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# *Overview of IT Statistics in Japan*[1]

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## Abstract

This paper presents a framework for systematically collecting information technology (IT) statistics we have developed for compiling a new statistical compendium on IT. In developing this framework, we took account of the discussion on e-commerce at the OECD, and have introduced three aspects to capture the development of IT: infrastructure, usage and impact. The three aspects were inspired by readiness, intensity and impact proposed in the OECD discussion. In the framework, IT statistics are categorized into the supply side and the demand side. The latter is composed of four sectors: household, enterprise, government and school.

Using this framework, we have collected statistics concerning IT in Japan for the compendium. In the process we found that statistics on infrastructure are generally well covered by administrative data from policy departments concerned and by the supply side data, while statistics on usage and impact are insufficient. In addition, we found problems such as inaccuracy and lack of standard definitions and classifications with respect to some of the currently available IT statistics.

To fulfill the needs for IT statistics, the Statistics Bureau of Japan and other statistical agencies are planning to collect and compile IT related statistics mainly by adding new questions on IT to the existing statistical surveys. It is expected that these actions will improve and strengthen IT statistics. Some of the actions to be taken within next few years are outlined in the paper.

## 1 Introduction

Statistical needs to grasp the present state of IT usage and its influence have been increasing in Japan, which stems from anticipation that the development of IT would bring about big impacts on various fields of society and economy. In response to the statistical needs, the Statistical Training Institute (STI) has developed a framework for systematically collecting information technology (IT) statistics as a basis to compile a new statistical compendium entitled *IT Indicators in Japan*. The STI is responsible for compiling the Japan Statistical Yearbook and other major official statistical compendia of the Japanese Government, but it has not compiled any on IT statistics data before.

One of the motivations to develop this framework was to meet the new policy initiative of the Japanese Government entitled *e-Japan Strategy* adopted in January 2001 with an aim to achieve advanced information and telecommunications network society as a crucial target for the nation in the 21st century. Prior to the adoption, the Government enacted in November 2000 the *Basic Law on Formation of an*

[1] The views expressed herein are those of the authors, and are not necessarily those of the Statistical Training Institute or any other Japanese government ministries.
[2] The Statistical Training Institute is a brother organization of the SBJ under the MPHPT. The Institute undertakes not only provision of statistical training to officials of central and local government, but also compilation of statistical compendia and research on statistics in collaboration with the SBJ.

*Advanced Information and Telecommunications Network Society*, which obliges the Government to compile and publish statistics concerning IT. The Government has set up a website[3] on its IT Policy in the homepage of the Official Residence of the Prime Minister. It displays a collection of statistical data to measure the policy targets presented in the *e-Japan Priority Policy Program* for promoting IT revolution. It also provides hyperlinks to IT related statistics and documents.

The collection of the statistical data in the IT Policy Website is policy oriented, and would be useful to measure the degree of the achievement of the IT policy targets. But the data collection based on the *e-Japan Priority Policy Program* is not comprehensive enough to grasp the new development in IT as a whole, because the *Program* has a strong emphasis on the priority areas.

Under the circumstances, the STI decided to compile the new compendium that would cover all the sectors of the society and the economy and give information ranging from the current status of IT to the impact of IT. Here, we mean IT as not just technologies based on the Internet, but emerging information and communication technologies that influence the society and the economy.

Through the development of the framework and the compilation of the new compendium, it would become possible to assess how well we can approach the IT development with the currently available statistics and to gain insights on the future direction to improve and strengthen IT statistics.

## 2 The framework for IT statistics

The framework can be described in the following chart. Each cell in this chart represents an area for which statistics are needed, and the existing statistics concerning IT should normally fall into one of the cells. Examples of IT statistics are given in each cell in *Italic*. If we have adequate and balanced statistics, every cell would be filled with relevant statistics.

**Fig. 1 The Framework for IT Statistics**

| | | |
|---|---|---|
| **Impact** | Direct/Indirect Impact on Macro Economy | *Trend of Employment, Value Added of the IT Industry, etc.* |
| | Impact on Society | *Social Problems (Digital Divide, Crime over Computer Network), Change in Life Style (Time Use, Telecommuting), etc.* |
| | Impact on Enterprises | *Improvement of Efficiency, Transformation of Business Structure, etc.* |

| | | Supply Side | Demand Side | | | |
|---|---|---|---|---|---|---|
| | | | Household | Enterprise | Government | School |
| **Usage** | | *Sales in Information Service Industry* | *Purposes of Using the Internet, Usage of e-Commerce* | | | |
| **Infrastructure** | Hardware & Software | *Shipment of Equipment* | *Purchase/Ownership of Computers* | | | |
| | Network | *Number of Subscribers of Mobile Phones* | *Connection to the Internet* | | | |
| | Human Resources/ Research & Development | *Number of Employees in IT Related Industries, Expenditure on R&D for IT* | *Computer Literacy* | | | |

In the framework we propose that IT development should be observed in the aspects illustrated vertically in the chart: infrastructure, usage and impact. These aspects have been derived from the three elements proposed in the discussion on e-commerce at the OECD[4]: readiness, intensity and impact.

The three aspects of IT development are represented in the lines of the framework. Infrastructure of IT is given at the bottom of the framework as the most fundamental aspect. Infrastructure is divided into three

[3] http://www.kantei.go.jp/jp/it (Japanese), http://www.kantei.go.jp/foreign/it (English). The text of the Law is available in both sites, but the statistical data are presented in the Japanese site only.
[4] Working Party on Indicators for the Information Society (WPIIS), OECD

elements: hardware & software, network and human resources/research & development. These elements are divided into two columns: supply side and demand side. Demand side is further subdivided into four sectors: households, enterprises, government and school.

For example, statistics on hardware & software of supply side may include those on shipment of equipment, while statistics on hardware & software of demand side may include those of purchase/ownership of computers. There are, of course, other statistics that may fall into these boxes of the chart.

Usage of IT is placed above the line of infrastructure in the framework. The line of usage is also divided into supply side and demand side, and demand side is further subdivided into the four sectors as in the case of infrastructure.

Statistics of purposes of using the Internet, for instance, may belong to those on usage. On the other hand, Statistics of connection to the Internet may belong to those of network in infrastructure.

Impact of IT will be brought about on the foundation of infrastructure and usage. Thus, the line of impact is placed at the top of the chart. Impact is divided into three categories: direct/indirect impact on macro economy, impact on society and impact on enterprises. Some examples of the impact are given in the cells of the chart.

### 3 The present situation of IT statistics in Japan and problems with them

Using the framework just described above, we have gathered currently available statistical data in Japan concerning IT as far as possible, mainly from official statistics. The statistical tables in the Tab.1 are contained in *IT Indicators in Japan* (in English and Japanese) which was released at the IAOS Satellite Meeting and was uploaded on the Website of the Statistics Bureau of Japan (SBJ).

In the chart below, figures in the cells correspond to the table numbers in the *Indicators*.

**Fig. 2 Present situation of IT statistics in Japan in the framework**

| | | |
|---|---|---|
| **Impact** | Direct/Indirect Impact on Macro Economy | *9,34* |
| | Impact on Society | *36* |
| | Impact on Enterprises | *25,26,27,28* |

| | | Supply Side | Demand Side | | | |
|---|---|---|---|---|---|---|
| | | | Household | Enterprise | Government | School |
| **Usage** | | *14* | *6,7,8* | *21,22,23,24* | *31* | |
| **Infrastructure** | Hardware & Software | *11,12,13,14,15* | *1,6* | *16,17,23,24* | *29* | *32* |
| | Network | *35* | *1,2,3,4,5* | *19,20,23,24* | *30* | *33* |
| | Human Resources/ Research & Development | *9,10,34* | | *18,34* | | *33* |

Note: Some table numbers fall into more than one cells.

**Tab.1 List of Statistical Tables in the IT Indicators in Japan**

Household Sector

1 Percentage of Households Possessing Information and Communication Appliances
2 Number of Subscribers of Mobile Phones and Personal Handyphone Systems
3 Number of Subscribers of Mobile Phones per 100 Persons in OECD Countries
4 Percentage of Households of Possessing PCs and Using the Internet by Type of Access Line
5 Number of Internet host computers, Internet Users and PCs by Country
6 Annual Expenditure of Households on IT Related Appliances and Services
7 Purposes of Using the Internet in Percentage
8 Information and Communication Services that Households Wish to Utilize

Enterprise Sector

Infrastructure

9 Number of Establishments, Employees in IT Related Industries
10 Intramural Expenditure on Research and Development for Information Processing
11 Value of IT Related Goods Shipped by Manufacturing Industries
12 Number and Value of Computers Manufactured
13 Number and Value of Communication Equipments Manufactured
14 Annual Sales of Information Service Industries
15 Export and Import of IT Equipments among OECD Countries
16 Number of PCs Owned per Enterprise and Employee
17 Number of LAN Servers, Clients and Rooters per Enterprise
18 Number of Regular Workers in Information Processing Divisions of Commercial, Mining and Manufacturing Industries
19 Number of Telecommunications Lines Connected to Own Computer Systems per Enterprise
20 Percentage of Establishments Having Connections to the Internet by Employment Size

Usage

21 Percentage of Enterprises Having Connections to the Internet and Using e-mail Services (Enterprises with 100 employees or More)
22 Percentage of Enterprises Introducing BtoB/BtoC e-Commerce (Listed Enterprises)
23 IT Related Annual Expenditures per Enterprise
24 Anticipated Percentage of IT Investment in the Whole Investment (Listed Enterprises)

Impact

25 Change in Work Style Caused by IT
26 Business Prospect Resulting from Use of IT
27 Effect Brought about by IT by Industry and Capital Size (Listed Enterprises)
28 Anticipated Change in Business Caused by BtoB e-Commerce (Listed Enterprises)

Government Sector

29 Number of Employees per PC in the Central Government
30 Number of Main Computer Systems and the Systems Connected to the Internet in the Central Government
31 Number of Administrative Procedures to Which Citizens Can Apply Online to the Government

School Sector

32 Number of PCs for Educational Use in Public Schools
33 Number of Public Schools Having PCs Connected to the Internet, and Number of Teachers Capable of Using and Teaching Computers

Others

34 Number of IT Related Engineers
35 Number of Internet Domain Names by Type
36 Number of Arrests of High-Tech Crimes

(Present Situation)
Here are findings about the status of IT statistics in Japan from Fig.2 by the three aspects.

(1) Statistics on Infrastructure

Statistics on hardware & software and network are, as a whole, covered well by existing statistics such as administrative data from policy departments concerned and the supply side data, although statistics on human resources are inadequate.

The data as of year 2000 shows that the ratio of large enterprises (100 employees or more) connected to the Internet is 80.5%, while those of small enterprises (5 to 29 employees) and households are 40.7% and 34.0% respectively (Table 4 and 20).

The number of establishments in IT related industries increased 3.9% from 1996 to 1999, but the number of employees decreased by 2.2%. This decrease in employee came from the drop in employee in IT related manufacturing and telecommunications industries (Table 9).

The Classification of the IT related industries in the Table 9 is based on the ICT sector defined by the OECD[5]. There is no standard definition or classification for IT industries to be referred in Japan. The figures for IT related industries are made by re-aggregation of the STI using the results of the Establishment and Enterprise Census.

(2) Statistics on Usage

Statistics on usage are not sufficient, compared with those on infrastructure. Yet statistics on usage for Household and Enterprise are more obtainable than those for Government and School.

22.4% of household Internet users have experienced online shopping, and 6.1% online banking in 2000 (Table 7). Among the listed enterprises[6], 37.7% has introduced BtoB e-commerce, and 20.6% BtoC e-commerce in 2001 (Table 22).

(3) Statistics on Impact

Statistics on impact has not been developed so much, yet. Some inquiries to enterprises on qualitative change have been carried out, but quantitative data has rarely been surveyed.

With regard to impact on enterprises, 91.7% of the listed enterprises answered that the benefit of introducing IT was agile operation, and 48.2% pointed out lower labor costs in 2001 (Table 27).

In relation to the impact on macro economy, some private research institutions aggregated the value added of the IT industry or market volume of e-commerce. But we omitted those figures from the *Indicators*, because the aggregations were based on surveys of which the response rates were not reasonably high.

[5] http://www.oecd.org/dsti/sti/it/prod/measuring_ict.pdf

[6] Listed enterprises in Table 22, 24, 27 and 28 are those listed either on the Tokyo Stock Exchange, the Osaka Securities Exchange or the Nagoya Stock Exchange.

(Problems)
From the findings above, the problems with the existing statistics on IT could be summarized in the three points as follows.

(1) Insufficiency

While statistics on infrastructure are generally well covered by administrative data and the supply side data, statistics on usage and impact are not adequate. Insufficiency of statistical data on IT is an obstacle to monitor the IT status in Japan, such as digital divide, transformation of business structure.

Efforts should be made by producers of statistics to strengthen IT statistics, in particular on usage and impact of IT. For example, statistics on IT usage by individual are needed for evaluation of digital divide.

(2) Inaccuracy

Even though there exist statistical data, some of them may have problems with respect to accuracy, because of inappropriate sampling methods or biases. One example would be the statistics by private research institutions on e-commerce as mentioned above.

It is necessary to improve the quality of such data. The official statistics would be expected to cover such fields with reliable methods.

(3) Lack of standard definition and classification

There is no standard definition or classification concerning IT in Japan, such as coverage of the IT industry, scope of information and communication appliances, etc. Establishing such standard would not only facilitates surveys on IT statistics, but also enables existing statistical data to be transformed into IT statistics by re-aggregation/re-grouping.

It is urged to build such standards to be referred commonly among producers and users of statistics in Japan. In doing so, we may need to take account of various arguments abroad such as at the OECD.

In connection to (2) and (3), it is also imperative that producers of statistics should provide users with metadata e.g. survey method, definition, classification, accuracy, etc. so that they could judge whether the data satisfy their needs. We will certainly annex the metadata of the statistical data to the *IT Indicators in Japan*.

#### 4 Plans for statistical surveys

To fulfill the needs for IT statistics, the SBJ and other statistical agencies are planning to collect and compile statistics concerning IT mainly by means of adding new questions on IT to the existing surveys. This practice would be efficient in terms of both budget and respondent burdens rather than initiating new surveys specialized in IT. It is expected that these actions will improve and strengthen IT statistics.

The SBJ, the central statistical office in the Japanese administration, will collect data relating to IT with major statistical surveys on households and establishments, including the Establishment and Enterprise Census. The Ministry of Economy, Trade and Industry (METI) will undertake statistical surveys for industries under its jurisdiction.

Listed below are statistical surveys concerning IT to be held within next few years.

< Households>

Survey on Time Use and Leisure Activities (October, 2001; SBJ)

The Survey, covering about 100,000 households, is conducted every five years with the aim to clarify the distribution of time spent for daily activities of people as well as their activities during spare time.

The forthcoming Survey will be conducted having new questions about use of the Internet. The Survey will ask about 200,000 individuals through households such questions as purpose, frequency and place of using the Internet.

The results, to be released in September 2002, will serve as valuable data for extensive analysis on IT use for individual attributes (sex, age, region, occupation, etc.) and household attribute (type, income, etc.). They will be the first practical material for the evaluation of digital divide of Japanese people.

Survey on Household Economy (to be launched from this October by SBJ)

This Survey will make inquiries on purchases of infrequently purchased but expensive goods and services to about 30,000 households, so as to complement the monthly Family Income and Expenditure Survey initiated in 1953 covering about 8,000 households.

Moreover, the Survey will collect data on purchase and ownership of IT related goods and services and use of the Internet, in order to monitor the trend of IT use in a timely manner. Questions on IT in this Survey will be modified flexibly in response to data needs.

<Enterprises>

Establishment and Enterprise Census 2001 (October, 2001; SBJ)

The Census is conducted every five years with the aim to clarify the industrial structure of the country as well as to provide the basic statistical framework for sample surveys on establishments and enterprises. Its coverage is all establishments with a little exception (unincorporated establishments belonging to agriculture, forestry and fisheries, etc.).

The forthcoming Census will ask enterprises about use of e-commerce, type (BtoB / BtoC), nature (sending orders, receiving orders, delivery of goods and services after the sales). The Census will provide data that users can analyze by region, industry employment size and so on. The results will be released in July 2002.

Census of Commerce (June, 2002; METI)

The Census is conducted every five years with the aim to clarify the actual condition of domestic trade. Its coverage is all establishments that run wholesale and retail trade. A supplementary Census is conducted two years after the Census.

The next Census will investigate e-commerce including annual merchandise sales and purchases over computer networks, etc.

Basic Survey of Business Structure and Activities (Annual; METI)

This Survey is conducted with the aim to obtain the basic business information needed for formulating policies. The coverage of this Survey is enterprises with establishments belonging to mining, manufacturing, wholesale and retail trade industries.

The 2001 Survey will inquire questions on e-commerce such as type of e-commerce (BtoC / BtoB / BtoG) and kind of economic activities performed over computer networks, etc.

(Further plans of SBJ)
The SBJ will hold quinquennial large-scale statistical surveys after 2002 as below. It would be conceivable to include questions relating to IT in these surveys for strengthening IT statistics. Considerations are needed, taking account of the purposes of respective surveys and the feasibility.

**Tab.2 List of statistical surveys to be held by SBJ after 2002**

| Quinquennial Surveys | Year | Conceivable questions relating to IT |
|---|---|---|
| Housing and Land Survey | 2003 | IT related facilities in housings, etc. |
| National Household Expenditure Survey | 2004 | Expenditure on IT related goods and services, ownership of PCs and other digital devices, etc. |
| Survey on Service Industry | 2004 | Values of service sales over the Internet and other computer mediated networks, etc. |
| Population Census | 2005 | Use of the Internet by individuals, etc. |

## 5 Conclusion

We have developed the framework for systematically collecting information technology (IT) statistics as a basis to compile new statistical compendium on IT that would cover all the sectors of the society and the economy and give information ranging from the current status of IT to the impact of IT on the society and the economy. In the framework, we have introduced three aspects to capture the development of IT: infrastructure, usage and impact.

Through the compilation of the *Indicators*, we found statistics on infrastructure are generally well covered by administrative data and the supply side data, while statistics on usage and impact are insufficient. In addition, we found problems such as inaccuracy and lack of standard definition and classification of IT with respect to some of the currently available IT statistics.

To fulfill the needs for IT statistics, the SBJ and other statistical agencies are planning to collect and compile statistics concerning IT. It is expected that these actions will improve and strengthen IT statistics. The STI will follow such development, and continue to compile and publish up-to-date and useful IT statistics of Japan.