether or not they had taken action in 12 areas, including developing a strategic vision for R&D, forming linkages between R&D strategy, management strategy and marketing, instituting a strategy for securing and

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while the latter performed sampling with replacement to the population represented by the number of employees, and bias may have existed in the responding companies. Consequently, the proportion of companies in Japan that have achieved innovation may have been excessively small. The results of the "Third Joint Innovation Survey" were announced in "Innovation in Europe-Results for the EU, Iceland and Norway" from Eurostat.

developing personnel, and managing the progress of research and development. More than 50% replied that they had taken action to clarify the system of responsibility concerning R&D strategy and to conduct progress management of research and development. However, relatively few had taken measures to prevent the loss of personnel, or to secure and develop personnel, or to flatten their organizational structure (Table 4). By totaling these results and assigning points to a "management of technology (MOT index)" with a maximum rating of 12, it was confirmed that, generally, the higher the MOT index was, the higher the R&D efficiency as shown in Figure 3.

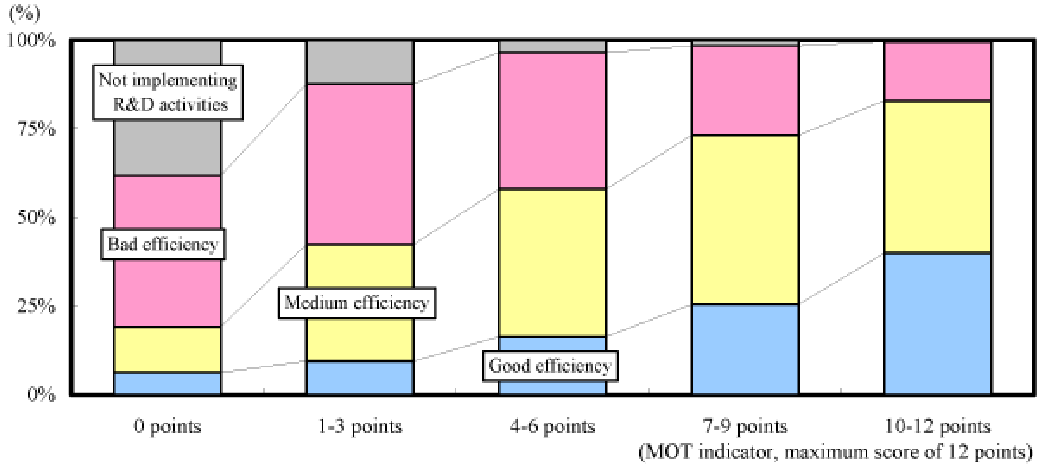
Table 4: Management of technology indicators

Content of the management of technology indicator	Average (0-1)
Clarifying decision-making and the system of responsibility concerning R&D strategy and appointing an R&D director (clear involvement of top executives in R&D)	0.527
Managing the progress of research and development	0.510
Implementing continuous R&D	0.471
Developing a strategic vision (roadmap) for R&D	0.449
Forming linkages among market surveys and the sales department and R&D activities	0.400
Establishing a knowledge (technology) sharing platform/ environment (System building and establishment of a corporate culture, etc.)	0.372
Forming clear linkages between R&D strategy and management strategy	0.365
After implementation of R&D, conducting evaluation and providing feedback to the management strategy and R&D strategy	0.359
Flattening the organizational structure and implementing cross-sectoral projects	0.342
Forming strategic partnerships with other companies for knowledge acquisition	0.307
Enhancing systems and building a strategy for securing and developing R&D personnel	0.282
Developing mechanisms and systems to prevent the loss of personnel	0.149

Notes: 1. *Questionnaire Survey of the Technological Creativity of Companies* (2005), Cabinet Office.
2. The sample size of the survey was 1,618 companies.
3. The average is the proportion of responding companies that replied "we are taking action" in each area.

Source: Cabinet Office of Government of Japan (2005)

Figure 3: MOT indicator and R&D efficiency



Notes: 1. *Questionnaire Survey of the Technological Creativity of Companies* (2005), Cabinet Office.
2. In response to the question "To what extent are your R&D activities getting results?," companies that replied "nearly always" or "often" were rating as having "good efficiency," companies that replied "around half of the time" were rated as having "medium efficiency" and companies that replied "not often" or "never" were rated as having "bad efficiency."
3. The sample size of the survey was 1,618 companies.
4. MOT indicator shows which of 12 areas of managerial and organizational efforts that are considered to be related to the achievement of innovation are being implemented by companies. It assigns companies a score between 0 and 12.

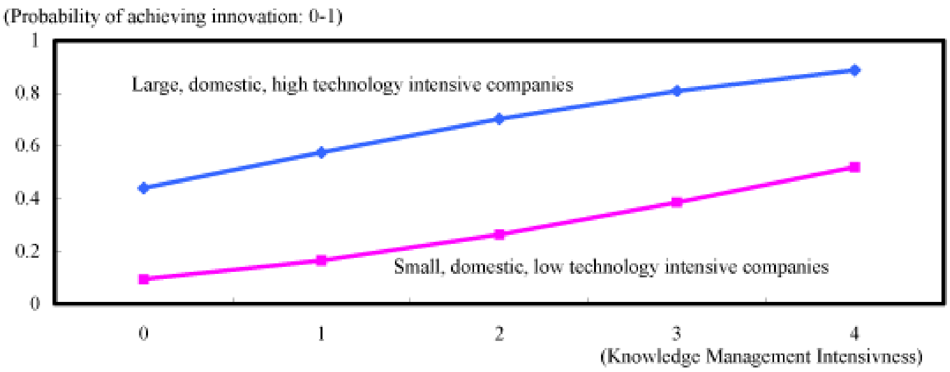
Source: Cabinet Office of Government of Japan (2005)

Cabinet Office (2005) also pointed out that knowledge management is a particularly important element for the strategic managerial initiatives that serve as the infrastructure for stimulating companies' innovative activities, In the EU's Third Joint Innovation Survey (CIS3) performed in France, the concept of knowledge management was defined in terms of four management techniques: (i) establishment of written policies concerning knowledge management; (ii) formation of values and a corporate culture designed to promote knowledge sharing; (iii) creation of incentives for retaining employees and directors; (iv) formation of partnerships and strategic alliances with other companies for knowledge acquisition.

In a study to determine what type of companies practiced knowledge management, it was found that larger companies and companies in high technology intensive manufacturing industries were more likely to practice knowledge management through any of the above techniques. However, even among large companies and high technology intensive industries, the percentage that implemented an incentive policy to retain employees was less than 30%, which is low compared with the use of other techniques of knowledge management. This lack of incentives is reflected in companies' slow progress in establishing systems for handing the assignment of rights pertaining to inventions developed on the job (i.e. service inventions), as seen in the large number of lawsuits by employees toward companies demanding a fairly substantial amount of compensation.

To determine whether or not the practice of knowledge management leads to the achievement of product innovation in manufacturing industries, an evaluation was conducted using a probit model. It was observed that if the company practices only one technique of knowledge management, the probability of achieving some type of innovation for that reason alone is high at 10% compared with the case where none of the four management techniques are practiced. This means that managerial and organizational initiative as typified by knowledge management probably has a large impact on the success of companies' innovative activities.

Figure 4: Knowledge Management and Innovation



Notes: 1 *Japanese National Innovation Survey*, National Institute of Science and Technology Policy, Ministry of Education, Culture, Sports, Science and Technology; *OECD Science, Technology and Industry Outlook (2004)*, OECD.

2. Knowledge management intensiveness shows how many of the four management techniques defined in the Innovation Survey (establishment of written policies concerning knowledge management, formation of values and a corporate culture designed to promote knowledge sharing, creation of incentives for retaining employees and directors, formation of partnerships and strategic alliances with other companies for knowledge acquisition) are being implemented. It is assumed that each technique makes an equal contribution to innovation and if all four are being implemented the intensiveness is four.

3. The function is estimated with a probit model that carries out a regression on the function of a cumulative standard normal distribution. Whether or not product innovation had been realized was set as the dependent variable and knowledge management intensiveness was set as the independent variable. Different characteristics were controlled using dummy variables for industry type, company size, and foreign capital companies. Concerning industry classifications, the four industry types in *OECD Science, Technology and Industry Outlook (2004)*, OECD (high technology intensive, medium- high technology intensive, medium-low technology intensive, low technology intensive) were used and dummy values assigned to them. For company size, the three sizes in the Japanese National Innovation Survey (large, medium, small) were assigned dummy values. Foreign capital companies refers to companies with their headquarters overseas.

4. The basis for the dummy variables for this graph is small, domestic, low technology intensive companies.

Source: Cabinet Office of Government of Japan (2005)

4. "Innovation 25 Plan" in Japan

It is in general pointed out that the Japanese economy with a declining and aging population should increase productivity of labor by improving its total factor productivity, that is production technology and that the improvements in the total factor productivity should be caused by innovation. When Prime Minister Shinzo Abe made a policy speech at his first Session of the Diet on September 29, 2006, he pointed out that as Japan has become a society with a declining population, it is essential to increase productivity and strengthen growth potential so that our people have dreams and hopes for the future, and to maintain a social security system which provides the basis for more secure lives. Then he referred to the so-called "Innovation 25" Plan as one of his political commitments in order to channel in new vitality to the Japanese economy through the power of innovation and openness. The “Innovation 25” Plan is a long-term strategic guideline for innovation in Japan spanning through the year 2025. He made the following speech at the beginning of the Session of Diet.

> Aiming at the creation of innovation that contributes to growth, I will compile and put into effect a long-term strategic guideline, “Innovation 25,” which will have a range of prospects up to 2025 in medicine, engineering, information technology, and a variety of other fields. By making full use of a world-leading high-speed Internet infrastructure, my goal is to substantially improve productivity by, for example, doubling the number of teleworkers who work from home. (http://www.kantei.go.jp/foreign/abespeech/2006/09/29speech_e.html)

Prime Minister Shinzo Abe referred to the “Innovation 25” Plan again when he made his policy speech at the beginning of the 166th Session of the Diet on January 26, 2007.

Now is the time to elevate the Japanese economy to a new stage for economic growth over the medium and long term, and toward that end, we have formulated the “Direction and Strategy for the Japanese Economy,” which lays out the reform goals that we will pursue during the next five years. Under my leadership, we will strongly advance a new growth strategy under this policy so that the people can truly sense for themselves that we are achieving real growth. This will be realized through innovation which brings about cutting-edge technologies, products and services, and an open approach which brings the vitality of Asia and the world into our country. (http://www.kantei.go.jp/foreign/abespeech/2007/01/26speech_e.html)

Prime Minister Shinzo Abe promised that he will draw up the “Innovation 25” Plan by May 2007 and he will implement concrete policies, such as strategic assistance for developing medicines with dramatic effects for cancer and Alzheimer's disease, and efforts to unify the various patent systems of different countries around the world.

Thus, the “Innovation 25” Plan is a long-term strategy initiative of the Japanese government for the creation of innovation contributing to the Japanese economic growth with an eye on the year 2025. A minister in charge of innovation was established and Ms. Sanae Takaichi, the Minister of State for Innovation, was appointed as in charge, in order that the Japanese government should intensively promote the decision of “Innovation 25” Plan. In addition, the “Innovation 25” Special Mission was set up within the Cabinet Office at the same time.

An “Innovation 25” Strategy Council of intellectuals from industry and academia was established, and the recruitment of ideas began in order to listen to and reflect the voices of the people for the formulation of “Innovation 25” Plan. At the first stage, while displaying in an easily understandable format how the lives of people, including safety and convenience, in the year 2025 will be improved by innovation, the kind of innovation that will be targeted, is scheduled to be finalized by the end of February 2007. The Cabinet Office has been collecting ideas from many individuals during the process till February 2007 in order to consider actively and enhance these ideas in a conference. The “Innovation 25” Strategy Council decides an overall image for the long-term strategy initiation of “shape and innovation that society should aim for in 2025”. The Council addresses the overall image as an Interim Report at the end of February 2007.

At the next stage, based on these results, the Cabinet Office has a plan that a roadmap for feasible strategic policies for realization will be studied through the discussion at the Council for Science and Technology Policy or other government bodies. These results will be combined as “Innovation 25” Plan. They will be finalized by June 2007.

Dr. Kiyoshi Kurokawa, special advisor to the Cabinet on science, technology and innovation issues who was assigned as Council Chairperson of the “Innovation 25” Strategy Council, under Minister Takaichi, Minister of State for Innovation pointed out that the following three points are very important when we think about a society created by innovation. The three points include “Realization of new wealth in our society from the perspective of the citizens,” “Large Asia and growth by coexisting with the world,” and a “Society where high-spirited, highly creative people are willing to take on any risks to play an active role in society.”

The “Innovation 25” Strategy Council addresses an Interim Report at the end of February. The Interim Report reflects a report addressed by the Science Council of Japan on January 25, 2007. The report describes how to create innovation under the circumstances of globalization and aging society with declining birth rate. It comprises wisdoms of scientists from various disciplines including humanities, social science, natural science and technology.

The report suggests conditions, environments, and systems for creating innovation to realize a targeted society in 2025, where people live calmly and safely, make full use of highly developed information and communication systems, each region activate, tackle to solve problems of global environment and energy, and adequately deal with water and food problems. The conditions, environments, and systems for creating innovation include systems of fostering talented people who create innovation, environments and R&D system that create innovation, social system design that realize innovation.

According to the Interim Report, it classifies innovations into Innovations of Science Technology, Society, and Human Resource in order to bring about continuing innovations in Japan.

(1) Innovation of Science Technology

It is important to provide environment and R&D system that bring about innovation. For the purpose, it is necessary to establish many universities as global level of Center of Excellence (COE) in Japan. Many universities should have the highest level of capacity so as to be global centers in terms of education and research. The universities could invite many excellent scholars and students from the rest of world. Universities should make active collaboration with firms not only in Japan but also in foreign countries. Also, regional universities should be formed as a Center of Excellence (COE) in a characteristic and strong research field by inviting scholars in the research field from nationwide and foreign countries. The regional universities should have closely linkage with its regional industries to be a core for activating the regions.

The government should enrich its official supports for activating research activities. It includes developing new fields by collaborating between different fields. On one hand, it should give enough supports for junior and women scholars to demonstrate their possible abilities. Moreover, it is pointed out that it is important to provide systems for improving mobility of talented persons. The government should revise employment customs, a pay scale based on seniority, retirement money, pension system to increase mobility of talented persons between education and research institutions, between firms, and between education and research institutions and firms.

It is important to make environmental readjustments for fostering venture business. It needs to enrich supportive service of experts in the fields of finance, accounting, judicial affairs, and tax affairs for fostering venture business.

It is pointed out that collaboration between industry and university are important for innovation. For the purpose, it is necessary to establish rules regarding to deregulation and conflict of interests. The government should conduct such a tax reform as to promote donation from companies to universities. Moreover, it is desirable to strengthen the basis of academic associations by such a tax reform to promote donation from companies while the academic association should be a place for promoting innovation.

Finally, it is absolutely necessary to enrich a system of intellectual property. The intellectual property at education and research institutions which include university should be protected. For the purpose, it is necessary to be acquainted with intellectual property system in Japan, the United States, and the European Union. At the same time, it is necessary to foster talented persons in the field of intellectual property, who experience research of frontiers research. It should be to strengthen regulation over imitations and pirated versions. On one hand, it should be important to secure freedom of academic research as a source of innovation and to prepare an intellectual property system that secures incentives to promote using the innovation in the industry.

(2) Innovation of Society

The government needs to design a social system that can effectively create innovation. It is proposed to investigate various sense of value of society, their interrelationships, and historical changes to make reform in the sense of value that is important for social developments. It is proposed to investigate system design that realizes well-balanced treatments of intra-generation and between generations in order to establish intellectual infrastructure for sustainable developments in society and economy. It should be to investigate social manner for establishing symbiotic society that consists of people with variety of individuality and variety of nationality in order to seek for formulation of manners and rule regarding common knowledge.

A new system design is necessary in order to seek for a way in which we subjectively design a social system as combination of value and technology to realize continuing evolution or improvement. Supporting systems such as recurrent education chance, investment and loan systems, tax system and so on, should be established in order to give chances to recover to challengers who fail in innovation. Under the supporting system, it is possible to develop of varied potentiality of individuals and to promote creative challenge of individual who investigate developments of business model and supporting system that cultural activities develop as social economic activities. It is necessary to promote volunteer solidarity activity of individuals in society. Accordingly, it is possible to establish social organization and network that make both self-fulfilling of individuals and satisfying public needs of society

It is supposed to seek for a system or "Social Technology" that we can deeply understand scientific technology. It is necessary to develop comprehensive and self-examining researches in order to direct adequately developments of scientific technology. In addition, we should consider comprehensively possibility and risks of scientific technology in order to reduce the risks. It is desirable to develop communication instruments between ordinary people and experts in order to enhance identification of society and capacity to deal with the social problems. Scientists should proceed to make autonomous and self-aware organization of scientists and researchers to form a community of scientists that is open internationally while they regard development of science, spread of scientific knowledge, and social responsibility of scientists as a purpose of collaboration. Scientists should make regularly a review and a report over developments of scientific technology scientist community to society on their own responsibility.

It is proposed to promote a research on innovation policy as policy science as conducted actively in the United States and the European Union. The government should prepare for a system where we propose and implement comprehensive and consistent innovation policy

(3) Innovation of Human Resource

A system of rearing talented persons who create innovation is necessary for active innovation society. In principle, it is to rear talented persons who identify a variety of senses of value from various angles. It is to rear talented persons who try to have active exchanges with different culture to improve together through friendly rivalry. It is to rear talented persons who challenge lively anything new. Concretely, it is a necessary condition to establish graduate schools that gather talented persons from the world. May excellent foreign scholars should be invited to Japanese universities under some internationally good competitive conditions. Graduate students could be free to move among graduate schools of different universities to research their own research topics under any professors whom they request as a supervisor.

It is impossible for us to allow promising young researchers to be boxed into a closed competitive environment early in their lives. Individuals should be encouraged to go out into wider international society to experience and become aware of the diversity of values and goals out there. Needless to say, it is of utmost importance that those in higher education – undergraduates, graduates, postgraduates, university personnel and researchers – who are engaged in human resources development and who push forward scientific knowledge and policy, must act on their own initiative by observing the principles under discussion. It is necessary to build a career forming structure in which scientists, researchers, and educators are encouraged to mingle with their peers and refine their research by exposing it to the criticism of rivals. Especially in a "vertical" society like Japan's, to introduce and perfect a system of integration in the early stages of education and socialization is the most basic policy for contributing to the future cultivation of human resources (Science Council of Japan(2005)).

5. Conclusion

This paper explained the most important factor that has decreased the lower growth rate of Japanese economy based on the analytical results conducted by Hayashi and Prescott (2002) and Jorgenson and Motohashi (2005). The growth rates of output per adult have stronger correlation with those of TFP factors. Especially in the "Lost Decade" from 1991 to 2000, the lower growth rate of TFP factors have had effects on the lower growth rate of output per adult in Japan. The decreases in TFP have reflected the non-information technology rather than the information technology. The R&D has not contributed to growth of TFP. It shows that the possibility that improvements in productivity commensurate with the amount of R&D investments have not been realized. The fact reflects the lower efficiency of R&D investments in Japan.

According to the "National Innovation Survey," innovative activities by Japanese companies are at much lower level than each of EU member countries. It is pointed out that the reasons include staff shortages, inadequate information about technology and markets, and organizational rigidity. The management of technology which includes developing mechanism and systems to prevent the loss of personnel and enhancing systems and building a strategy for securing and developing R&D personnel are poor in Japanese companies. The poor management of technology has adverse effects on the R&D efficiency. Managerial and organizational initiatives as typified by knowledge management might have reflected in the lower innovative activities of Japanese companies.

Prime Minister Shinzo Abe is taking as the "Innovation 25" Plan that is a long-term strategy initiative of the Japanese government for the creation of innovation contributing to the Japanese economic growth with an eye on the year 2025. The "Innovation 25" Strategy Council addresses an Interim Report at the end of February. The Interim Report classifies innovations into Innovations of Science Technology, Society, and Human Resource in order to bring about continuing innovations in Japan.

Eiji Ogawa is Professor of Graduate School of Commerce and Management, Hitotsubashi University and Deputy Director of EU Institute in Japan, Tokyo Consortium E-mail: ogawa.eiji@srv.cc.hit-u.ac.jp, tel: 81-42-580-8859, 81-42-580-8747

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