

# Chapter 3

## Attaining Safe, Secure ICT Utilization Environment and R&D Strategy

Part 1

### Section 1 Big Data utilization and personal data

#### 1. Potential and problems of personal data utilization and distribution

##### (1) Current state and potential of personal data utilization and distribution

Personal data utilization has made rapid progress in various areas in Japan and other countries. In line with future technological development, new highly convenient personal data services are expected to emerge in the future.

As far as the disclosure of personal data to relevant persons, the obtainment of consent from specific persons to the utilization of their personal data and the use of anonymity technologies are appropriately implemented, personal data may be utilized with no privacy infringement problems being caused.

##### (2) Systems and initiatives for personal data utilization and distribution

###### a. Enactment of Personal Information Protection Act

The Act on the Protection of Personal Information (Law No. 57 of 2003) (hereinafter referred to as the Personal Information Protection Act) was enacted in May 2003 and took effect in April 2005. Simultaneously, the Act on the Protection of Personal Information Held by Administrative Organs and the Act on the Protection of Personal Information Held by Independent Administrative Agencies, etc. were enacted and implemented. In April 2004, the Cabinet made a decision on the Basic Policy on the Protection of Personal Information based on the Personal Information Protection Act.

###### b. MIC initiatives

In response to the full implementation of the Personal Information Protection Act, the MIC revised the Guidelines for Protection of Personal Information in the Telecommunications Business released in 1991 and established the Guidelines for Protection of Personal Information of Broadcast Receivers, the Guidelines for Personal Information Protection in the Postal Service Field and the Guidelines for Personal Information Pro-

tection in the Corresponding Delivery Service Field.

The MIC initiated a panel on problems regarding ICT services based on the viewpoint of users in April 2009 and provided proposals on personal data protection.

##### (3) Challenges for promoting appropriate utilization and distribution of personal data

###### a. Handling user information in smartphones

Smartphones are linked to their users more strongly than personal computers because users carry smartphones that remain switched on and connected with networks. Users' actions and communication history and other data are made available through smartphones. Since around the summer of 2011, many media reports have emerged on cases where the handling of user information in smartphones became controversial, leading smartphone users to become interested in the matter.

###### b. Challenges for utilization of personal data in Japan

The utilization of personal data causes privacy problems when data are linked strongly to specific persons. Difficult problems regarding how to handle personal data are highly likely to emerge when it is difficult to decide how strong the linkage of personal data with specific persons is in the course of personal data utilization and distribution.

In the secondary and tertiary utilization of personal data, particularly, the linkage of these data with specific persons, though weak in the primary utilization, could grow stronger with more information accumulated and analyzed to allow these persons to be identified. In such case, it may be difficult to decide whether the utilization could run counter to privacy rules. Since secondary or tertiary users alone have difficulties in obtaining relevant persons' consent to the utilization, the overall mechanism for the utilization of personal data must be designed to secure the appropriate handling of data.

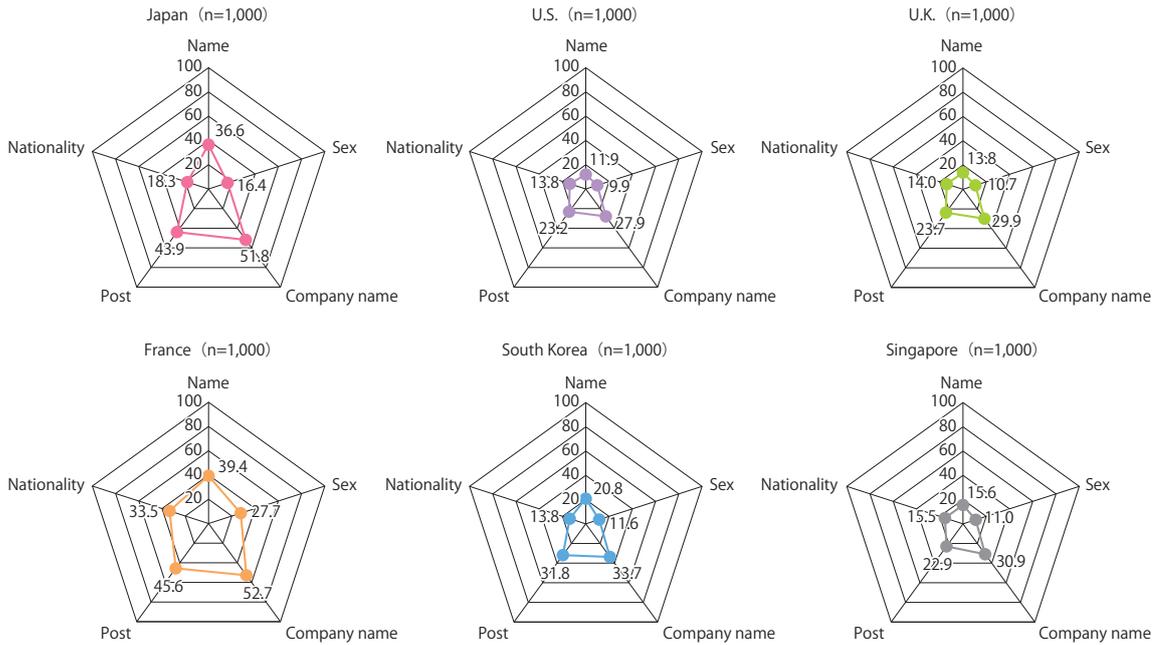
#### 2. International comparison of personal data users' consciousness of data treatment

##### (1) Perceptions about personal data handling

Personal data that should be protected might have different degrees of privacy, ranging from names that are usually published to information that relevant persons would like to keep unavailable to other persons.

In a survey on personal data users' perceptions, respondents were asked about how they perceive personal data subject to protection. Personal data were then divided into three groups – (1) ordinary personal data (personal data with a lower degree of privacy), (2) per-

**Figure 3-1-2-1 Data that people are reluctant to provide or publish in any case (ordinary personal data)**



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

sonal data subject to prudent handling (personal data with a high degree of privacy) and (3) sensitive data (personal data with a very high degree of privacy). Users' perceptions about each group of personal data were compared.

**a. Ordinary personal data**

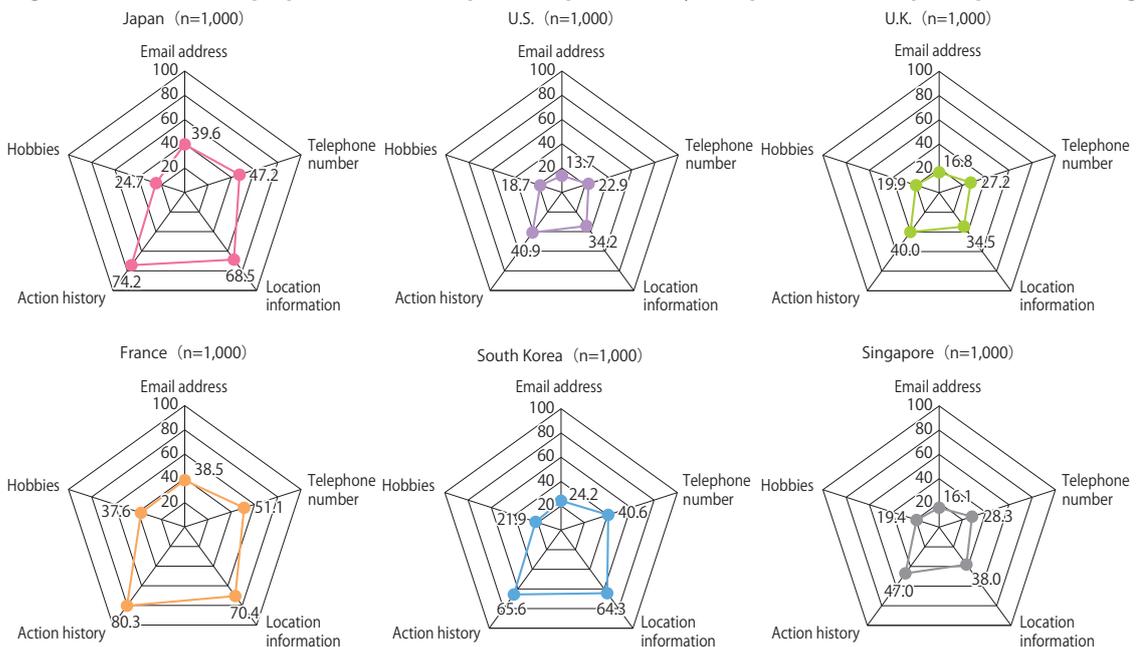
Percentage shares for respondents answering that they are reluctant to provide or publish ordinary personal data in any case are generally low in the countries

subject to the survey. But the shares in France are higher than in the other countries (Figure 3-1-2-1).

**b. Personal data subject to prudent handling**

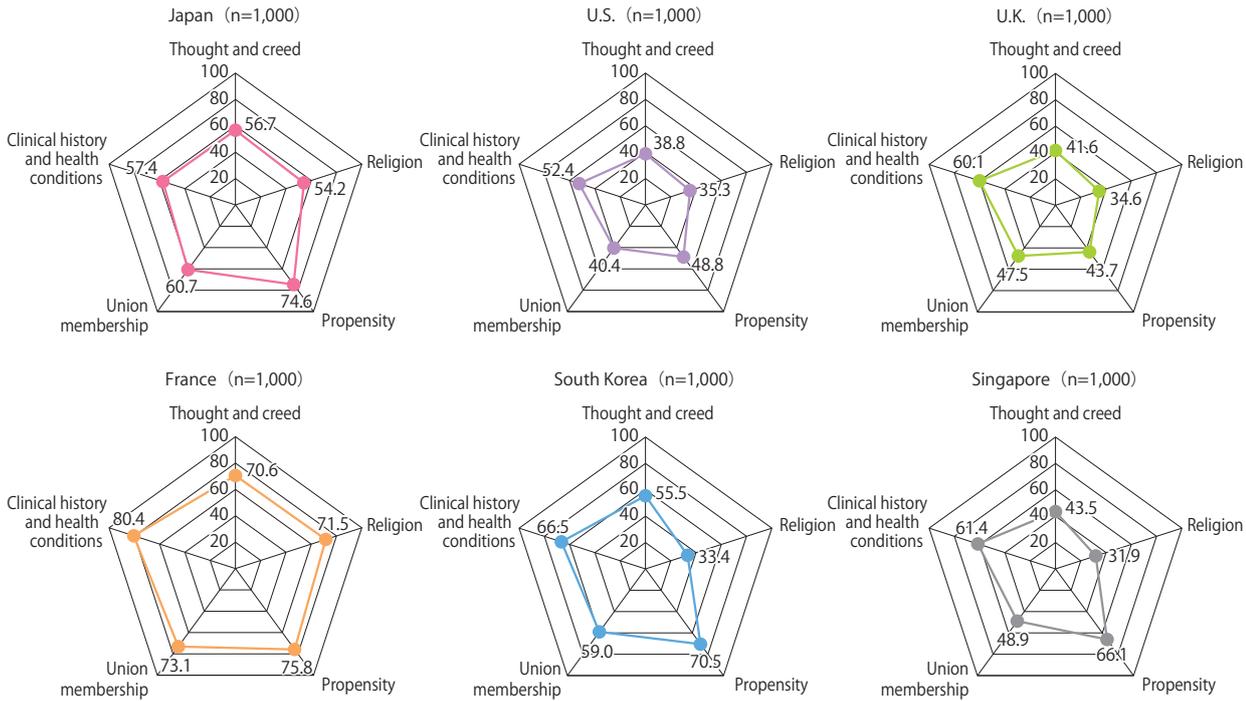
Percentage shares for respondents answering that they are reluctant to provide or publish their email address and hobbies among personal data subject to prudent handling are relatively low in all of the countries. But such shares regarding location information and action history are relatively high (Figure 3-1-2-2). A com-

**Figure 3-1-2-2 Data that people are reluctant to provide or publish in any case (personal data subject to prudent handling)**



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

**Figure 3-1-2-3 Data that people are reluctant to provide or publish in any case (sensitive data)**



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

comparison of country-by-country survey results indicates that shares for those answering that they are reluctant to provide or publish personal data subject to prudent handling are higher in Japan, France and South Korea than in the other countries.

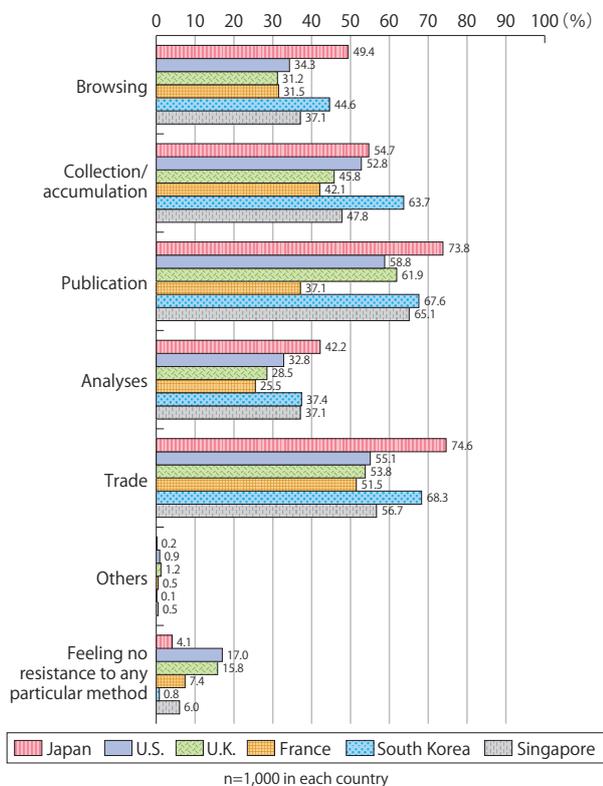
**c. Sensitive data**

Percentage shares for respondents answering that they are reluctant to provide or publish sensitive data are higher than those for the other two groups of personal data in all of the countries. Shares regarding sensitive data are relatively low in the United States and the United Kingdom and relatively high in France, as is the case with ordinary personal data or personal data subject to prudent handling (Figure 3-1-2-3). In the United States, the United Kingdom and France, shares for those answering that they are reluctant to provide or publish clinical history and health conditions among the five categories of sensitive data are higher than those for the other categories. In Japan, South Korea and Singapore, the shares regarding propensity are the highest.

**(2) Service users' perceptions about service providers' utilization of personal data**

When service providers ask service users to give personal data to be utilized by those service providers for improving services, those users may feel resistance against some utilization methods. We conducted a survey on specific utilization methods subject to resistance in the six countries and compared the survey results. The results indicate that percentage shares for respondents feeling resistance against each of the utilization methods including browsing, collection/accumulation, publication, analyses and trade in Japan are higher than

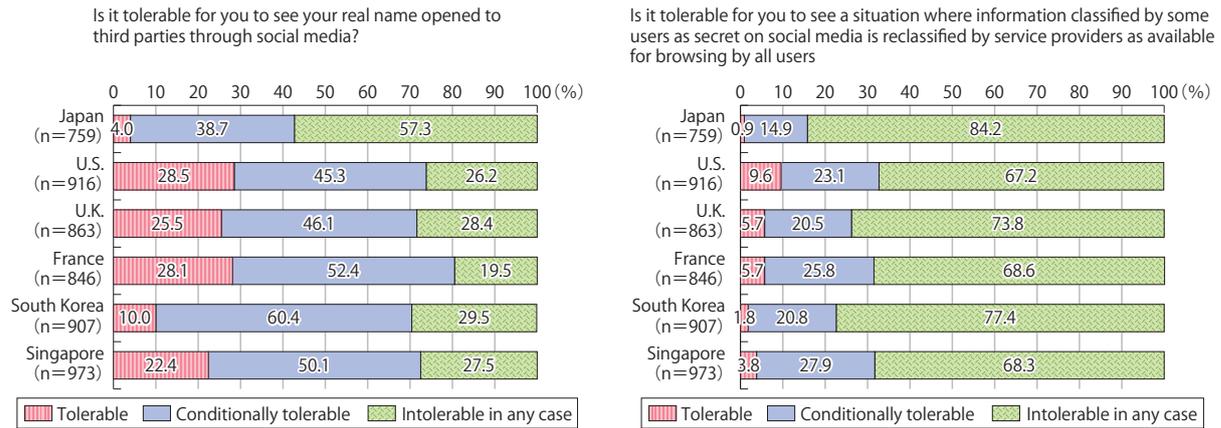
**Figure 3-1-2-4 Service providers' methods for utilization of service users' personal data against which users feel resistance**



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

in the other countries (Figure 3-1-2-4).

**Figure 3-1-2-5 Tolerable range of personal data treatment (during social media use)**



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

**(3) Tolerable range of personal data treatment**

**a. Perceptions about personal data treatment during social media use**

The international survey indicates that the percentage share in Japan for respondents who cannot tolerate the publication of their names by third parties through social media in any case is far higher than in the other countries. Percentage shares are high in all of the countries for those who cannot tolerate a situation where information classified by some users as secret on social media are reclassified by service providers as available for browsing by all users (Figure 3-1-2-5).

In all of the countries, percentage shares for "tolerate personal data being utilized or distributed" are the highest in the case where "users give explicit consent." While Western shares reach around 50%, Asian shares are limited to around 30%.

Given the above survey results, Japanese service users' perceptions about service providers' utilization of their personal data can be summarized as follows. The percentage share for service users who are reluctant to have their personal data published in any case in Japan is higher than in the United States and the United Kingdom. The shares for those feeling resistance against various utilization methods such as browsing, opening, analyses and trade in Japan are higher. These results indicate that any border between legal and illegal actions for the utilization of personal data tends to be vague in Japan.

**b. Perceptions about Big Data-related services**

In the questionnaire survey, respondents were also asked about users' perceptions about Big Data-related services (Figure 3-1-2-6). The survey results indicate that users feel less resistance against personal data treatment that is specific and advantageous for users from the viewpoint of security and safety.

As to conditions for supplying personal data to service providers, respondents in the survey generally answered that they may supply such data to service providers in "cases where the service providers are reliable." But Japan features high percentage shares above 50% for "cases where economic advantages are gained through personal data supply" and "cases where convenience is improved through personal data supply."

**(4) Conditions for supplying personal data to service providers**

Questioned about conditions for supplying personal data to service providers in the survey, many respondents in all of the countries answered that they may supply such data to service providers in "cases where the service providers are reliable." (Figure 3-1-2-7)

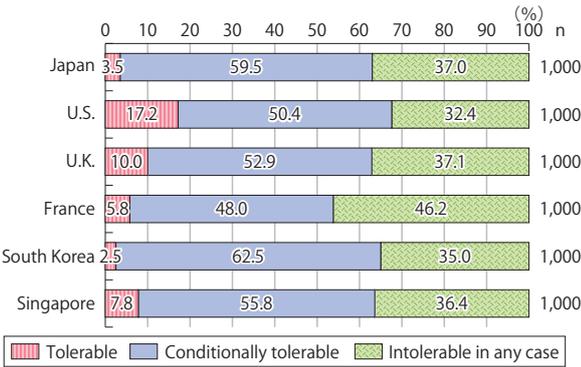
Regarding conditions for service providers' registration, utilization or distribution of service users' personal data, service users in the survey were asked whether they would tolerate personal data being utilized or distributed in specific cases. The survey results show that 20-30% in Japan would tolerate their personal data being utilized or distributed with the condition of their explicit consent, and anonymizing or coding of data.

**(5) Conditions for utilization or distribution of personal data**

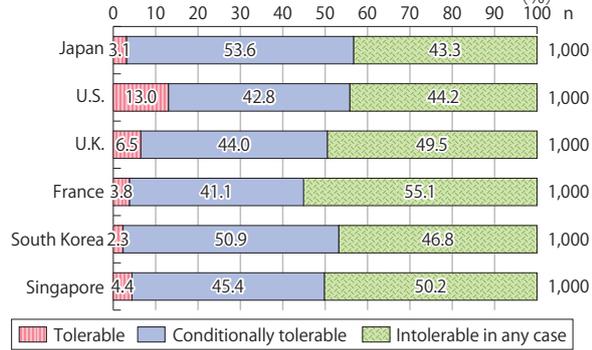
Regarding conditions for service providers' utilization or distribution of service users' personal data, service users in the six countries were asked whether they would tolerate personal data being utilized or distributed in four cases. Figure 3-1-2-8 illustrates the relationship between percentage shares for those who "tolerate personal data being utilized or distributed" and those who "do not tolerate personal data being utilized or distributed."

**Figure 3-1-2-6 Tolerable range of personal data treatment (Big Data-related services)**

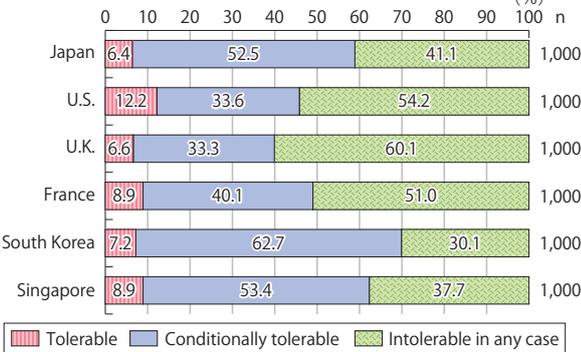
Personal data registered for different services including social media and e-commerce services are linked together



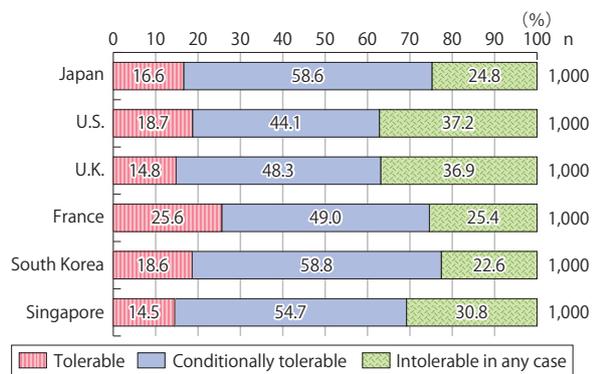
Personal data registered for a membership registration service are used by providers of other services including e-commerce, healthcare and video-browsing services



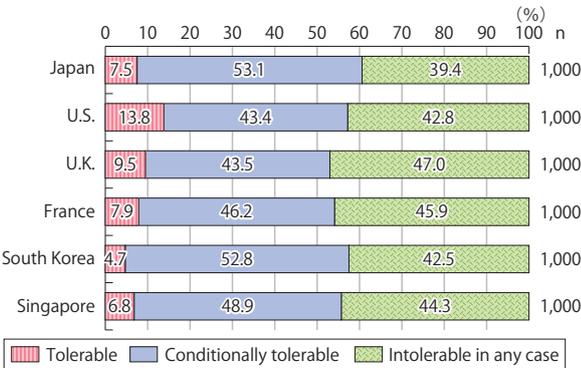
Location information acquired from smartphones and other terminals is used for providing information on recommended restaurants and shops around relevant locations



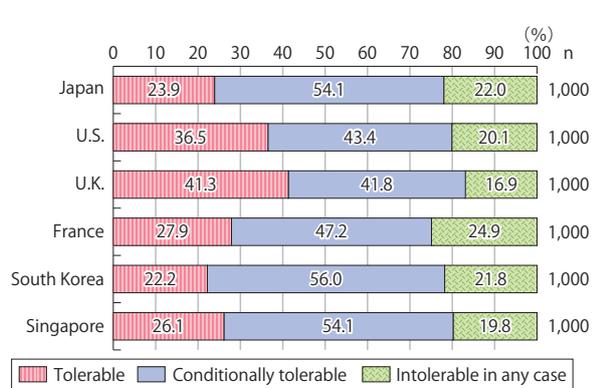
Collecting data from running vehicles for figuring out traffic conditions and dangerous locations



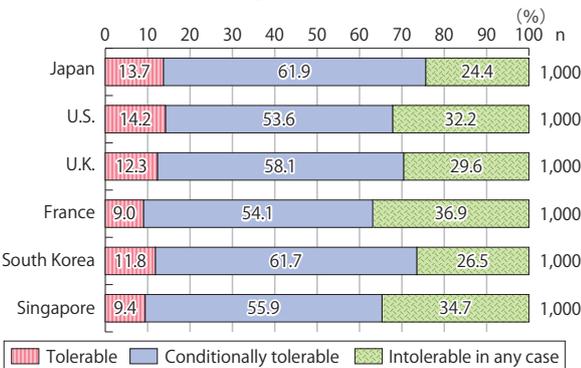
Collecting data from running vehicles for enterprises to design auto insurance products



Installing many surveillance cameras for crime prevention purposes

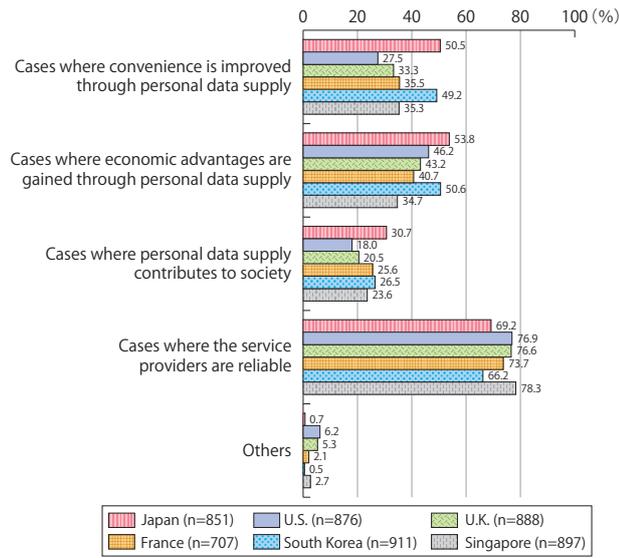


Using medical information (including patients' personal data) for developing medical services



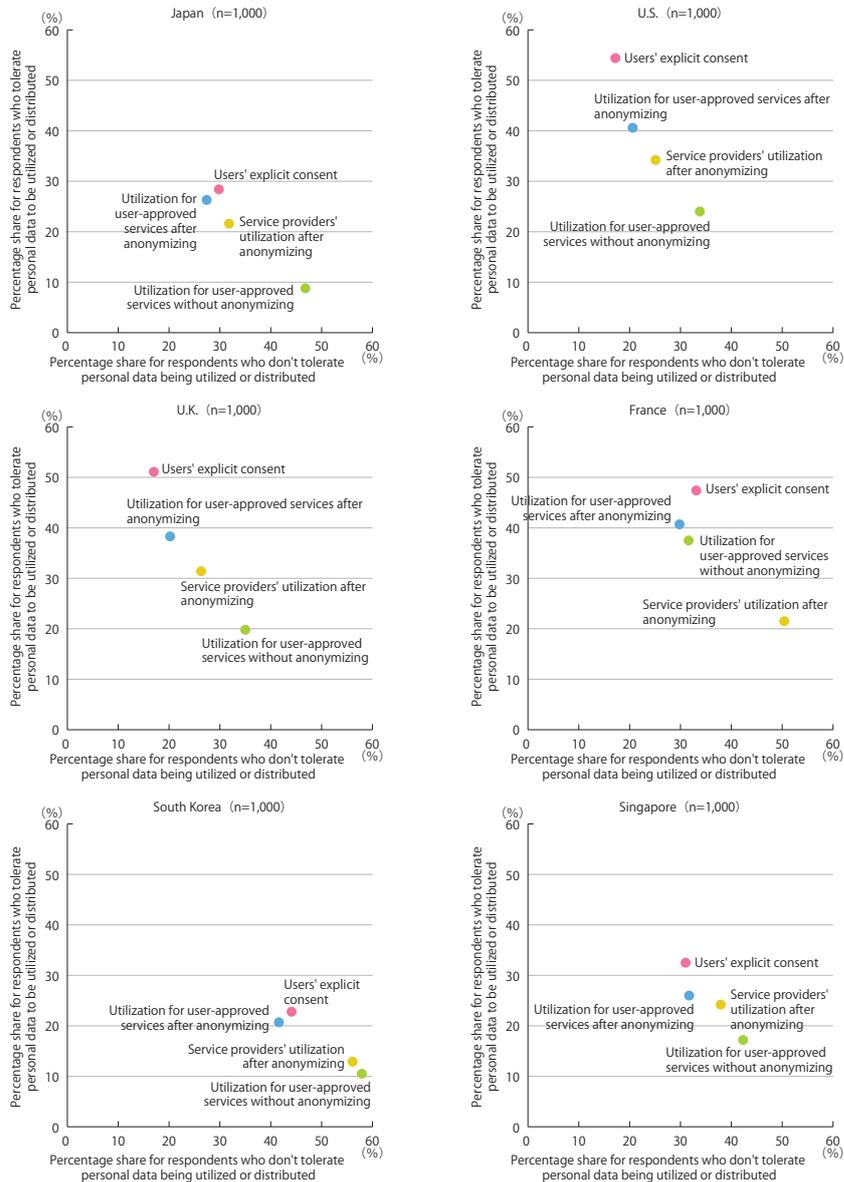
(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

Figure 3-1-2-7 Conditions for supplying personal data to service providers



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

Figure 3-1-2-8 Conditions for utilization or distribution of personal data



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

### 3. Government initiatives

#### (1) Strategic Headquarters initiatives

On personal data treatment, the Declaration towards Creating a World-leading IT Nation, adopted by the Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society in June 2013, states (1) that business environments should be developed to harmonize the utilization of personal data with the protection of personal information and privacy to facilitate the utilization, (2) that Japan should use the OECD (Organisation for Economic Cooperation and Development) and other international negotiations and promote international cooperation, as the standardization of rules on privacy and information security, the improvement of convenience through the creation of international mechanisms and the smooth cross-border transfer of information are important for business environment development, and (3) that the diffusion of personal data utilization should be promoted in Smartphone and other areas where rules for handling user information have already been created.

The declaration also urges the Strategic Headquarters to promptly create a new panel to specify rules for utilizing personal data while giving consideration to the

protection of personal information and privacy and to launch initiatives as early as possible within 2013 to revise personal information protection guidelines and standardize procedures for obtaining consent for the utilization. Another new panel is planned to develop guidelines (including a roadmap) within the year for institutional reforms including the creation of third-party organizations and new legal measures.

From 2014 on, the government will develop personal data utilization environments in line with the roadmap in the institutional reform guidelines to promote the utilization, while giving considerations to international cooperation, according to the declaration.

#### (2) MIC initiatives -- Creating personal data utilization and distribution panel

In November 2012, the MIC initiated a panel on the utilization and distribution of personal data. Its report proposed a framework for the utilization of personal data and policies for its realization to specify personal data utilization rules for promoting the appropriate utilization and distribution of personal data.

## Section 2 Information security and safe, secure information utilization

### 1. Cyber attacks growing more sophisticated and complicated

#### (1) Trend of threats to information security

At present, the malware types registered in databases at information security vendors are rapidly increasing, while external attacks including malware infection and hacking are accounting for a high share of causes of information leakage and infringement incidents. In this

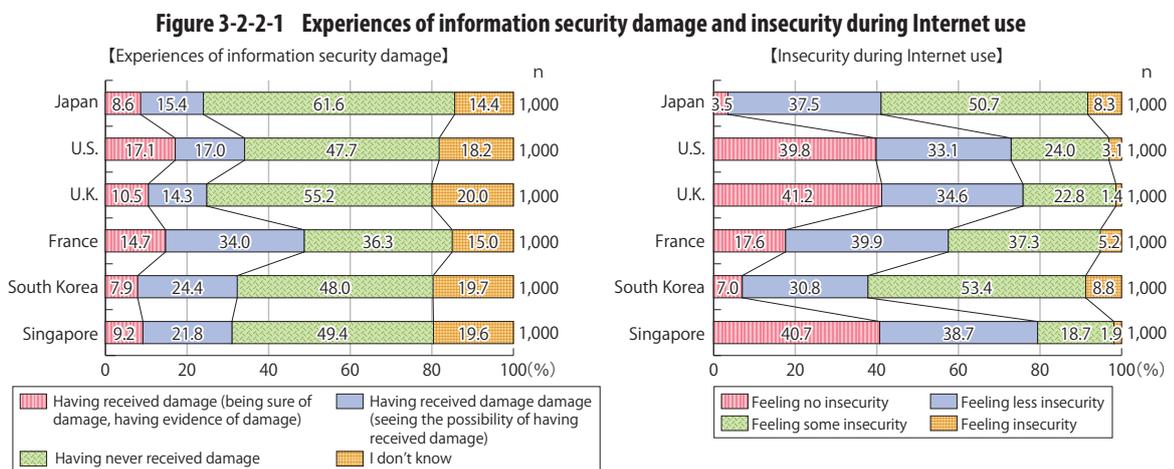
way, threats to information security around us are growing more serious. Recent cyber attacks have ranged wide, targeting from state secrets to personal information and money. The time has come for individuals as well as government agencies and enterprises to take more information security measures.

### 2. Information users' consciousness of information security

#### (1) Experiences of information security damage and insecurity during Internet use

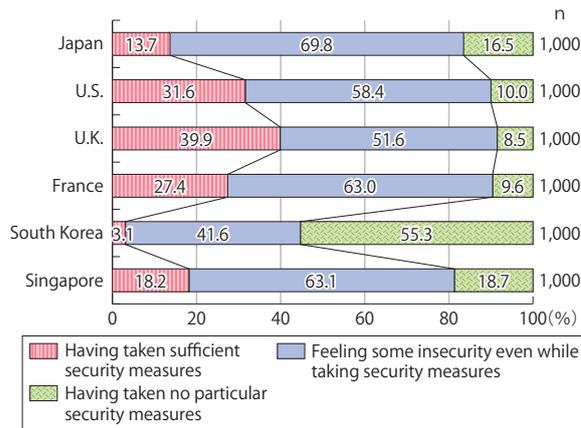
Questioned whether they incurred information secu-

rity damage during their Internet use, those answering that they were sure or had evidence of damage and those answering that they saw the possibility of having



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

**Figure 3-2-2-2 Implementation of information security measures**



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

received damage accounted for 48.7% of respondents in the survey in France. The French share is the highest among the six countries, followed by 34.1% in the United States and 32.3% in South Korea. The percentage share for respondents answering that they had never received damage came to 61.6% in Japan, the highest among the six countries.

About insecurity during Internet use, those feeling insecurity and those feeling some insecurity accounted for 62.2% of respondents in the survey in South Korea. The share is the highest among the six countries, followed by 59.0% in Japan and 42.5% in France. South Korea and France have more respondents who received information security damage and felt insecurity during Internet use. In Japan, more respondents felt insecurity, although more received no damage (Figure 3-2-2-1).

**(2) Implementation of information security measures**

Questioned about information security measures in the survey in the six countries, those having taken no measures accounted for a majority of 55.3% of respondents in South Korea, but those who had taken security measures and were still feeling insecurity commanded majority shares in the other five countries. In Japan, particularly, about 70% answered that they had taken security measures and were still feeling insecurity. In the United States and the United Kingdom, more than 30%

answered that they had taken sufficient security measures (Figure 3-2-2-2).

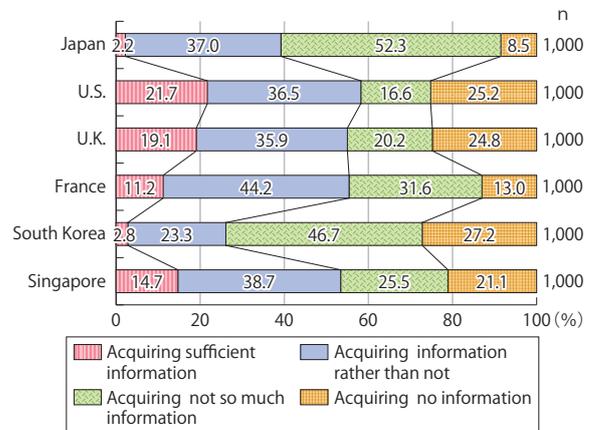
**(3) Smartphone information security**

Japan has published the so-called Three Articles on Smartphone Information Security and is working to enlighten citizens about the articles. In the survey, respondents in the six countries were asked about their awareness of the three articles – "updating OS and applications," "introducing anti-virus software" and "confirming safety of applications to be installed." The survey results indicate that respondents in Japan are more aware of all three than in the other countries (Figure 3-2-2-3).

**(4) Information security literacy**

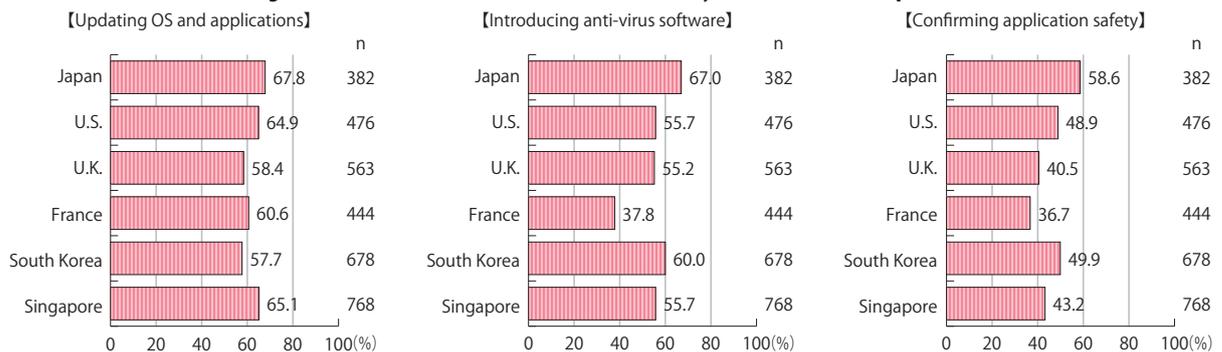
Questioned whether they had acquired information about information security, more than 50% of respondents answered yes in the United States, the United Kingdom, France and Singapore. In contrast, the corresponding percentage shares in Japan and South Korea slipped below 40% (Figure 3-2-2-4).

**Figure 3-2-2-4 Acquiring information about information security measures**



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

**Figure 3-2-2-3 Awareness of information security measures for smartphones**



(Source) MIC "Survey Research on New Challenges for Advancement of ICT Infrastructure and Services" (2013)

### 3. Information security initiatives in Japan

#### (1) Creation of new information security strategy

As the environment surrounding Japan's information security has rapidly changed with progress being made in the fusion or integration of cyber and real spaces, cyber space risks have expanded, dispersed and become global. Given the serious environmental changes, the Information Security Policy Conference in June 2013 decided a cyber security strategy calling for realizing a cyber security-oriented country by building a world-leading resilient, vigorous cyber space to ensure national security and crisis management, social and economic development and the people's safety and security.

#### (2) Consultations with foreign countries and regions on information security

Japan has vigorously discussed the possibility of bilateral information exchange and cooperation, and other topics at bilateral meetings with foreign countries and regions (the United States, the United Kingdom, the European Union, the Association of Southeast Asian Nations and India) on information security.

#### (3) MIC initiatives

##### a. Initiating Information Security Advisory Board

In order to receive advice from experts to allow the public and private sectors to effectively address rapidly changing information security challenges and contribute to Japan's economic growth, the MIC initiated the Information Security Advisory Board in March 2013 to consider a future information security policy. In April, it compiled a proposal on the MIC's information security policy promotion.

##### b. Public-private cooperation

In order to contribute to preventing cyber attack damage from expanding, the entire government has made information-sharing arrangements with key infrastructure operators through CEPTOAR (Capability for Engineering of Protection, Technical Operation, Analysis and Response). The MIC has promoted cooperation with relevant people for the key information and communications infrastructure and local governments and with the National Institute of Information and Communications Technology (NICT) in sharing information and enhancing measures against cyber attacks.

In July 2012, the MIC and METI created the Cyber Attack Analysis Council jointly with four relevant organizations – NICT, the Information-Technology Promotion

Agency (IPA), the Japan Data Communications Association's Telecom-ISAC Japan and the Japan Computer Emergency Response Team Coordination Center – to promote information sharing and advanced analyses about cyber attacks. Furthermore, the MIC has launched measures to collect and analyze cyber attack information, build network protection models based on analyses and implement practical public-private exercises for protection from cyber attacks.

##### c. International cooperation

Since any single country or organization has difficulties in addressing the increasing cross-border cyber attacks, international cooperation is important. The MIC has cooperated with Internet service providers and universities in Japan and foreign countries in building international networks to collect information about DDoS (Distributed Denial of Service) and other cyber attacks and malware. The MIC has also cooperated with foreign countries to conduct research and development, and demonstration tests for technologies for predicting and responding quickly to cyber attacks under the PRACTICE (Proactive Response against Cyber Attacks through International Collaborative Exchange) project. The ministry has launched such cooperation with the United States, ASEAN and others.

##### d. Diffusion and enlightenment

As smartphone, SNS, wireless LAN and other new information and communications services have penetrated into society, fraudulent and other actions to take advantage of these services have caused damage. Therefore, it is important for each service user to understand the characteristics of these services and acquire knowledge for their safe and secure use (information security literacy).

Since FY2003, the MIC has operated the Information Security Website for the People where information security knowledge is explained in an easy-to-understand manner. Based on the latest trends of services and threats to information security, the MIC renewed the website in April 2013.

As for wireless LAN services that have been growingly used, information theft and other security challenges have been reported. In response, the MIC has drafted and published a guidebook for promoting the safe, secure use of wireless LAN services.

## Section 3 R&D to promote ICT innovation

### 1. Present situation and challenges for innovation creation

Innovations can be divided into two categories – “sustainable innovations” through the improvement of traditional products and services, and “disruptive innovations” for destroying values of traditional products and

services. At the same time, innovations are divided into two groups by approach – “product innovations” to develop new products for their differentiation and “process innovations” to implement new processes for the differ-

entiation of products.

Japan's economic development has apparently been led by sustainable innovations where Japan has caught up with forerunners and obtained greater competitiveness through process innovations centering on improvements and product innovations represented by smaller, lighter devices such as transistor radios and headphone stereos.

Meanwhile, economic globalization has made progress, with many technologies commoditized. As a result, competitiveness obtained through sustainable innovations has become easier to be caught up with. In fact, Japan's competitiveness in innovations has weakened year by year.

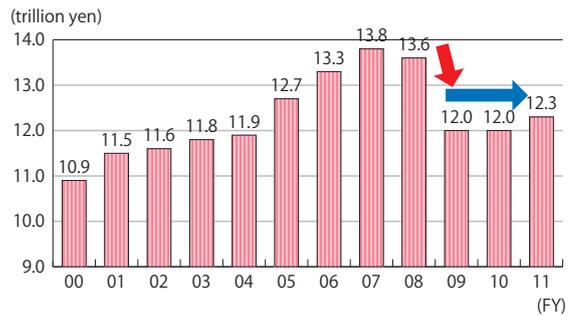
In order to achieve further economic growth stably, therefore, the creation of disruptive innovations is required.

**(1) Slumping R&D investment**

Japan's research and development investment, which has been led by private sector enterprises, has declined rapidly since the Lehman Shock (Figure 3-3-1-1). Private R&D investment now centers on large enterprises' internal investment. Risk money investment in ventures, small and medium-sized enterprises, universities and other third parties has been limited.

The government's R&D investment excluding supplementary budget expenditures has remained flat (Figure 3-3-1-2).

**Figure 3-3-1-1 Corporate R&D investment trends**



(Source) MIC "2012 Science and Technology Research Survey"

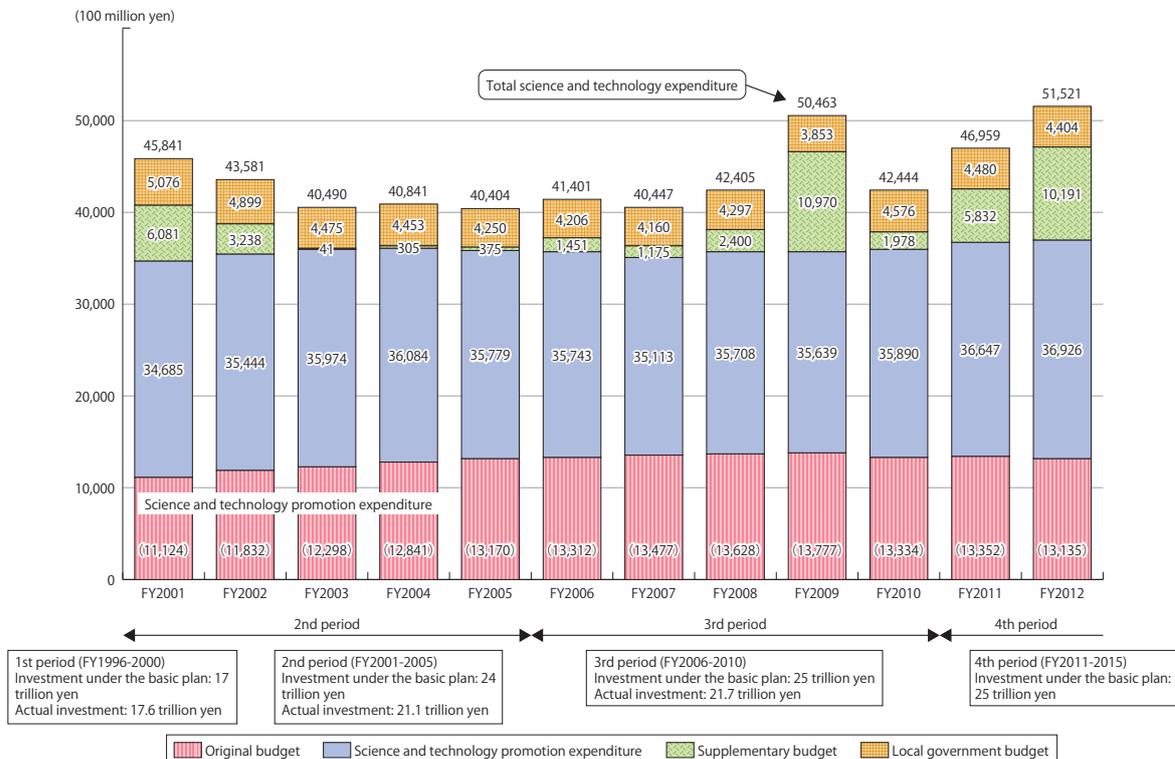
**(2) Sticking to independence-oriented approaches**

Japan's industry features fierce domestic competition. In Western countries and South Korea, however, a small number of enterprises are very competitive in each area and monopolize key technologies. Large Japanese enterprises have made less effort to acquire technology-leading ventures and SMEs, purchase technologies from other firms or universities, or undertake global joint R&D projects.

**(3) Human resources shortages**

In Japan, there are less science-based human resources who create technologies to realize innovations than in other countries. There are far less highly educated ICT human resources in Japan. While women's viewpoints are required to produce new technologies, women's share in science-based human resources is still small.

**Figure 3-3-1-2 Science and technology budget trends**



(Notes)

1. The science and technology promotion expenditure is on an original budget basis.
2. The local government expenditure for FY2012 is a preliminary figure given in February 2013.

(Source) Cabinet Office Website

Japan has few people who can select promising technologies for new businesses or industries while figuring out market needs. Japanese are weak in developing new technologies into new businesses or industries.

#### **(4) Lagging behind in developing intellectual property strategies**

Japanese enterprises' measures to secure patents and other intellectual properties have been centered on defensive ones including those to allow their products to be provided to others. They have been less ambitious to take advantage of intellectual properties as business resources. As a result, they have not sufficiently utilized intellectual properties.

Costly, time-consuming international patent applications have remained slack. Such applications by Japanese, if any, are relatively slower than global R&D moves.

#### **(5) Structural social obstacles**

##### **a. Venture business development infrastructure shortages**

While ventures and other new organizations can make effective efforts to produce disruptive innovations, it has been difficult to find ventures in Japan due to high business startup risks, shortages of risk money including venture capital funds, and limited opportunities for entrepreneurs to meet their supporters.

Ventures for their part lack new market exploration efforts. Many of them tend not to fully consider their business concepts or competitive advantages before their startup. Japan also lacks infrastructure for large enterprises to take advantage of ventures' achievements through alliances or M&As. Ventures depend heavily on initial public offerings as an exit to growth. As a result, many ventures disappear before becoming able to go public.

##### **b. Cultural and institutional obstacles to innovations**

As Japan's present business culture gives priority to periodic profit or loss, enterprises have difficulties in initiating unproven business models. Specific products or services are required in the screening process for commercializing technologies. Commercialization is difficult unless legal problems are solved. It is thus difficult to pursue disruptive innovations in Japan.

As the mark-to-market accounting system has been globally introduced over recent years, the entire society has tended to pursue short-term achievements. Under such circumstances, long-term business efforts might have declined in the absence of fund providers for long-term R&D projects in the private sector in Japan. This could be a background factor behind lack of disruptive innovations.

## **2. Steps for innovation creation in Japan**

### **(1) Direction of solutions to challenges**

The Innovation Creation Subcommittee has drafted an interim report on solutions to the abovementioned challenges for realizing the creation of disruptive innovations originating from Japan, calling for the entire nation to (1) create new technologies and services, (2) utilize technologies from the viewpoint of potential needs, (3) shift away from independence-oriented or self-contained approaches, and (4) develop the environment for promoting the creation of innovations.

### **(2) Specific government initiatives**

The direction of solutions to challenges indicates that in order to realize the creation of disruptive innovations originating from Japan, the government will have to consider five initiatives – (1) to support efforts to create new technologies and services, (2) to support eco-system formation, (3) to promote preemptive projects to absorb social needs, (4) to build a remarkably excellent environment for inducing innovations, and (5) to guide the private sector to vitalize risk money investment.

### **(3) Technology areas for future initiatives**

Although the above focused on how best to pursue disruptive innovations, sustainable innovations also remain important. Since peripheral supportive technologies as well as unique technologies are required for realizing disruptive innovations, Japan will have to develop a wide range of technologies.

The Innovation Creation Subcommittee, based on its discussions, has divided present and future priority technology areas into two groups – application technologies for solving challenges and ICT-supporting infrastructure technologies for realizing applications.