

## Section 2

### Bolstering Competitiveness through Innovation and Global Deployment supported by ICT

As a mature, aging society with a low birth rate, Japan must search for new routes to economic growth, not only on a governmental and corporate level but on an individual level as well. This section will examine the necessity of innovation-led growth and the vital role of ICT in this endeavor, as well as routes to enhance international competitiveness through global deployment that harnesses the cooperation of ICT users and exploits Japan's strengths on the world stage.

#### 1. Examination of Japan's environment for innovation

##### (1) Evaluation of Japan's environment for innovation based on existing international surveys

Figure 3-12 gives an overview of how Japan's environment for innovation has been evaluated in existing international surveys. All of the surveys give Japan's environment for innovation a high rank, and in the EIU survey in particular Japan is given top rank, above such advanced Western nations as the US, Switzerland, Finland, and Sweden.

**Figure 3-12 Ranking of environment for innovations from existing international surveys (Top ten ranks shown)**

Rank	ITIF "The Atlantic Century" Global comparison of innovation and competitiveness (2009)	EIU "A new ranking of the world's most innovative countries" Innovation (2009)	WEF "The global Competitiveness Report" (2009-2010) Environment for innovation
1	Singapore	<b>Japan</b>	The US
2	Sweden	Switzerland	<b>Japan</b>
3	Luxembourg	Finland	Switzerland
4	Denmark	The US	Sweden
5	South Korea	Sweden	Germany
6	The US	Germany	Finland
7	Finland	Taiwan	Denmark
8	The UK	The Netherlands	Taiwan
9	<b>Japan</b>	Israel	The Netherlands
10	NAFTA <sup>25</sup>	Denmark	Singapore

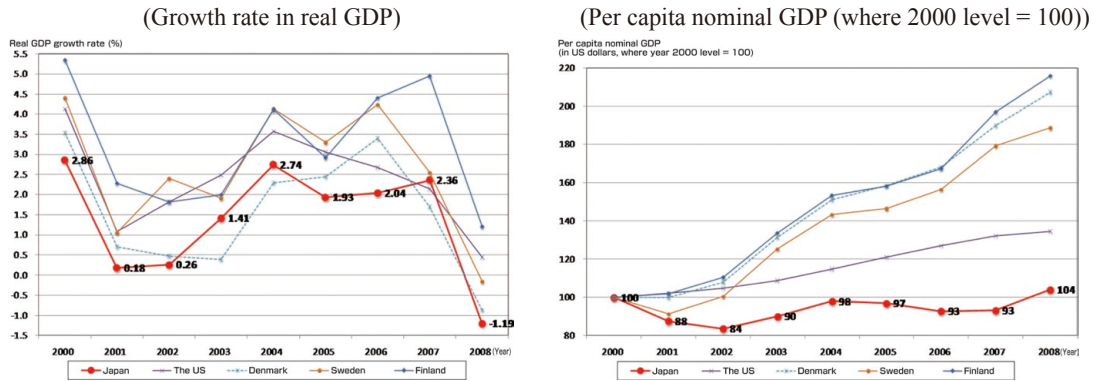
※ For the WEF "The Global Competitiveness Report", the rankings for the innovation-related index "Innovation and Sophistication Factors" are shown rather than the composite index

(Source) Compiled from Survey on Revitalization of Local Communities and Bolstering Competitiveness Through ICT (2010), Ministry of Internal Affairs and Communications

However, among those countries recognized as having a well-developed environment for innovation (Japan, the US, Denmark, Sweden, and Finland, all of which were in the top 10 in all three rankings), comparisons of economic growth rates (Figure 3-13, left side) since 2000 show that Japan's has been the lowest in a great number of years. Furthermore, in terms of the per capita nominal GDP (Figure 3-13, right side), while other countries' have been expanding at a good pace, Japan's alone has remained nearly stagnant. It would seem apparent that while Japan's environment for innovation is healthy, it is having a minimal effect on actual economic growth.

<sup>25</sup> The NAFTA member states are the US, Canada and Mexico

**Figure 3-13 Changes in growth rate in real GDP and per capita nominal GDP for countries recognized as having superior environment for innovation**



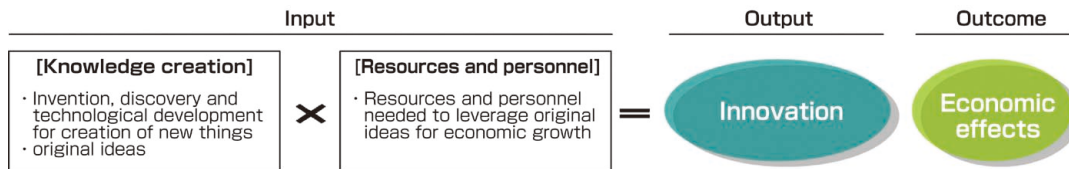
(Source) Compiled from IMF "World Economic Outlook Databases (April 2010 edition)"

**(2) Evaluation of environment for innovation using original criteria**

**A. Environment for innovation evaluation method**

With the above issues in mind, we have undertaken a quantitative evaluation using original criteria to determine the route by which Japan's environment for innovation exerts influence on the country's economy as a whole. The basic standpoint is that "for innovation to flourish, what is necessary is not only 'knowledge and creativity' such as original ideas, but also 'resources and personnel' that leverage ideas for economic growth." This evaluation evaluates environment for innovation indicators in three stages, input, output (direct effects), and outcome (final results).

**Figure 3-14 Basic standpoint for evaluation of the environment for innovation in this White Paper**



(Source) Compiled from Aoshima, Kusunoki "Innovation as a Means of Redefining Systems", Hitotsubashi Business Review (2008 SPR, Volume 55 No. 4), Toyo Keizai Inc.

As to the specific evaluation method used, after selecting 21 indicators from the indexes used in previous international surveys of environment for innovation, factor analysis<sup>26</sup> is used to extract the factors that have an influence on the environment for innovation, which are then taken as the input. At the same time, principal component analysis<sup>27</sup> is used to extract one indicator from the 21 indicators, which is then taken as the "output" that gives a boost to the environment for innovation as "total innovation strength." Finally, the per capita GDP and labor productivity are defined as the "outcome" summing up the overall economic impact of the nation as a whole. With consideration given to regional balance and availability of relevant data, etc., 29 countries were selected for evaluation<sup>28</sup>.

**B. Environment for innovation evaluation results**

Based on the above-described evaluation method, concrete values are given for input, output, and outcome respectively, and the correlations between them analyzed. For "input," the 21 environment for innovation indicators for the 29 evaluated countries were analyzed and five factors extracted: Factor 1, sustainable adaptability

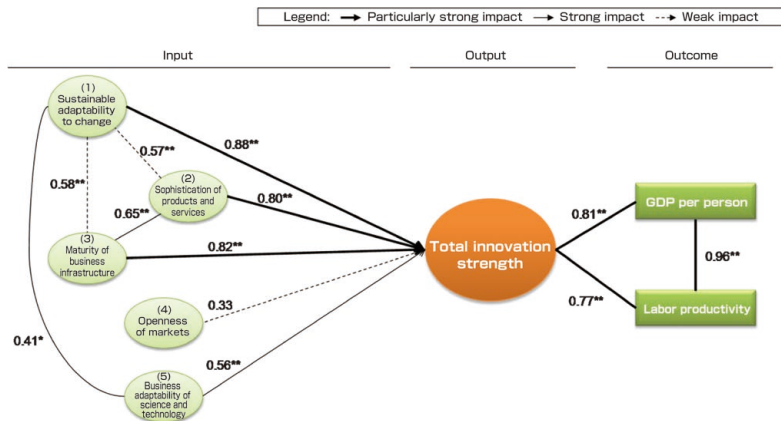
<sup>26</sup> A statistical method used to describe unobserved factors based on variability among a large number of observed variables  
<sup>27</sup> A statistical method that transforms a number of possibly correlated variables into one, or a smaller number of uncorrelated variables called principal components  
<sup>28</sup> 1) Japan 2) the US 3) The UK 4) South Korea 5) Singapore 6) Sweden 7) Denmark 8) Italy 9) India 10) Australia 11) Austria 12) The Netherlands 13) Canada 14) Belgium 15) Spain 16) Germany 17) Greece 18) Finland 19) Ireland 20) France 21) Poland 22) Portugal 23) Slovakia 24) Czech Republic 25) Hungary 26) Russia 27) China 28) Mexico and 29) Brazil.

to change; Factor 2, sophistication of products and services; Factor 3, maturity of business infrastructure; Factor 4, openness of markets; Factor 5, business adaptability of science and technology.

**C. Analysis of the relationships between input, output and outcome for the environment for innovation**

Examining the correlations between “total innovation strength” and input and outcome (Figure 3-15), the strongest correlation can be seen with three factors, Factor 1, sustainable adaptability to change; Factor 2, sophistication of products and services; and Factor 3, maturity of business infrastructure, with a strong correlation also seen with Factor 5, business adaptability of science and technology. There is also a notable correlation between “total innovation strength” and both “outcome” indicators, per capita GDP and labor productivity.

**Figure 3-15 Relationships between input, output and outcome for the environment for innovation**

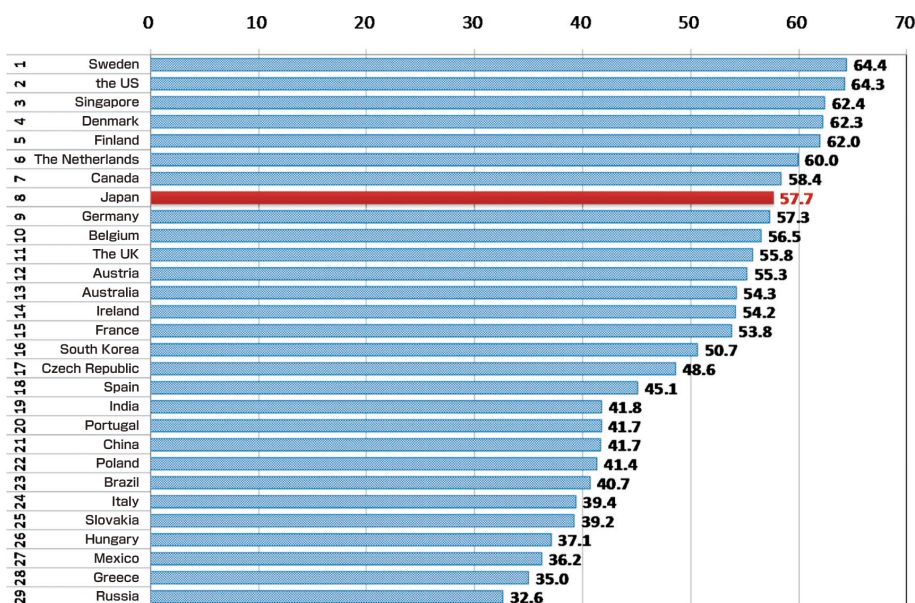


※ Values are correlation coefficients. \*\* indicates significance level of 1%, \* indicates significance level of 5%  
 (Source) Compiled from: Ministry of Internal Affairs and Communications “Research on Community Revitalization and International Competitiveness through the Application of ICT” (2010)

**D. Evaluation of output indicator “total innovation strength”**

In a comparison (Figure 3-16) of the deviation values for output indicator “total innovation strength,” extracted through principal component analysis from the 21 indicators related to the environment for innovation for 29 countries, Japan is ranked eighth. The numerical value for Japan was 57.7, whereas all of the five top-ranked countries had values over 60: Sweden (64.4), the US (64.3), Singapore (62.4), Denmark (62.3), Finland (62.0).

**Figure 3-16 29-country comparison of output indicator “total innovation strength”**



※ Values shown are deviation values  
 (Source) Compiled from Ministry of Internal Affairs and Communications “Research on Community Revitalization and International Competitiveness through the Application of ICT” (2010)

**E. Issues Japan faces in developing an effective environment for innovation**

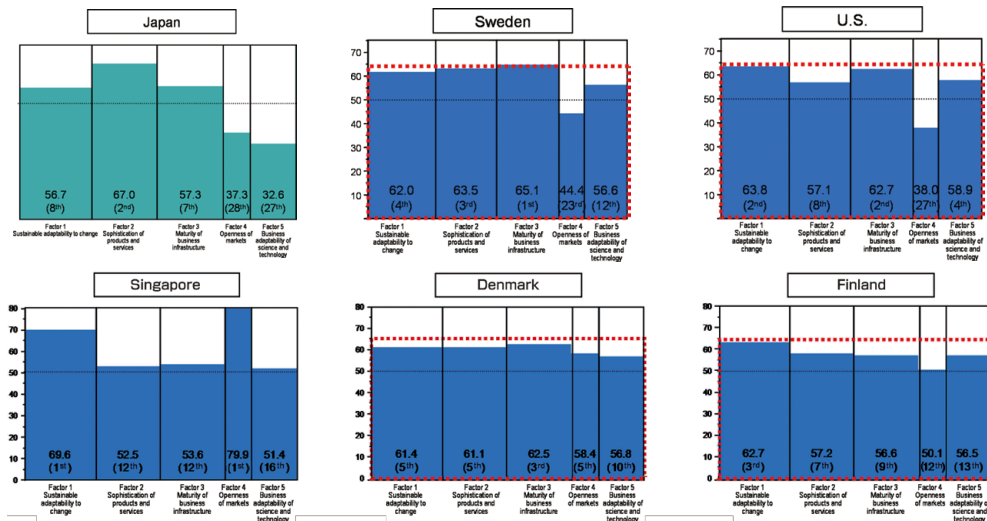
We may surmise that exerting efforts toward the improvement of Factors 1, 2, 3, and 5, which have a large horizontal axis width in the Figure below, in other words a large impact on “total innovation strength,” is an effective means of developing the environment for innovation. Further, regarding the correlation between input and output, a detailed comparison between Japan and the five countries with highest rankings for “total innovation strength” is shown in the upper part Figure 3-17, with the extent of influence of the various input factors on the output indicator “total innovation strength” as horizontal axis and the factor score deviation values for each factor for the 29 countries as vertical axis.

Sweden, the US, Denmark, and Finland all show high values for Factor 1, sustainable adaptability to change; Factor 2, sophistication of products and services; Factor 3, maturity of business infrastructure, and Factor 5, business adaptability of science and technology, with a good balance between them. Japan, on the other hand, while strong in Factor 2, sophistication of products and services, is one rank below the others for Factor 1, sustainable adaptability to change, and Factor 3, maturity of business infrastructure, and in terms of Factor 5, business adaptability of science and technology, is well below the average for the 29 countries surveyed.

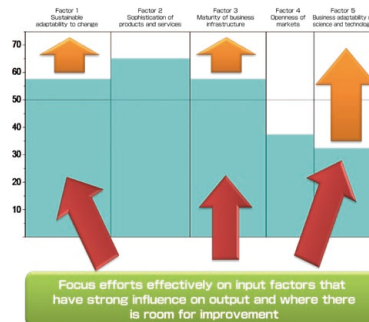
It follows that henceforth Japan must make concerted efforts towards improving Factor 1, sustainable adaptability to change; Factor 2, sophistication of products and services; Factor 3, maturity of business infrastructure, and Factor 5, business adaptability of science and technology, so as to boost “total innovation strength” and, consequently, achieve economic impact or “outcome,” (Figure 3-17, bottom part.)

With regards to these efforts, the indicators “maturity level of e-government” and “Internet utilization rate,” which have strong correlations with Factor 3, maturity of business infrastructure, can benefit directly from the promotion of ICT utilization. Also, indicators such as “rate of acquisition of talented human resources by corporations,” “corporate training and education,” and “quality of educational systems,” strongly correlated to Factor 1, sustainable adaptability to change, there is room for the positive benefits of ICT and a possibility of ICT making contributions in the future.

**Figure 3-17 Six-country comparison of correlation between input and output of environment for innovation and issues faced by Japan**



(Issues related to Japan’s environment for innovation)



(Source) Compiled from Ministry of Internal Affairs and Communications “Research on Community Revitalization and International Competitiveness through the Application of ICT” (2010)

## 2. Global expansion and development of products and services in cooperation with users

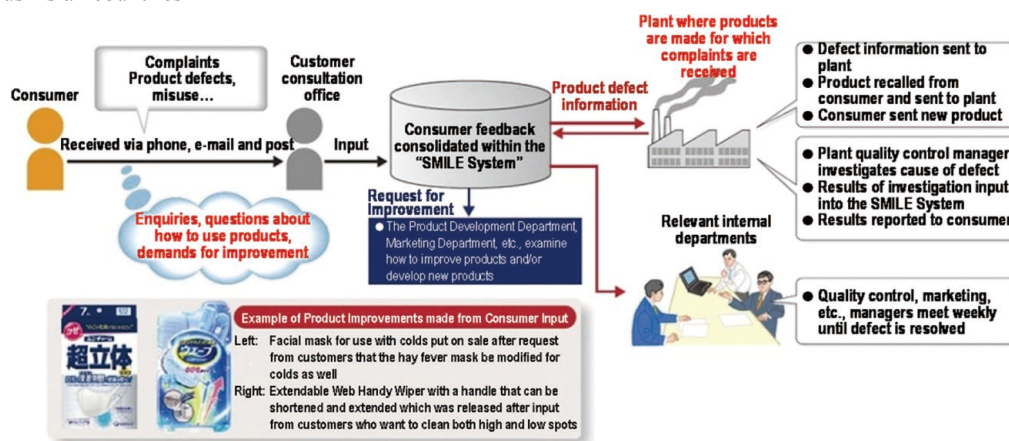
The creation of assets, services and innovations with uniquely Japanese high added value is vital not only for stimulating domestic demand, but overseas demand as well (in other words, global deployment). In terms of global markets, however, the key issue is to develop and supply products and services that bring high added value to users in other countries. Enhancement of communication with said users through ICT is seen as being an effective means of achieving this goal.

Let us examine the “SMILE System” of Unicharm Corporation (Figure 3-18) as an example of a Japanese corporate initiative that makes effective use of ICT, and makes effective use of UGD (User Generated Devices)<sup>29</sup> in collaboration with users for global deployment. Unicharm Corp. launched the SMILE System in April 2008 to consolidate the management of all phone calls, e-mails and letters, etc. the company receives from consumers including inquiries and complaints, and share this data not only with the customer service division but with all related divisions including plants and the marketing and research and development (R&D) divisions, putting them to use for product development. Many of the company’s products, such as diapers and surgical masks, come into direct contact with the skin, and product defects can cause customers to feel unpleasant and lead to product recalls and downgrading of the brand’s image. As a result, Unicharm adopts the philosophy that customer relations directly impact the company’s competitive power, and appropriate handling of all input from customers, be it complaints or requests, etc., is indispensable. The SMILE System is used to react immediately when a product defect occurs, and to share information with the R&D division that can help to generate product ideas. In some cases, products are updated at three-month intervals based on customer feedback. As 35% of Unicharm’s sales are overseas, the company has already expanded the SMILE System to China and Thailand and has plans to introduce it to Taiwan and Indonesia, aiming to achieve the “best customer service in all of Asia,” and to leverage this effective means of reflecting customer feedback in product development, and pursue further global deployment.

In the past, Japanese corporations pursued global deployment by putting down roots in other countries, putting in hard work and making every effort to localize. Exhibiting at international trade fairs was also an effective method, but in recent years the growing presence from Chinese, South Korean and other corporations has diminished that of Japanese corporations. Henceforth, these strategies will continue to be effective means of gauging the needs of overseas consumers and markets, and implementing timely product development, sales and marketing, but UGD cooperation with users using ICT is also an effective means, and in future will increase in importance not only for corporations’ domestic development, but for overseas expansion as well.

**Figure 3-18 The Unicharm SMILE System**

Unicharm is expanding the SMILE System, which shares input from consumers on products company-wide, in various Asian countries



(Source) Nikkei Computer (August 15, 2008)

<sup>29</sup> The following links to the first edition of “Nikkei Electronics (March 23, 2009)”: <http://techon.nikkeibp.co.jp/article/HONSHI/20090316/167277/>.

Users participate in the development of devices and services and build digital devices to their own specifications using functional hardware modules and software provided by manufacturers.

### 3. Global expansion utilizing Japan's strengths

In addition to tracking the preferences of local markets and reflecting them in product and service development, it is also essential to aim for global deployment in sectors and services in which Japan has strength.

Japan has experience and know-how in solving and overcoming various social issues, as an “issues leader” that has faced such problems as striking a balance between economic development and environmental protection / energy efficiency, construction of systems to deal with damage from natural disasters such as earthquakes, a low birth rate and an aging society. Other nations face similar problems, and Japan has the opportunity to incorporate ICT into the societal infrastructure built up in response to these issues and develop it into projects that can be pursued overseas, making a contribution to problem solving at a national level in Asia and elsewhere in the world. This entails not merely selling single technologies and products, but also marketing Japanese operation and management experience and know-how as part of a package, so as to secure a stable source of revenue over the long term.

One promising example of an area where Japan's problem-solving experience and know-how can be marketed overseas is the technology 1,100 kilovolt (kV) ultra-high voltage (UHV) technology used in smart grids.

The 1,100 kV UHV technology usable in smart grids developed in Japan over 30 years with the participation of electric power companies, manufacturers, etc., was adopted as an international standard by the International Electrotechnical Commission (IEC) in May 2009, making 1,100 kV one of the standard voltage values for international use.

1,100 kV UHV allows for bulk power transmission three to four times that of the 550 kV transmission lines currently in use in Japan, and makes it possible to reduce costs and boost energy efficiency through reduction of transmission routes and transmission loss. In addition, it is thought that UHV technology could have applications in smart grids, and that such applications, along with expansion in countries with massive energy demand such as China and India, could lead to further adoption as a standard and a share of a market said to be worth as much as one quadrillion yen over the next 20 years.

Furthermore, Japanese electric power companies have been lending technical cooperation to China, where energy demand is soaring and there is an urgent need for greater energy efficiency. Such ties with the massive Chinese market have helped influence the standardization process, helping to obtain the support of Germany and Sweden which had previously stood in opposition to Japan's 1,100 kV UHV transmission technology.

For Japan to boost its international competitiveness, it is vital to harness the nation's strengths, such as high technological development capabilities and accumulated technological achievements, experience in tackling issues such as environmental preservation, energy efficiency and disaster prevention, and geographical proximity to mainland Asia, which will henceforth take an increasingly central role on the world stage and has a strong need for such problem-solving experience as Japan possesses. It is clear that Japan must reappraise its geographical advantage in having close proximity to mainland Asia, which is exerting a growing global presence (particularly China and India), and make effective use of ICT and Japan's technology and experience to expand in these regions, cooperating with these Asian nations to overcome the problems they face and contribute to their growth. In this process, Japan as well can achieve sustainable growth over the long term.