Chapter 2

Transformation of ICT Industries and Society, induced and accelerated by "Smart Revolution"

Section 1

"Smart Revolution" — ICT Paradigm Shift

1. Completion of "Ubiquitous Network" Environment and "Smart Revolution"

(1) Internet and mobile phones, which have become a social infrastructure

As shown in Chapter 1, ICT's capabilities as the driving force of the world economic growth have been proven and widely acknowledged. Those capabilities are enabled in the Internet, which has been rapidly deployed in all types of countries — advanced, emerging, or developing. Even the frequently-reported cyber-attack damages that governments or businesses are suffering can be seen as a by-effect of the openness of the Internet which has become an indispensable infrastructure of the social or economic activities in every country in the world. The Internet, as an infrastructure supporting any kind of social activity, plays a role of a driving force to improve the convenience of life or stimulate the economy. On the other hand, mobile phones have been aggressively deployed, in advance of economic growth, in the countries with handicaps such as a low literacy-rate or poor electrical power or other infrastructure, and have been working as the launching power for those countries to take-off from poverty to prosperity. In such a way, mobile phones have gained in their importance as the "first step" to economic growth.

(2) Completion of ubiquitous network environments

As shown above, ICT has become to play an important role in economic or social growth in a wide variety of fields; particularly, the Internet, which has become a social infrastructure, driven by the dramatic development of the network service environments supported by the advanced ICT technologies such as radio communication technologies or storage technologies, plays an increasingly important role in various fields. The activities of the Ministry of Internal Affairs and Communications, initiated under the concept of creation of ubiquitous network society (anybody or anything promptly connects to the network at anytime and from anywhere), have resulted in the ubiquitous environments: particularly technologies, services, and devices or equipment.

In addition, the following trends in Internet have become obvious: as well as human entities, non-human entities, exchanging information to each other without human interventions, strengthening their mutual connections through a system called M2M which automatically and optimally controls the connections through networks of censors built in equipment, work for the efficient control of social infrastructures or business improvement by utilizing Big Data. It suggests that ICT-based networks, beyond the boundary of communication tools, have become to serve as an infrastructure that assures the foundation of democracy — freedom of expression and freedom of speech, enhances human-ties, and helps services and assets in digital form go back and forth beyond borders.

(3) New trends coming after the completion of ubiquitous network environments — smartization and "Smart Revolution"

Digital information distributed and accumulated in the networks has been dramatically increasing since the Internet became a social infrastructure; the Internet has enabled network-service providers and others to easily generate, collect, and accumulate enormous data of various kind (Big Data), to analyze and utilize such data for the detection of abnormalities or predictions on the near-future, and to provide services adapted to the individual users' needs or to improve business efficiency; as a consequence, new-types of industries are expected to emerge. In such a way, ubiquitous environments, accelerating the distribution, accumulation, and utilization of enormous data of various kinds, help ICT-network services evolve into the foundation for the knowledge creation. As a conclusion, the combination of ubiquitous network environments and "smartization," bringing a new-type of ICT innovation called the "Smart Revolution," enhancing ICT's functionality as a growth engine or a universal tool, has the potential to change the entire landscape of the social and economic activities in Japan.

2. International Discussions: What the Cyber Space should be

The Internet, embracing diversified services including supply chains or communities, can be seen as a new-type of social space (Cyber Space). While the importance or value of such a cyber space has been highly recognized, what the cyber space should be and how it should be regulated is frequently discussed in a variety of international organizations or conferences. Japan has been discussing the topic in bilateral talks with the U.S., the U.K., or the European Commission, and has participated actively in the discussions in multinational meetings.

As for the bilateral talks, Japan finalized the agreement, "Japan-US Trade Principles for ICT Services," in January 2012, where Japan pointed out, as one of principles, that cross-border information distribution should not be interfered with; in March 2012, in the Japan-US Policy Cooperation on Internet Economy, the principle

Figure 2-1-1-1 Conceptual Diagram of Mechanism bringing the Smart-revolution

●Integration of "Ubiquitous features" and "Smart features," realized and accelerated by the recent spread of smartphones, potential of M2M communication, and new trends in Big Data utilization, will lead to "Smart revolution."
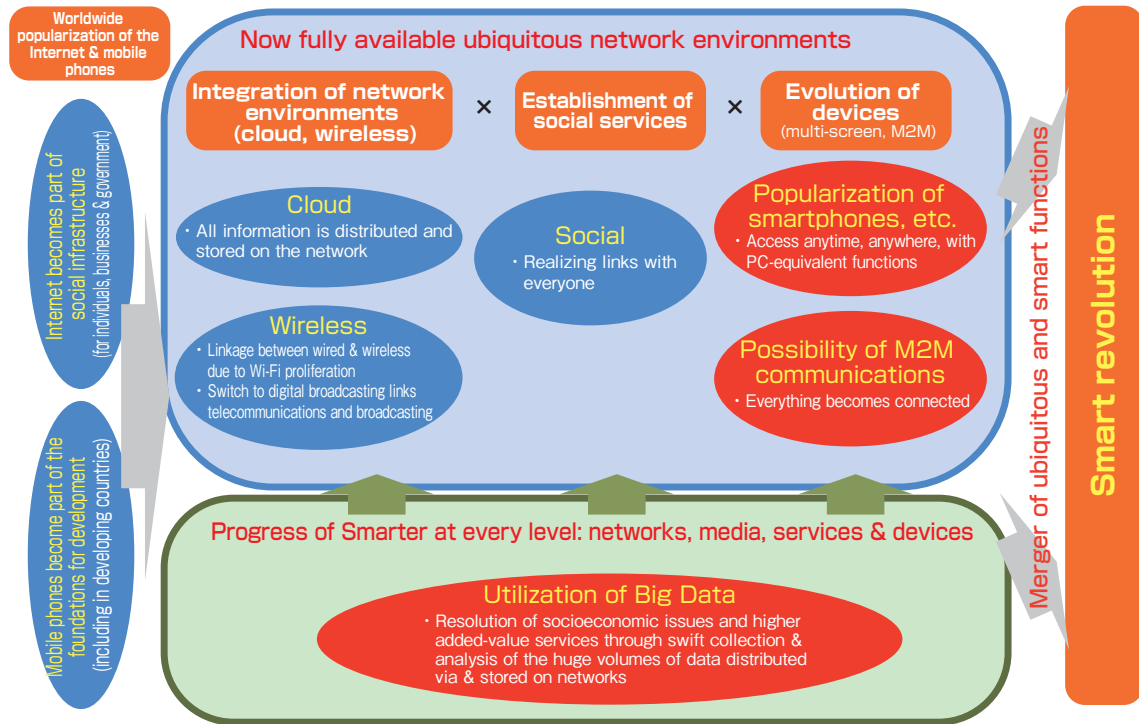
on the preservation of Internet openness and its interoperability was reconfirmed; in April 2012, the enhancement of the corporation on cyberspace issues was included in the fact sheets released at the Japan-US Summit Meeting.

As for the U.K., as a result of the inclusion of the item — the enhancement of the bilateral talks on the cyber space — in the Japan-UK joint statement by the prime ministers released in April 2012, the joint statement by Mr. Tatsuo Kawabata, Minister for Internal Affairs and Communications and Mr. Rt Hon Jeremy Hunt MP, Secretary of State for Culture, Olympic, Media and Sport was released in May 2012 confirming the cooperation by Japan and the U.K. on Internet policy issues. As for the European Commission, the joint statement by Mr. Tatsuo Kawabata, Minister for International Affairs and Communications and Ms. Neelie Kroes, Vice-President of the European Commission was released in May 2012, including the item — enhancement of Japan-EC cooperation on Internet policy issues.

International discussions are expected in future to include a diversity of issues, for example the role of Internet as the foundation of people's livelihoods and economic activities, the role of Internet as the critical infrastructure bringing innovations of socioeconomic systems, the role of Internet as the support for securing the promotion of democracy, the protection of privacy and personal information, the preservation of information security, and the protection of intellectual property.

Japan will continue to actively participate in those discussions so that the international rules will be built leading to the formation of Japan's future vision.

3. Counter Measures for Increasingly Severe Cyber Attacks and Challenges for Preservation of Information Security

While Internet has become the indispensable infrastructure for the socioeconomic activities in the global society, the threats to formation security have been spreading globally, such as the globally spreading computer viruses, increasing cyber crimes, and various systems troubles in the critical infrastructures for people's livelihoods and socioeconomic activities. Suffering from threats of targeted attacks aiming to steal the state's critical information, unlike the conventional thrill-seeking attacks, including the cyber-attack incident regarding Mitsubishi Heavy Industries, Ltd on September 2011 and the attacks on both the houses of Representatives and Councilors, the nerve center of the state, and also suffering from the increasing number of malwares targeting smartphones, Japan is acutely required to enhance the counter measures, such as the prompt sharing of information on threats and the enhancement of government-business cooperation, through the involve-

ment of the related parties.

The recent cyber-attack incidents in Japan and other countries have increased in severity, particularly in terms of their targets; serious concerns have been shown in the declaration by leaders at the Deauville G8 Summit Meeting and mentioned in other international conferences; therefore, the importance of international cooperation has been repeatedly suggested with regard to the preservation of information security in the cyber space in addition to international regulations applied to the cyber space.

In Japan, in the situation where the serious targeted-attacks which might affect Japan's national security, such as the attacks to the defense industries including Mitsubishi Heavy Industries, Ltd, the annual plan for FY 2012, "Information Security 2012" ,including the following items as the key principles was adopted in July 2012: ① the enhancement of counter measures to the high-level threats targeting the corporations and others involved with the critical information concerning the state and the national safety; ② the development of secured and safe environments for the usage of information-terminals including smartphones, shutting down the risks that have emerged along with the full-range spread of information terminals including smartphones; ③ the enhancement of the international cooperation.

The Ministry of Internal Affairs and Communications has taken the following actions: the ministry, in collaboration with the ministries and agencies, including the Information Security Center, Cabinet Office and businesses, has established Telecom-ISAC Japan, the joint conference of the government and the business, for the purpose of discussing the information-sharing on cyber attacks and the enhancement of counter measures; the ministry has taken actions for the enhancement of corporation with telecom operators, broadcasting companies and the local governments; in addition, the ministry, collaborating with other countries, has been conducting research and development and proof-of-concept experiments for predicting cyber attacks and taking prompt actions.

4. ICT — Creator of New Added-Value, Serving as a Knowledge and Information Infrastructure — and Utilization of Big Data

An enormous amount of digital data has been created, distributed, and accumulated in the Internet since the completion of the ubiquitous network, particularly through the availability of advanced wireless communication technologies and the synergistic effects of the evolutions in the service level, such as the adoption of cloud services and social services, with the evolutions at the device level, such as the spread of smartphones and the progress of M2M communication. Various corporations and organizations around the world have initiated activities for the utilization of such Big Data, aiming to create innovative services or business models, to make correct judgments on management, or to improve business efficiency; in addition, the governments of the countries including the U.S.A, paying attention to the value-creation capability of Big Data, have started strategic actions, seeking ways to utilize Big Data for economic growth.

(1) Utilization of Big Data: overview

Big Data is significant because it contains a vast amount of data, because it contains a variety of data, and because it has real-time capability; as a result of progress in ICT, the generation, collection and accumulation of data, in a manner exploiting the characteristics of Big Data, has become feasible and easy; the purpose and value of Big Data utilization is to provide services adaptive to individual users' needs, and to improve the business operation efficiency or to create new business, through the detection of abnormalities or the predictions concerning the near-future.

While, at present, Big Data is utilized in the web service fields such as search, e-commerce, or social media to provide such services, Big Data will be used for the creation of a variety of added-value, when a series of technologies of collection, accumulation, and analysis are developed, and new commercial services or equipments emerge.

As for the data eligible for Big-Data-like processing, as well as the data in the web service fields presently utilized, various new types of data including the data collected through sensor networks such as M2M are expected; the high-volume and diversified data collected through networks is expected to, through the cross-sector and real-time utilization, support the solution of social issues such as the reduction of traffic congestion, the enhancement of medical services or the prevention of crime, and to support the efficient operations of social and business infrastructures such as power grids; on the other hand, Big Data is expected to contribute to the growth of ICT industries through the creation of new types of ICT services.

The Ad-hoc Group on Big Data Utilization, ICT Basic Strategy Board, Information and Communications Council, with regard to the socio-economic effects of Big Data, estimates as follows: "At least 10 trillion yen of newly created value is expected in the market of Big Data-utilization involving the businesses using Big Data or support-service providers, along with 12 to 15 trillion yen of social-cost reduction.".

(2) Toward the economic growth accomplished through the active utilization of Big Data

Facing increasingly fierce competition in the international economy and society, Japan is now in a difficult situation where its pool of human resources, having backed its economic growth along with its advanced science and technology such as ICT, is rapidly shrinking due to demographic ageing with a declining birthrate, ahead of any other country. Furthermore, as a result of the shrinkage of the labor population, Japan is facing the threat of a declining economy. For the continuation of Japan's economic growth, the high utilization of the existing resources or the cultivation and utilization of new resources is acutely required.

On the other hand, in Japan, as one of the lessons from the Great East Japan Earthquake, the importance of information and at the same time the supporting of ICT are re-acknowledged as forming a life line protecting human life. Also in Japan, diversified data-resources have been created and accumulated at a significant rate.

Therefore, in order to enhance its global competitiveness while preserving its strength in manufacturing, and to achieve economic growth again, Japan is required to recognize Big Data as a strategic resource and promote its utilization in the real society under government coordination.

Specifically, Japan is required to promote discussions on the development of environments for utilizing the data which have been accumulated in various sectors and used only closely in the individual sectors, for the purpose of allowing the public sector and businesses to share data and utilize the data across borders, for example, under the policy of the promotion of open-government. In addition, it is important for Japan, which has the globally-acknowledged strength in manufacturing, to solve social problems and activate its economy through utilizing, in a cross-border manner and analyzing in a real-time manner, the large and various data generated and collected through censor networks, such as M2M, while paying attention to the preservation of personal information, so that such data is accumulated, publicized, distributed, and integrated for the creation of knowledge and information that can be shared by the entire society. Furthermore, it is required to promote the safe and secure utilization of Big Data, through advances in technologies of authentication, encapsulation, and regulation of data.

In summary, Japan, which is running ahead of other countries toward the social problems they share, and at the same time is expected to be the front runner to solve such problems, should realize an environment that enables the creation of new values, through utilizing Big Data to create new values and enhance the features of ICT as a tool and a driving force of economic growth.

Section 2

"Smartphone Economy"— Transformation of ICT Industry Structure and User Behavior

1. New Competition and Growth induced by Rapid Spread of Smartphone

(1) Rapid Spread of Smartphone and Transformation of Terminal Market

This article shows the analysis of the smartphone market by the broader definition[1] partly including feature phones

a. Forecasts on the world market expansion of smartphones

The smartphone share of units sales (including feature phones) around the world mobile phone market reached about 27 % in 2011; the smartphone share is predicted to grow to over 50 % of the world mobile phone market in 2015; the smartphone market is promising because of its high growth rate.

b. Changes around the world smartphone market

Figure 2-2-1-1 shows the change of the world smartphone market share distributions by OS and major mobile phone manufactures from 2009 — when smartphones were widely accepted — to 2011; in the three year period, smartphone sales-units grew 2.7 times, indicating that a rapid change has occurred in the smartphone terminal market; a look into the change in manufacturer-shares shows that the Japanese manufacturers have failed to obtain benefits from the growing market —while four Japanese manufactures or subsidiaries were ranked in the top 10 in 2009, only one was ranked in 2011. Figure 2-2-1-2[2] presents the overview of such

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[1] The data shown in this article is based on the research by Gartner, Inc. They specify a smartphone as follows: a smartphone should be equipped with ① an OS of which specifications are completely or partially public and ② an OS for which a software development kit (SDK) accessible through an API is provided to software developers and ③ should be a terminal which is not included in the tablet-terminal category, and compatible with mobile-communication networks. Note that the specification ② covers Symbian, Linux, Android, Windows Phone, RIM (Black Berry OS, iOS and others. Also note that the NTT DoCoMo FOMA terminal (versions later than 2004) is covered by the specification because NTT-approved developers are provided with SDK accessible through an API (note that some versions of FOMA terminals are not covered)

[2] Terminal manufacturers are classified into the regional groups, Japan and China-Taiwan-Korea, according to the location of the headquarters or, in the case of a subsidiary, the location of the parent company headquarters. In such a way, manufacturers are region-classified as follows: in Japan, Fujitsu, NEC, Panasonic, Sharp Sony-Ericson; in China-Taiwan-Korea, Huawei (China), Samsung and LG (Korea), Acer and Asus (Taiwan)

rapid changes around the world smartphone regional market, showing that in each region, the large growth of the terminals equipped with iOS or Android pulls the market, leading to the growth of Chinese, Korean, or Taiwanese manufacturers.

c. Changes in the smartphone market in Japan

Similarly to the world smartphone market, in the Japanese market, iOS and Android have gained in the OS share; Apple's rise in the major manufacturer-share distribution in 2011 is noticeable.

(2) Changes in the Mobile-communication Business-strategies after the Spread of Smartphones

Figure 2-2-1-4 shows the comparison of the mobile-business performances (including the sales in other fields than telecommunications) of the major three companies, NTT DoCoMo, KDDI, and Softbank. As for NTT DoCoMo and KDDI, the sales-drop in total telecommunication-sales has been abated by the increase of the data-communication sales; on the other hand, as for Softbank, total telecommunication sales have been boosted by the data communication sales growth, which was 50

Figure 2-2-1-1   Trends in Global Unit-shares of OSs

[By OSs]

Smartphone unit sales to consumer (in 2009)

Smartphone unit sales to consumer (in 2011)

Smartphone-market conditions have changed in three years: it is led by Android and iOS.

Android 4%
Miscellaneous 1%
Linux 5%
Microsoft 9%
iOS 14%
RIM 20%
Symbian 47%
in 2009 Total 172,373 (thousand units)

The market has grown 2.7 times.

Bada 2%
Microsoft 2%
Miscellaneous 1%
RIM 11%
Symbian 19%
Android 46%
iOS 19%
in 2011 Total 471,743 (thousand units)

Smartphones' share in the mobile phone market
14.2% → 26.6%

Same level of market-concentration when measured by unit sales
HHI=2922 ⟶ HHI=3002

[By manufacturers]

Smartphone unit sales to consumer (in 2009)

Smartphone unit sales to consumer (in 2011)

Android has spread widely, and Samsung has grown largely, as a result of the change of OS leader. Japanese manufacturers except for one have disappeared off the global top 10 ranking.

NEC 2%
Panasonic 2%
MOTROLA 2%
Sharp 3%
Miscellaneous 4%
Fujitsu 3%
Samsung 3%
HTC 6%
Apple 14%
RIM 20%
Nokia 41%
in 2009 Total 172,373 (thousand units)

The market has grown 2.7 times.

ZTE 2%
Huawei 3%
Miscellaneous 7%
MOTROLA 4%
LG 4%
Sony Ericsson 4%
HTC 9%
RIM 11%
Apple 19%
Samsung 19%
Nokia 18%
in 2011 Total 471,743 (thousand units)

The market has become more competitive, measured by units
HHI=2374 ⟶ HHI=1291

Note: Each of the market-share rankings of mobile-phone manufacturers lists 10 companies.

Prepared based on Gartner's survey

Figure 2-2-1-2 Trends in Regional Unit-shares of OSs

[Proportion by major OS]

Number of smartphones sold to end users (2009)

Number of smartphones sold to end users (2011)

Figures in red represent the growth rate in the number of units for each region overall

In all regions, the growth of iOS and Android is driving popularization & expansion

4.2 times 2.4 times 2.2 times 3.3 times 1.4 times

	Japan	Asia-Pacific	North America	Europe	Other
iOS	7.4%	7.6%	24.3%	16.0%	6.4%
Android	0.7%	0.8%	9.2%	4.1%	0.2%
Symbian	50.3%	77.4%	3.4%	52.9%	71.2%
RIM	0.5%	3.3%	50.3%	14.0%	14.4%
Microsoft	1.2%	9.1%	8.1%	12.3%	6.4%
Other	39.9%	1.8%	4.8%	0.7%	1.5%
Total (million units)	17	38	46	53	19
HHI	4178	6149	3289	3420	5360

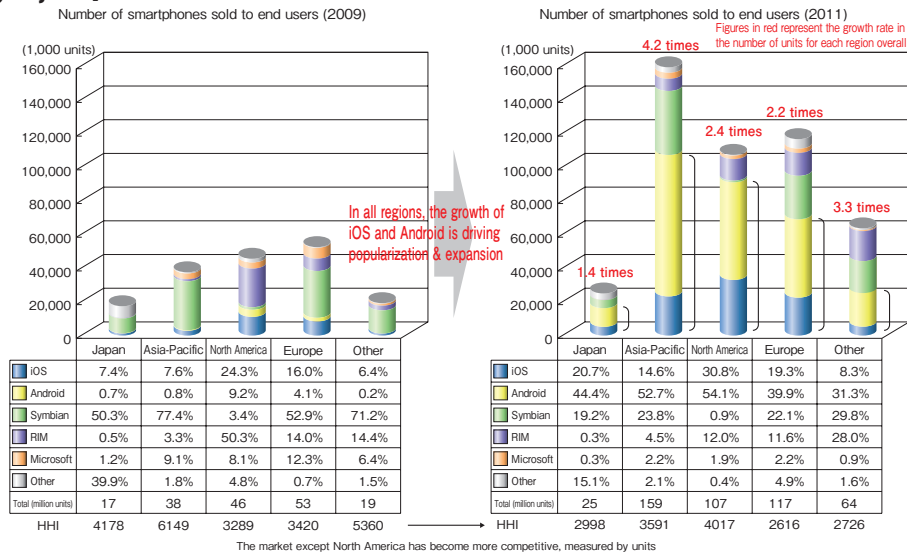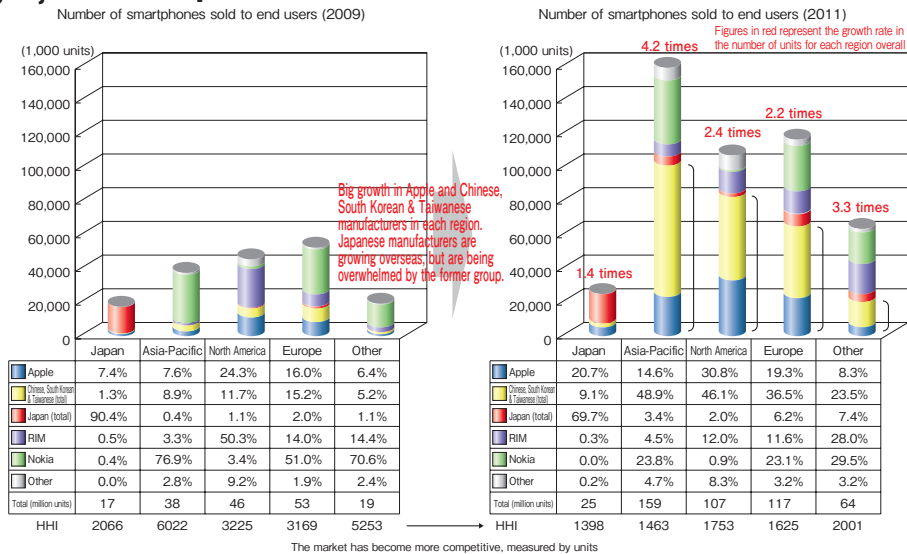|	Japan	Asia-Pacific	North America	Europe	Other
iOS	20.7%	14.6%	30.8%	19.3%	8.3%
Android	44.4%	52.7%	54.1%	39.9%	31.3%
Symbian	19.2%	23.8%	0.9%	22.1%	29.8%
RIM	0.3%	4.5%	12.0%	11.6%	28.0%
Microsoft	0.3%	2.2%	1.9%	2.2%	0.9%
Other	15.1%	2.1%	0.4%	4.9%	1.6%
Total (million units)	25	159	107	117	64
HHI	2998	3591	4017	2616	2726

The market except North America has become more competitive, measured by units

[Proportion by major manufacturer]

Number of smartphones sold to end users (2009)

Number of smartphones sold to end users (2011)

Figures in red represent the growth rate in the number of units for each region overall

Big growth in Apple and Chinese, South Korean & Taiwanese manufacturers in each region. Japanese manufacturers are growing overseas, but are being overwhelmed by the former group.

4.2 times 2.4 times 2.2 times 3.3 times 1.4 times

	Japan	Asia-Pacific	North America	Europe	Other
Apple	7.4%	7.6%	24.3%	16.0%	6.4%
Chinese, South Korean & Taiwanese (total)	1.3%	8.9%	11.7%	15.2%	5.2%
Japan (total)	90.4%	0.4%	1.1%	2.0%	1.1%
RIM	0.5%	3.3%	50.3%	14.0%	14.4%
Nokia	0.4%	76.9%	3.4%	51.0%	70.6%
Other	0.0%	2.8%	9.2%	1.9%	2.4%
Total (million units)	17	38	46	53	19
HHI	2066	6022	3225	3169	5253

	Japan	Asia-Pacific	North America	Europe	Other
Apple	20.7%	14.6%	30.8%	19.3%	8.3%
Chinese, South Korean & Taiwanese (total)	9.1%	48.9%	46.1%	36.5%	23.5%
Japan (total)	69.7%	3.4%	2.0%	6.2%	7.4%
RIM	0.3%	4.5%	12.0%	11.6%	28.0%
Nokia	0.0%	23.8%	0.9%	23.1%	29.5%
Other	0.2%	4.7%	8.3%	3.2%	3.2%
Total (million units)	25	159	107	117	64
HHI	1398	1463	1753	1625	2001

The market has become more competitive, measured by units

Prepared based on Gartner's survey

%; as for each of the three companies, the mobile-business sales excluding telecommunication sales (means contents-delivery, charge-commission, and terminal sales) has shown growth of over 50 %, particularly in KDDI and Softbank.

A close look at the strategies of the three companies shown in their annual reports, by paying attention to the smartphone[3] shift of their terminals, reveals the following significant two trends: the first is the rebuilding of the business model toward "value-added" business; the second is "coping with the growing traffic"

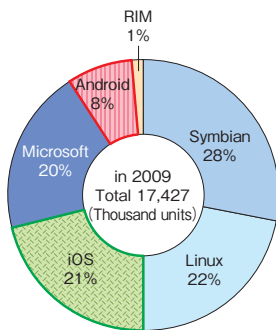As for the change in ARPU before and after the shift to smartphones, the annual reports 2009 to 2011 of the three companies show the following: each of the three, while gaining in the data-communication ARPU due to the spread of smartphones, have failed to make up for the decline in the voice ARPU, and have been suffering from the decline of the ARPU of the entire business.

A look at the plans the three have for promoting their businesses shows the following: NTT DoCoMo, taking advantage of its all-round capability, seeks for sales growth; KDDI, taking advantage of its multi-network capability — to operate and provide different networks by one company — seeks for sales growth; Softbank, combining telecommunication services and value-added services, seeks for profit growth, As a conclusion, the three

[3] Hereinafter, "smartphone" refers to a mobile terminal equipped with iOS (Apple), Android OS (Google), and Windows Mobile (Micro Soft), not to a so-called feature phone (such as a terminal equipped with Symbian OS or RIMOS)— a terminal having no finger-touch-UI (User Interface),

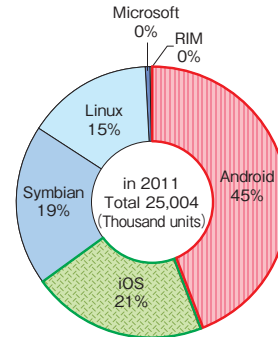## Figure 2-2-1-3   Trends in Manufacturers' Unit-shares in Japan

Trends in unit-sales-share of smartphones in Japan
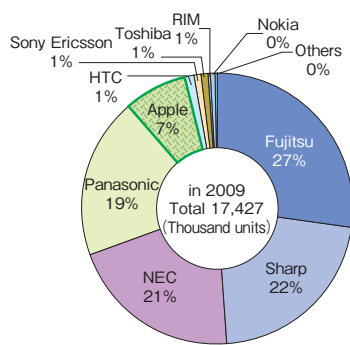(by OSs, from 2009 to 2011)

RIM 1%
Android 8%
Microsoft 20%
Symbian 28%
iOS 21%
Linux 22%

in 2009
Total 17,427
(Thousand units)

HHI=4178 → HHI=2998

Trends in OS share resemble those in the global market

The market had grown 1.4 times.

Microsoft 0%
RIM 0%
Linux 15%
Symbian 19%
Android 45%
iOS 21%

in 2011
Total 25,004
(Thousand units)

Trends in unit-sales-share of smartphones in Japan
(by manufacturers, from 2009 to 2011)

Sony Ericsson 1%
Toshiba 1%
RIM 1%
Nokia 0%
Others 0%
HTC 1%
Apple 7%
Panasonic 19%
NEC 21%
Sharp 22%
Fujitsu 27%

in 2009
Total 17,427
(Thousand units)

HHI=2066 → HHI=1398

Apple's growth in the domestic market is remarkable. Android terminals are available from Japanese manufacturers.

Casio 1%
HTC 1%
Toshiba 5%
Samsung 6%
Sony Ericsson 8%
NEC 9%
Panasonic 11%
Fujitsu 17%
Sharp 19%
Apple 21%
Others 2%

in 2011
Total 25,004
(Thousand units)
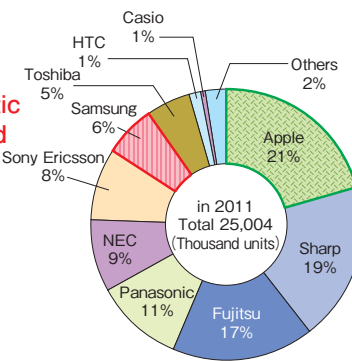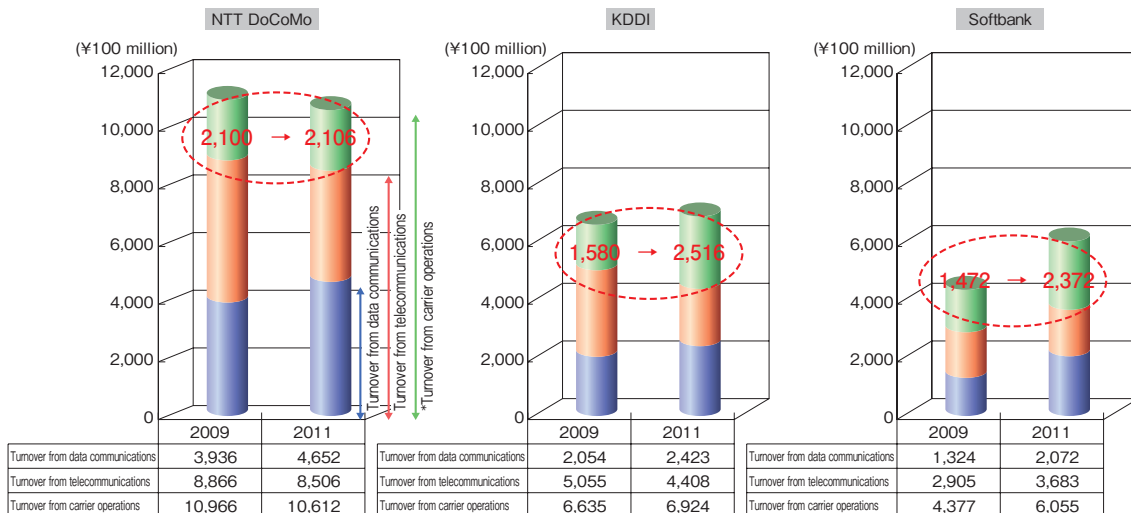
Prepared based on Gartner's survey

Figure 2-2-1-4   General Trends in Mobile Businesses in Japan: comparison of their 3rd quarter statistics in 2009 and 2011

● KDDI and Soft Bank have increased their income in mobile communication service which is not included in data-communication or telecommunication services.

NTT DoCoMo

(¥100 million)

2,100 → 2,106

	2009	2011
Turnover from data communications	3,936	4,652
Turnover from telecommunications	8,866	8,506
Turnover from carrier operations	10,966	10,612

KDDI

(¥100 million)

1,580 → 2,516

	2009	2011
Turnover from data communications	2,054	2,423
Turnover from telecommunications	5,055	4,408
Turnover from carrier operations	6,635	6,924

Softbank

(¥100 million)

1,472 → 2,372

	2009	2011
Turnover from data communications	1,324	2,072
Turnover from telecommunications	2,905	3,683
Turnover from carrier operations	4,377	6,055

*The turnover from carrier operations includes turnover from business other than that from the telecommunications business, such as income from content distribution and charges, and income from sales of handsets.
*Note: The data-communication sales of Docomo and KDDI were estimated using publicly available ARPU data and the number of subscribers.

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)
(Prepared based on the data disclosed by the respective companies)

companies seek for expanding their business into the value-added business area, taking the telecommunication business as the axis. Those strategies of the three companies are summarized as follows: each of the three, in a situation where the sales of telecommunication services by itself never promises a large revenue growth,

plans to expand into the value-added area.

At the same time, the rapid traffic growth as a result of the rapid spread of smartphones has forced each of the three companies to take action for the enhancement of its network; while the total traffic of mobile communications has grown about 2.2 times, according to KDDI, which reveals the traffic shares of the feature phones and the smartphones, the smartphone's traffic share is about 80 %. At the same time, each of the three, focusing on the speed-improvement of their mobile communication networks and off-loading of mobile communication traffic, is promoting the development of the network able to absorb the growing smartphones.

A look at the specific actions by the three companies shows the following: each of the three companies has started or enhanced its LTE service, aiming to improve the speed of its mobile communication network, and at the same time, has been promoting the measures for off-loading the growing data-traffic, such as opening Wi-Fi spots, which have reached about 360,000 spots as of the end of March 2012 as a total of the three; those actions have resulted in the recent growth in investments in communication infrastructures for the purpose of enhancing the networks.

(3) Growth of Internet-related Businesses

The spread of smartphones has the potential to drive the growth of Internet-related businesses through the increase in the users' opportunity to purchase goods by the e-commerce-services available on the Internet, or via more frequent use of media services such as social media, e-book or video-subscription.

a. Growth of Internet-platform businesses

The graphs below, showing the growth rates of major global ICT corporations, suggest the following: platform-service providers have shown high growth and at the same time high profit ratios Concerning Japanese players, those who provide social-game services, although smaller than US players in business-size, show high growth-rates and high profit-ratios comparable to US players; on the other hand, players in the network layer or the terminal layer, except for Apple, continue stable business performance with relatively low growth rates.

b. Ripple effects to application business — App Economy

Along with the spread of smartphones, application programs (so-called applications) operating on smartphones have rapidly become critical in the mobile-related industries; 38.2 billion copies of applications were downloaded in 2011, and 182.7 billion copies are predicted to be downloaded in 2015[4]; such expansion of applications is further driving the spread of smartphones and is expected to lead to the expansion of data-communication via mobile phones, the creation of value-added business areas, the development of new-types of mobile phone-terminal-usages, and at the same time, brand-new business areas in ICT industries.

(4) Layer-by-layer market size and growth rate of ICT industries

Figure 2-2-1-6, and Figure 2-2-1-7 show the layer-by-layer market size and growth rate of ICT industries in the global market and in Japanese and US market respectively with a focus on the Internet-related industries.

Figure 2-2-1-5　Profitability Comparison of Major Global ICT players
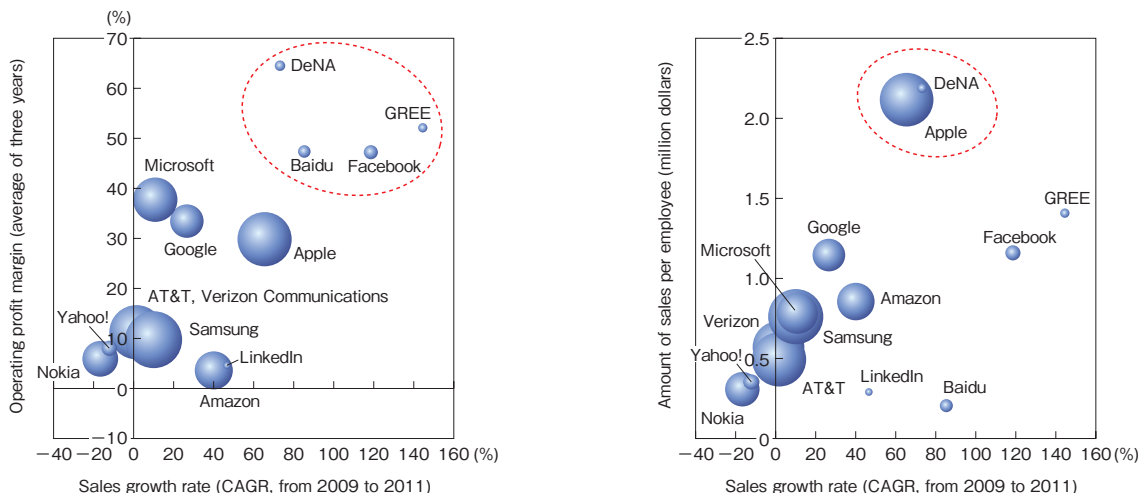
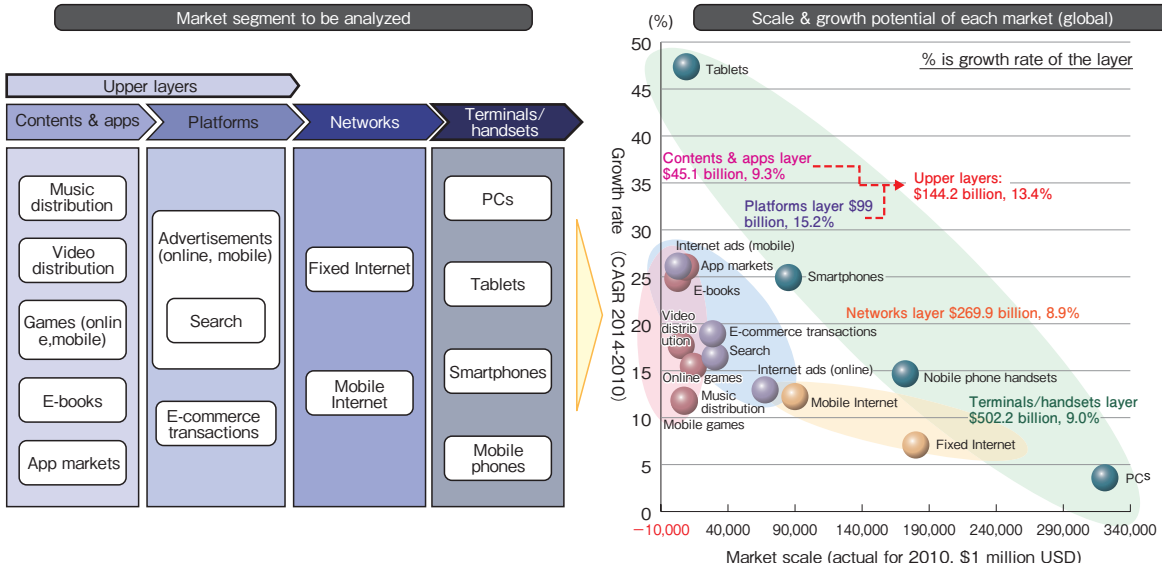Note: Sizes of balloons are proportional to amounts of sales (in 2011)

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)
(Prepared based on the financial reports, etc. disclosed by the respective companies)

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[4] "IDC Forecasts Nearly 183 Billion Annual Mobile App Downloads by 2015", IDC press release, JHune 2011

Figure 2-2-1-6　Layer-by-layer Comparison of Size and Growth-rate in Global Market of Internet-related ICT Industries

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

Figure 2-2-1-7　Layer-by layer Comparison of Size and Growth-rate in US and Japanese Market of Internet-related ICT Industries
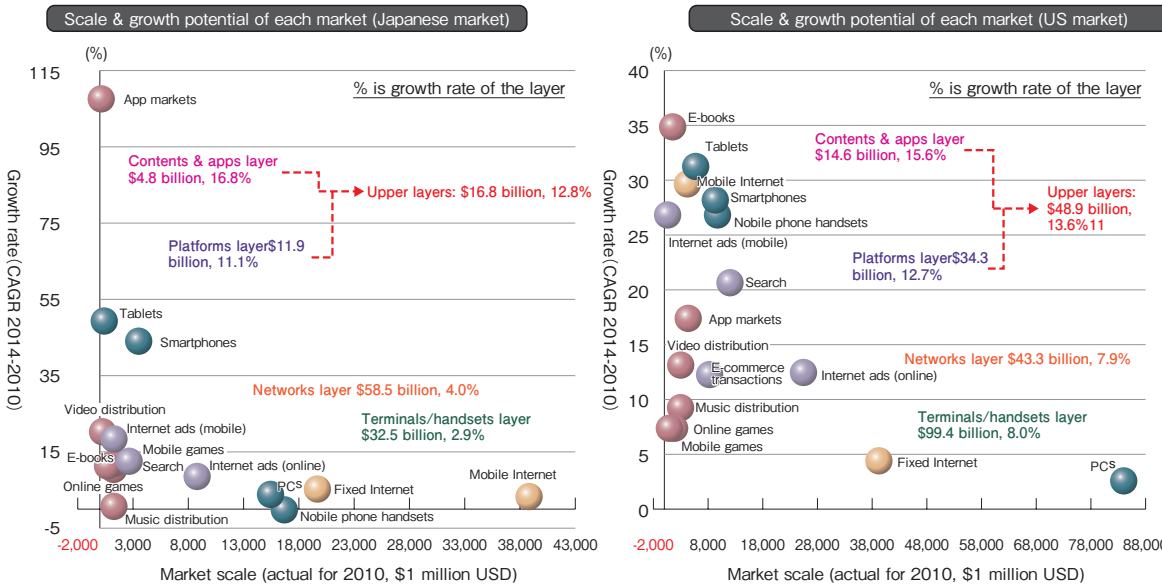
(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)
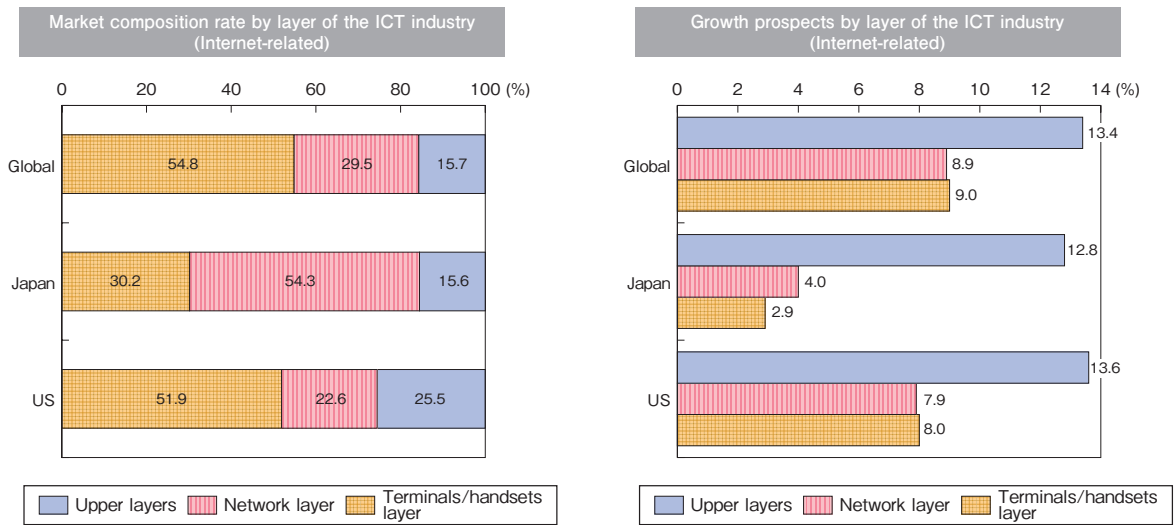
Internet related-industries are selected from among the ICT industries and classified into four layers — "contents/application layer," "platform layer," "network layer," and "terminal layer"[5] — and analyzed through sum-marizing or making estimates co concerning the data shown in the publicly accessible research reports by private organizations.

In terms of growth rate and market size, the terminal

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[5] Section 2, 1(4), following the previous versions of Information and Communications in Japan, defines the layers as follows: the contents/application layer, "a layer including the businesses related to the development and supply of services and contents related to telecommunications, and the businesses related to the development and operation of applications and software related to telecommunications"; platform layer, "a layer providing user-authentication functionalities including user-authentication, device (terminal) authentication, and contents authentication, as well as user-identification functionality, charging functionality, and author's right management functionality, service-quality management functionality"; network layer, "a layer providing transmission-services via networks including communications and broadcastings"; terminal layer, "a layer related to the manufacturing of equipments or devices for users." Note that the definition of platform-layer is not identical to the "platform" used in "2.1. Coming Competition among ICT Business Eco-systems and Overview" to mean the common functionalities and capabilities for services (including OS) provision. Also note that the absolute division of the platform-layer from the contents/application layer is difficult, considering the cases where contents/application providers are providing platform-functionalities to their clients, or the cases where some of the large contents/application providers offer their platform functionalities openly to the third parties.

Figure 2-2-1-8   Summary of Figure 2-2-1-6 and Figure 2-2-1-7 shown in bar chart

Market composition rate by layer of the ICT industry (Internet-related)

Growth prospects by layer of the ICT industry (Internet-related)

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

layer and the upper layer (contents/application layer and platform layer) are significant and worth watching in the global market.

The comparison of Japan's market with that of the US shows the following: the US market size is twice that of Japan; while in Japan, the network layer occupies more than half of the entire industry, in the U.S, it is the terminal layer that occupies more than half of the entire industry, and the size of the upper layer is larger than that of the network layer; in terms of growth rate, while the upper layer's growth rate is generally high in both countries, in the US market, the growth rate of the network layer and the terminal layer is high.

Figure 2-2-1-8 shows the market size, the share of each layer, and the predicted growth rate of each layer of the Internet-related industries. The figure indicates that, in terms of growth-rate-prediction, the upper layer shows the highest in every region.

2. Coming Competitions among ICT Business Eco-system and Overview

Smartphones are a driver of competition and growth and also a potential transformer of the present mobile industries through the platforms that will be prepared by network business players. Recently, the term "Eco-system" — an analogy to the ecosystem of the natural world — is frequently used to express the growth dynamics in the ICT industries involving the complimentary goods and services such as applications provided by a variety of the by-players, in addition to network services and terminals. As shown in the popularity of the term, the growth of the ICT industry is widely researched and analyzed from the standpoint of the con-

cept of an ecosystem, in such a way that, as the industry moves toward inter-ecosystem competition, as the common foundation, platforms (for example, OS or application-stores for smartphones) will come to play a key role in each of the ecosystem competition strategies.

(1) Competition among ICT business eco-systems

Conventionally in Japan, goods and services have been provided through two different and co-existing structures on the Internet: the "Separated-by-layer-boundary" type such as PC-Internet, and the "Carrier-controlled-vertical-integration" type such as the conventional mobile Internet. However, the spread of smartphones is leading to the creation of a variety of structures (Figure 2-2-2-1).

Apple, which has conventionally been doing businesses on a proprietary foundation and reportedly generating earnings mainly through terminal sales, is seeking for the quality improvement of over-all user-service through the operation of platforms for contents or applications (see iTunes or App Store).

Google, which has reportedly generated earnings mainly through selling Internet advertisements around their search system, is seeking, through supplying Android OS to mobile terminal manufacturers, to increase access to their search system from the terminals equipped with their OS and to increase their earnings coming from their application store. The other players are seeking to build their own ecosystems; in many cases, they are seeking ecosystems which will give them profits through supplying their OS or through providing ID registration service or charging-system services in their application store. On the other hand, as shown in the trend in the Internet connection-method in which both the 3G network or Wi-Fi are available, the simple classification of business formations into vertical inte-

gration or the horizontal distribution is becoming meaningless.

(2) Effects of shift of terminals to smartphones and tablets and the influence of applications, etc.

a. Trends in application stores

The basic earning scheme of the smartphone business has been said to be as follows: provision of application-development-environments to developers induce third-parties to develop their applications, and the developers receive a dividend from the sales revenues of those applications. Such a scheme has attracted corporate or individual developers. Therefore, for an ecosystem, enclosing many application developers is said to be the key to its high competitiveness. The right-hand-side graph of Figure 2-2-2-2 shows the status of the size of developer group and the OS share for Android OS and iOS; it shows a certain relationship existing between the size of developers and the OS share.

With regard to the situations of developers, many of them like to supply their applications to the Apple App Store (iOS) or to the Android Market (Android OS); also
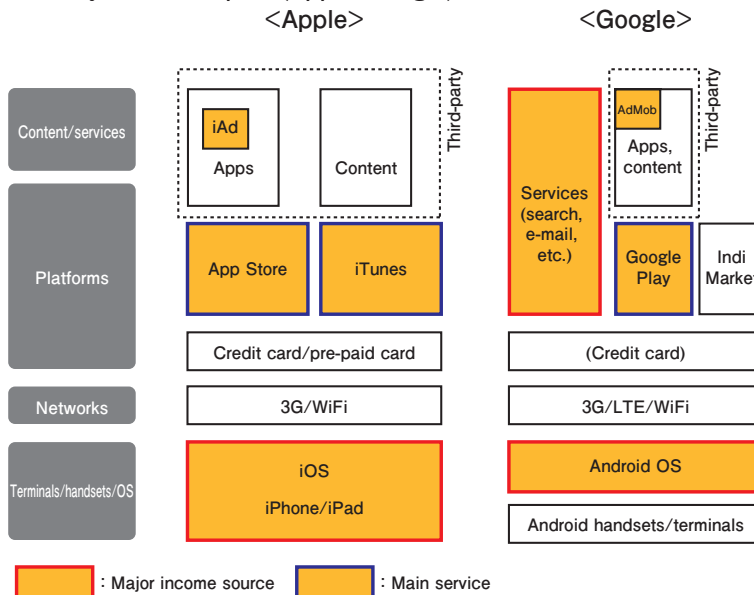
Figure 2-2-2-1　Trends in Ecosystem Formations in Smartphone Market

Business classification			Network-based			Manufacturer-based			Carrier-based
Main operators			Microsoft	Google	Apple	Nokia	RIM	Samsung	NTT Docomo i-Mode
Business layers	Contents/apps		Live! Service	Google Mobile Services	iTunes Mobile Me	Ovi Service	BlackBerry	—	i-appli/ voluntary sites
	Platforms	App stores	Sky Market	Google Play	App Store	Ovi	BlackBerry App World	Samsung Apps	Carrier-operated market
		Customer management/ charges	ID management/charging functions (paid by credit card, etc.)						Imposition & collection on behalf of others
	Networks (related to carriers)		Carrier-neutral		Apple-selected (sales promotion premiums)	Carrier-neutral			Network manages everything
	User interface	OS	Windows Mobile Windows 8	Android OS	iOS	Symbian OS	RIM OS	Bada	Various OS
		Handset/terminal	Windows Phone	Android handset/ terminal	iPhone/iPad	Symbian handset	BlackBerry	Mainly Android handset/ terminal	i-Mode handset
		Supplier	Various companies (various manufacturers)		Own-brand				Other companies (various manufacturers)
		Planning & development	Led by handset/terminal manufacturers						Led by carrier
Smartphone market	Global handset/terminal share (% of units sold)		—	—	19%	18%	11%	19%	—
	Global OS share (% of units sold)		2%	46%	19%	19%	11%	2%	—
	Number of registered apps		82,234 (as of April 2012)	450,000 (as of February 2012)	585,000 (as of April 2012)	116,583 (as of December 2011)	60,000 (as of January 2012)	—	5,521 (as of February 2012)
	Countries where app store can be used (%)		16%	24%	40%	95%	47%	52%	Within Japan only

*Note: Core services and products are written in red letters.
*Note that the covering range of those ecosystems differs slightly; for example, in Japan, for Google's Android terminals, charging/collection through carriers is available, but as for Apple's IPhone, only direct charging/collection by Apple is allowed.

■Ecosystem Examples (Apple/Google)

<Apple>　　　　　　<Google>

□: Major income source　□: Main service

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

Figure 2-2-2-2   Relation of Installed-units of OSs and Size of Application Vendors or Developers
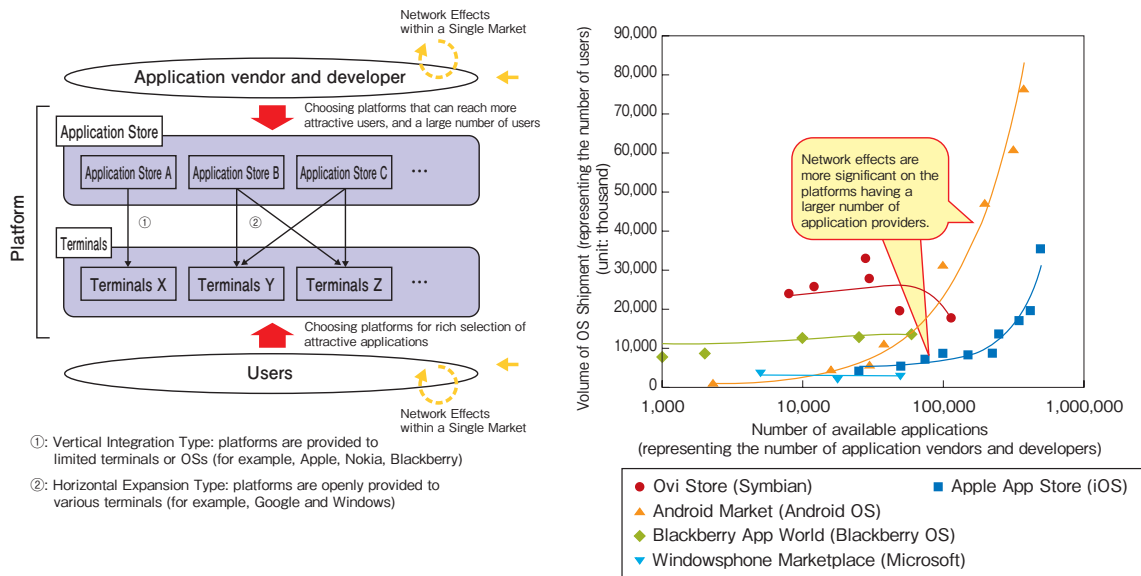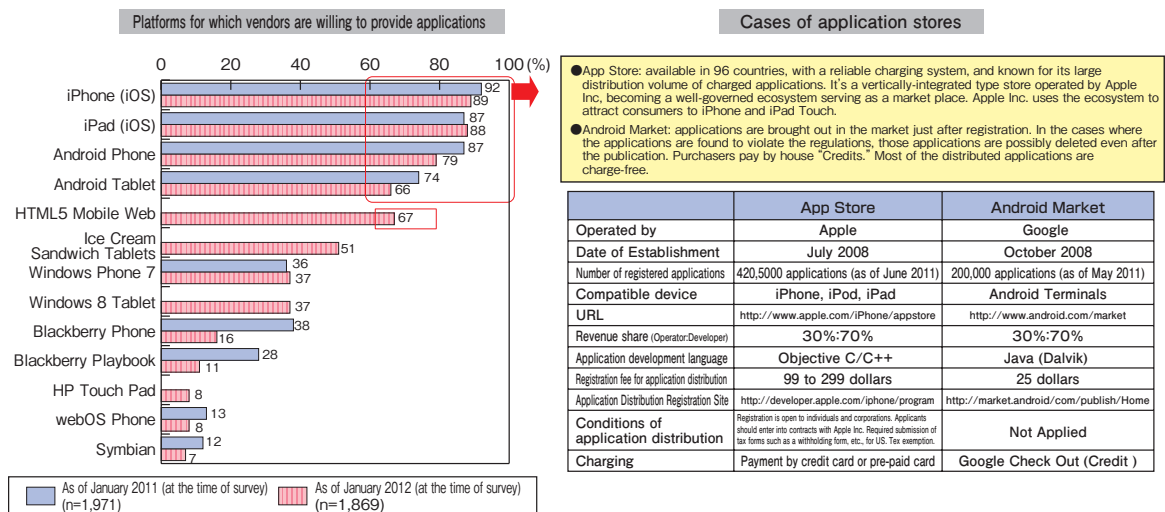

①: Vertical Integration Type: platforms are provided to limited terminals or OSs (for example, Apple, Nokia, Blackberry)

②: Horizontal Expansion Type: platforms are openly provided to various terminals (for example, Google and Windows)

- Ovi Store (Symbian)
- Android Market (Android OS)
- Blackberry App World (Blackberry OS)
- Windowsphone Marketplace (Microsoft)
- Apple App Store (iOS)

Based on Gartner's Survey

Figure 2-2-2-3   Tendencies to OSs of Application Vendors or Developers, and General Description of Major Application Stores

Platforms for which vendors are willing to provide applications

	iPhone (iOS)	92 / 89
iPad (iOS)	87 / 88
Android Phone	87 / 79
Android Tablet	74 / 66
HTML5 Mobile Web	67
Ice Cream Sandwich Tablets	51
Windows Phone 7	36 / 37
Windows 8 Tablet	37
Blackberry Phone	38 / 16
Blackberry Playbook	28 / 11
HP Touch Pad	8
webOS Phone	13 / 8
Symbian	12 / 7

As of January 2011 (at the time of survey) (n=1,971)
As of January 2012 (at the time of survey) (n=1,869)

Cases of application stores

●App Store: available in 96 countries, with a reliable charging system, and known for its large distribution volume of charged applications. It's a vertically-integrated type store operated by Apple Inc, becoming a well-governed ecosystem serving as a market place. Apple Inc. uses the ecosystem to attract consumers to iPhone and iPad Touch.

●Android Market: applications are brought out in the market just after registration. In the cases where the applications are found to violate the regulations, those applications are possibly deleted even after the publication. Purchasers pay by house "Credits." Most of the distributed applications are charge-free.

	App Store	Android Market
Operated by	Apple	Google
Date of Establishment	July 2008	October 2008
Number of registered applications	420,5000 applications (as of June 2011)	200,000 applications (as of May 2011)
Compatible device	iPhone, iPod, iPad	Android Terminals
URL	http://www.apple.com/iPhone/appstore	http://www.android.com/market
Revenue share (Operator:Developer)	30%:70%	30%:70%
Application development language	Objective C/C++	Java (Dalvik)
Registration fee for application distribution	99 to 299 dollars	25 dollars
Application Distribution Registration Site	http://developer.apple.com/iphone/program	http://market.android.com/publish/Home
Conditions of application distribution	Registration is open to individuals and corporations. Applicants should enter into contracts with Apple Inc. Required submission of tax forms such as a withholding form, etc., for US. Tex exemption.	Not Applied
Charging	Payment by credit card or pre-paid card	Google Check Out (Credit)

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

note that, in addition to developing the native applications for the proprietary OSs, an increasing number of developers are oriented toward developing web applications by HTML 5; the number of developers who have an HTML 5 orientation just exceeds the number of those oriented to the Android Tablet.

**b. Analysis on user behavior of application stores, based on poll surveys on Web**

The poll survey on the web for the purpose of knowing how the smartphone-spread has affected the behavior of users of feature phones, smartphones, and tablet terminals — note that the number of responses for each terminal are normalized — shows the following: more than 50 % of the users have no experiences of download-

ing paid applications, and as for free applications, more than 50 % have downloaded less than 10 applications, suggesting that the usage of applications is not spreading so widely; the comparison of usage ratio of paid/free applications for each terminal type shows that the paid-application ratio for the tablet-terminal user is 24.4 %, more than the 14 % for smartphone users, and that for smartphone users, according to the store-by-store analysis, the paid-application download ratio differs from one application-store to another.

c. The influence of the smartphone spread on platform-level services

The influence of the smartphone spread on the platform-level services including search, SNS, and on-line shopping are analyzed using the result of the poll-survey

Figure 2-2-2-4　Trends in Application-usage through Smartphones or Tablet-terminals
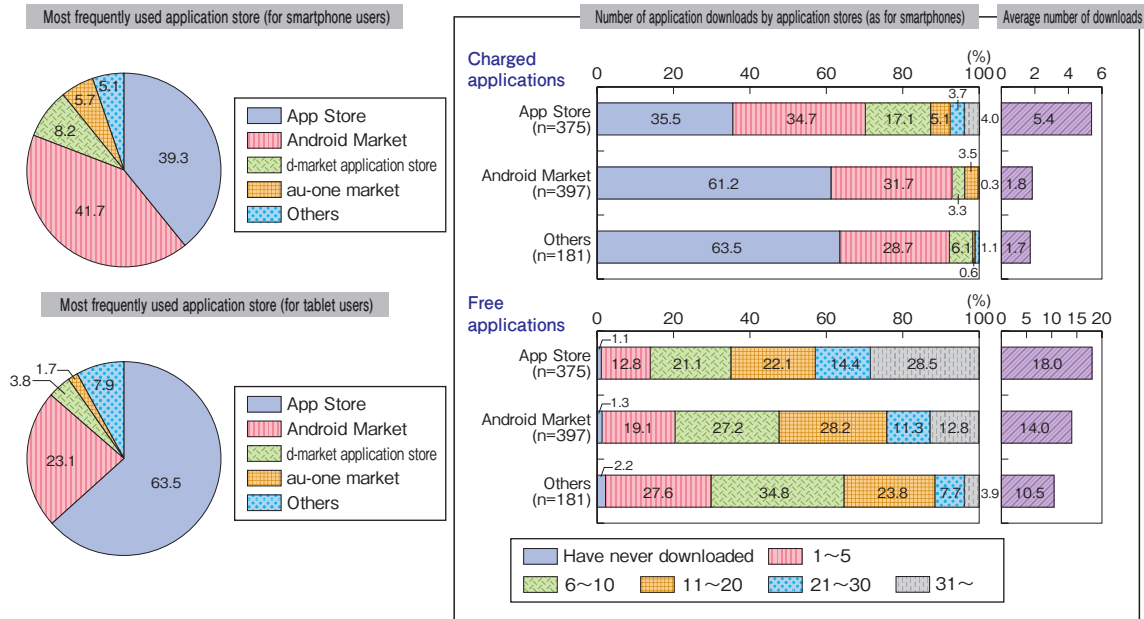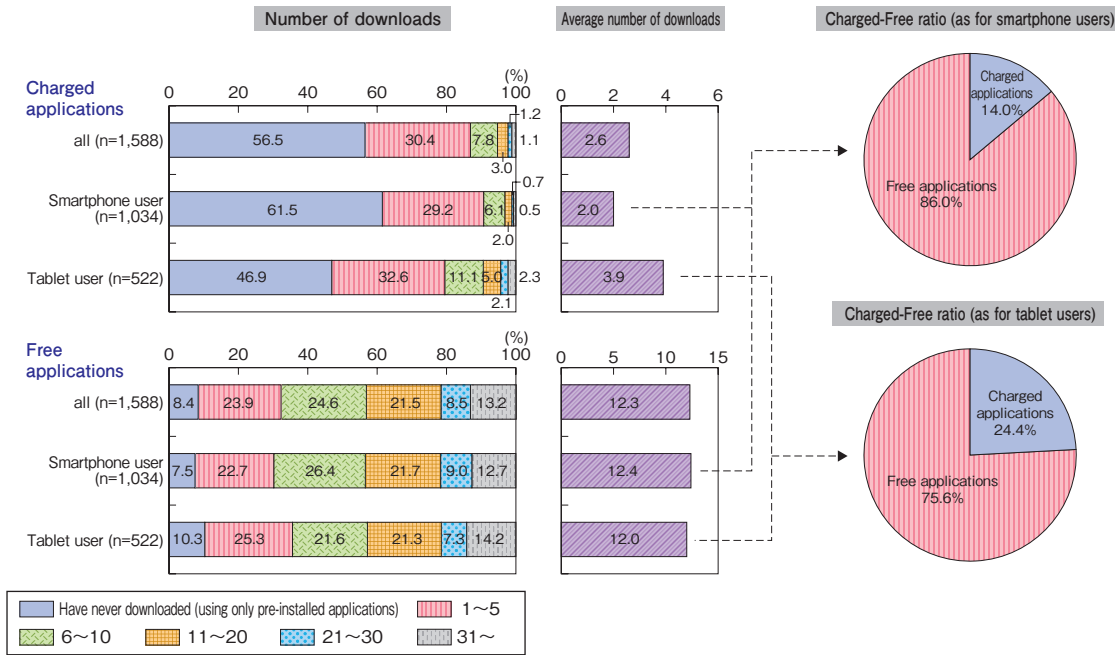
(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)
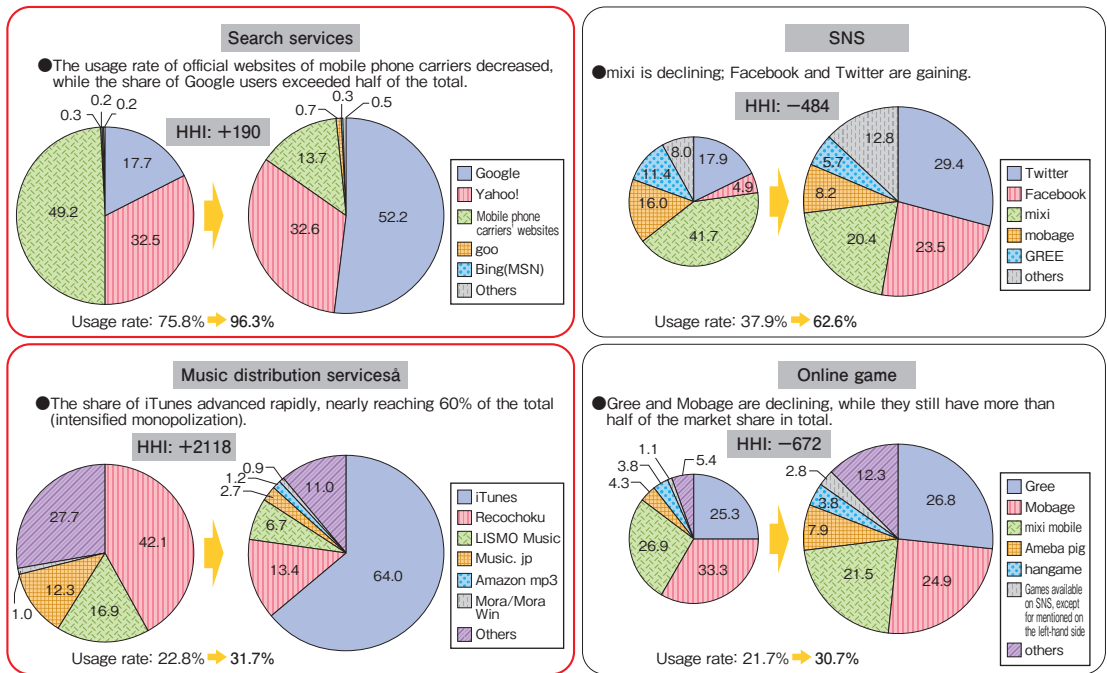
shown in the previous paragraph in the following manner: the eight services, ① search service, ② SNS service, ③ music subscription service, ④ online games, ⑤ online shopping, ⑥ video-subscription service, ⑦ e-book service, and ⑧ e-paper service, are selected; as for each service, how the type of terminal for access — feature phone, smartphone, and personal computer — influences the selection of the eight services is analyzed.

The analysis of the most frequently used service-site for each type of service by each type of terminal: smartphone, feature phone, and personal computer, shows the

following: as for online shopping service and video-subscription service, no significant differences by terminal type are found; as for e-paper service, a similar trend is shown, except for some sites having a high share among smartphone users; as for music subscription service, some specific sites are much more frequently used than other sites by smartphone users, and a similar trend is found among personal computer users; as for other services, smartphone users show a trend between feature phone users and personal computer users.

The analysis of the response to a question dedicated

Figure 2-2-2-5　Influence of Smartphone-shift on Individual Service (Platform) Usage

Search services
●The usage rate of official websites of mobile phone carriers decreased, while the share of Google users exceeded half of the total.

HHI: ＋190

0.3　0.2　0.2
17.7
49.2
32.5

0.7　0.3　0.5
13.7
32.6
52.2

Google
Yahoo!
Mobile phone carriers' websites
goo
Bing(MSN)
Others

Usage rate: 75.8% ➡ 96.3%

SNS
●mixi is declining; Facebook and Twitter are gaining.

HHI: −484

8.0　17.9
11.4
16.0
41.7　4.9

12.8　29.4
5.7
8.2
20.4　23.5

Twitter
Facebook
mixi
mobage
GREE
others

Usage rate: 37.9% ➡ 62.6%

Music distribution serviceså
●The share of iTunes advanced rapidly, nearly reaching 60% of the total (intensified monopolization).

HHI: ＋2118

27.7
1.0
12.3
16.9
42.1

1.2　0.9
2.7　11.0
6.7
13.4
64.0

iTunes
Recochoku
LISMO Music
Music. jp
Amazon mp3
Mora/Mora Win
Others

Usage rate: 22.8% ➡ 31.7%

Online game
●Gree and Mobage are declining, while they still have more than half of the market share in total.

HHI: −672

1.1
3.8　5.4
4.3
26.9
33.3　25.3

2.8　12.3
3.8
7.9
21.5　24.9
26.8

Gree
Mobage
mixi mobile
Ameba pig
hangame
Games available on SNS, except for mentioned on the left-hand side
others

Usage rate: 21.7% ➡ 30.7%

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

to current smartphone users concerning whether, for the eight services, their favorite sites have changed after shifting to smartphones shows the following: in terms of the changes in the usage rate and in the site-concentration for the top tree services (platforms), for video subscription service, music subscription service, and search service, both the usage rate and the site-concentration have increased, and particularly for music subscription service, the iPhone users' shift to iTunes has boosted such trends; on the other hand, as for on-line shopping, SNS, and online games, the usage rate has increased while the site concentration is leveling-off or declining, suggesting that the inter-site competition has become active.

In addition, the users who are currently using smartphones are questioned concerning what services (platforms) they use. The responses for the individual services are summarized as the share of the individual services (indicating what services are used more frequently) (Figure 2-2-2-5); the respondents are requested to answer regarding use before buying the smartphone and after. The shares are shown in Figure 2-2-2-5. Similarly to the previous analysis, it is apparent that for the services such as search, music-subscription, and video-subscription, the "after" share is larger than the "before" share.

The analysis shown above suggests that the ecosystem strategy in the smartphone business, where terminals, OS, and services (platform) are interconnected, and third-parties having specific advantages are involved for the purpose of the enhancement of the value of over-

all service, has proven its effectiveness. Therefore, each of the business players in the ICT industries, when deploying their services, should pay attention to the ecosystem and platform strategies.

3. Changes in ICT User Behavior induced by Smartphone Spread

(1) Smartphone user's characteristics

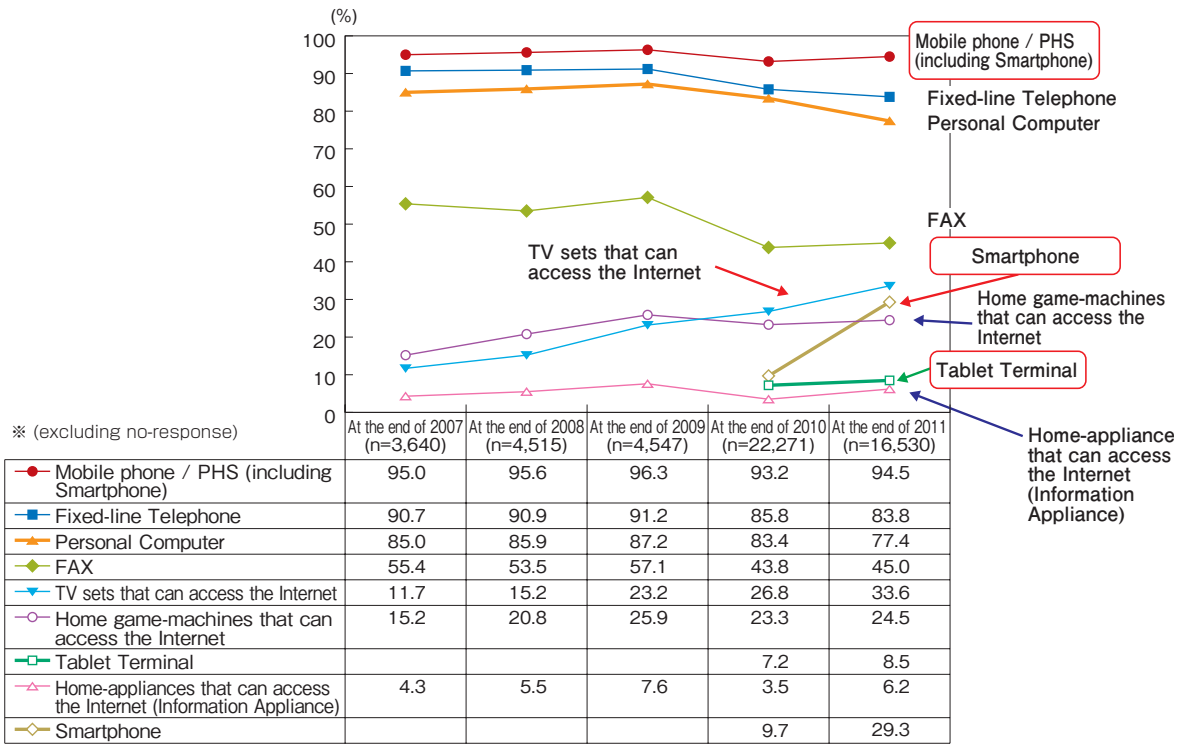### a. Number of ICT devices per family and Internet usage via terminal

Figure 2-2-3-1 shows the last five-year trends in the number of ICT devices per family based on the State of Japan's Communication in terms of Traffic, 2009 as follows:

While the spread of ICT devices has generally reached the level of saturation, the rapid spread of smartphones is remarkable, and new demands have emerged in connection to them.

A look at what types of terminals are frequently used by Internet users to connect to the Internet shows that 16.2 % of all Internet users use smartphones, and 9.8 % of people who use the Internet from outside of their homes mainly use smartphones.

At the same time, a look at what types of terminals — mobile phones, smartphones, tablet terminals — are frequently used for connecting to the Internet by what generation groups shows that more than 40 % of 20 year olds use smartphones, whereas almost all the genera-
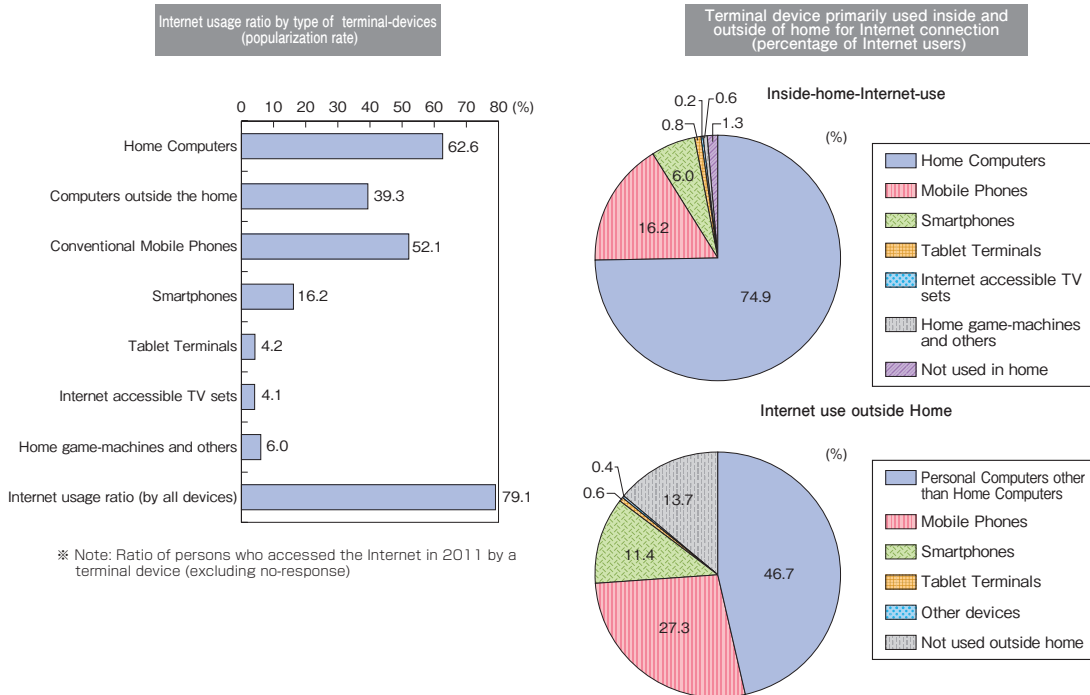
Figure 2-2-3-1   Major Information/Communication Devices in Household (2007 to 2011)

(%)

Mobile phone / PHS (including Smartphone)
Fixed-line Telephone
Personal Computer
FAX
Smartphone
Home game-machines that can access the Internet
TV sets that can access the Internet
Tablet Terminal
Home-appliance that can access the Internet (Information Appliance)

※ (excluding no-response)

	At the end of 2007 (n=3,640)	At the end of 2008 (n=4,515)	At the end of 2009 (n=4,547)	At the end of 2010 (n=22,271)	At the end of 2011 (n=16,530)
Mobile phone / PHS (including Smartphone)	95.0	95.6	96.3	93.2	94.5
Fixed-line Telephone	90.7	90.9	91.2	85.8	83.8
Personal Computer	85.0	85.9	87.2	83.4	77.4
FAX	55.4	53.5	57.1	43.8	45.0
TV sets that can access the Internet	11.7	15.2	23.2	26.8	33.6
Home game-machines that can access the Internet	15.2	20.8	25.9	23.3	24.5
Tablet Terminal				7.2	8.5
Home-appliances that can access the Internet (Information Appliance)	4.3	5.5	7.6	3.5	6.2
Smartphone				9.7	29.3

※ Note: Since the end of 2010, mobile-phones / PHS (including smartphones) has been counted as an item of smartphones. The ownership-ratio, when smartphones are excluded, is 89.4 % at the end of 2011.
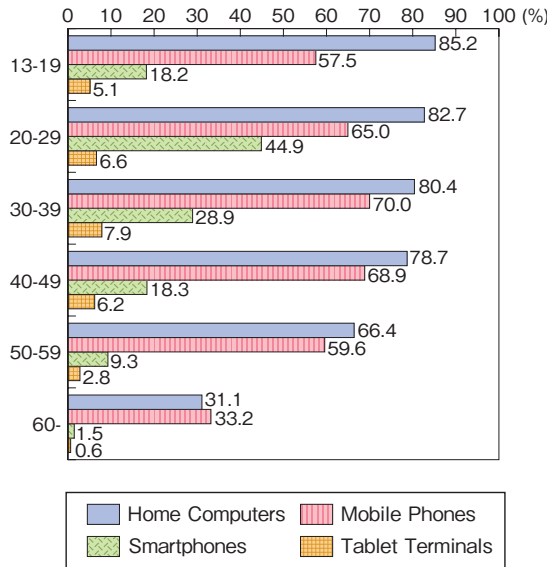
(Source) MIC "2011 Communications Usage Trend Survey"

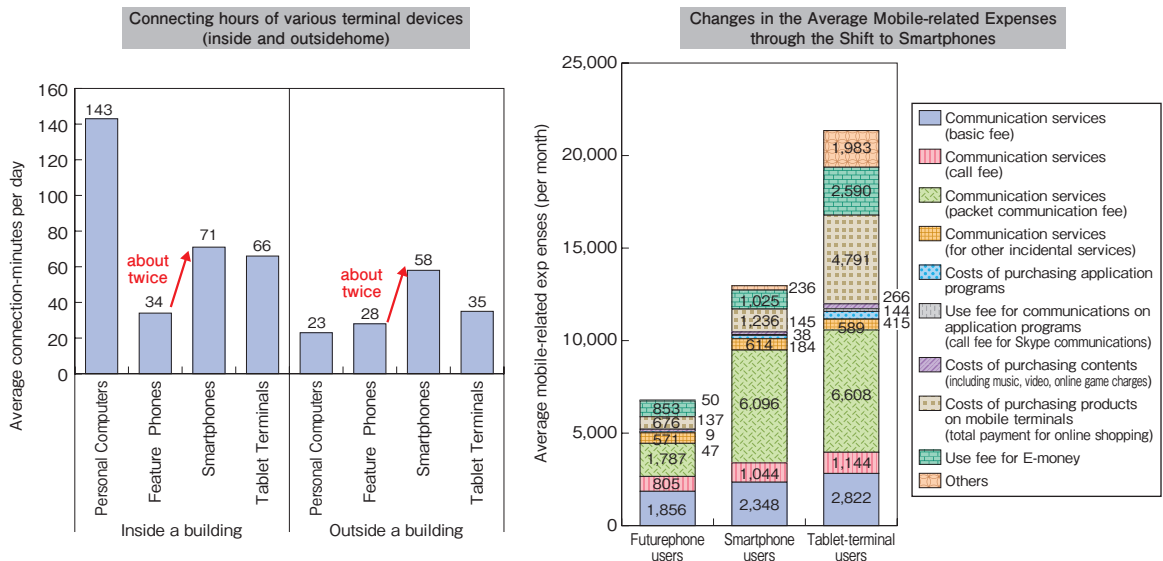**Figure 2-2-3-2   Trends in Individual Use of Internet (as of the end of 2011)**

Internet usage ratio by type of terminal-devices (popularization rate)

0 10 20 30 40 50 60 70 80 (%)

- Home Computers: 62.6
- Computers outside the home: 39.3
- Conventional Mobile Phones: 52.1
- Smartphones: 16.2
- Tablet Terminals: 4.2
- Internet accessible TV sets: 4.1
- Home game-machines and others: 6.0
- Internet usage ratio (by all devices): 79.1

※ Note: Ratio of persons who accessed the Internet in 2011 by a terminal device (excluding no-response)

Terminal device primarily used inside and outside of home for Internet connection (percentage of Internet users)

Inside-home-Internet-use (%)

- 74.9
- 16.2
- 6.0
- 0.8
- 0.2
- 0.6
- 1.3

Legend:
- Home Computers
- Mobile Phones
- Smartphones
- Tablet Terminals
- Internet accessible TV sets
- Home game-machines and others
- Not used in home

Internet use outside Home (%)

- 46.7
- 27.3
- 11.4
- 0.6
- 0.4
- 13.7

Legend:
- Personal Computers other than Home Computers
- Mobile Phones
- Smartphones
- Tablet Terminals
- Other devices
- Not used outside home

※ Note: Ratio of persons who accessed Internet in 2011 by using the terminal device as the primary connection device to the persons who accessed Internet in 2011 (excluding non-responses)

(Source) MIC "2011 Communications Usage Trend Survey"

Figure 2-2-3-3 Generation-by Generation Trends in Individual Use of Internet (as of the end of 2011)

13-19: 85.2 / 57.5 / 18.2 / 5.1
20-29: 82.7 / 65.0 / 44.9 / 6.6
30-39: 80.4 / 70.0 / 28.9 / 7.9
40-49: 78.7 / 68.9 / 18.3 / 6.2
50-59: 66.4 / 59.6 / 9.3 / 2.8
60-: 31.1 / 33.2 / 1.5 / 0.6

Home Computers / Mobile Phones / Smartphones / Tablet Terminals

(Source) MIC "2011 Communications Usage Trend Survey"

Figure 2-2-3-4 Terminal-type Comparison of Use-hours and Expenses on Mobile-use

Connecting hours of various terminal devices (inside and outsidehome)

Average connection-minutes per day

Inside a building: Personal Computers 143, Feature Phones 34, Smartphones 71, Tablet Terminals 66
Outside a building: Personal Computers 23, Feature Phones 28, Smartphones 58, Tablet Terminals 35
about twice

Changes in the Average Mobile-related Expenses through the Shift to Smartphones

Average mobile-related expenses (per month)

Communication services (basic fee)
Communication services (call fee)
Communication services (packet communication fee)
Communication services (for other incidental services)
Costs of purchasing application programs
Use fee for communications on application programs (call fee for Skype communications)
Costs of purchasing contents (including music, video, online game charges)
Costs of purchasing products on mobile terminals (total payment for online shopping)
Use fee for E-money
Others

Futurephone users: 1,856 / 805 / 1,787 / 571 / 676 / 853 / 50 / 137 / 9 / 47
Smartphone users: 2,348 / 1,044 / 6,096 / 614 / 1,236 / 1,025 / 184 / 38 / 145 / 236
Tablet-terminal users: 2,822 / 1,144 / 6,608 / 589 / 4,791 / 2,590 / 1,983 / 415 / 144 / 266

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

tion groups still accept conventional mobile phones as Internet-connection terminals usable from everywhere. This suggests that the younger generation has rapidly accepted smart phones.

b. Changes in user behaviors in terminal usage induced by the spread of smartphones

A look at the State of Japan's Communication Traffic, 2009 for the changes in user behaviors in terminal usage induced by the spread of smartphones reveals the following:

As for the frequency of Internet usage outside the home, while more-than-once-per-day usage is just over 50 % for conventional-mobile-phones, it exceeds 80 % for smartphones, suggesting that smartphones accelerate Internet usage. In terms of the purpose of usage outside the home, smartphones are more frequently used than conventional mobile phones for almost all purposes, and more frequently used distinctly for the purpose of web-page browsing, social-media-access, on-line shopping, and map-viewing.

As for online shopping, smartphones are much more frequently used than conventional mobile phones for almost every purchase-item; the highest price per purchase, averaging the replies by people who have purchased goods on online-shopping sites, is 13,054 yen through conventional mobile phones and 15,533 yen through smartphones, which is 2,400 yen or about 18 %

Figure 2-2-3-5　Terminal-type Comparison of Service-use
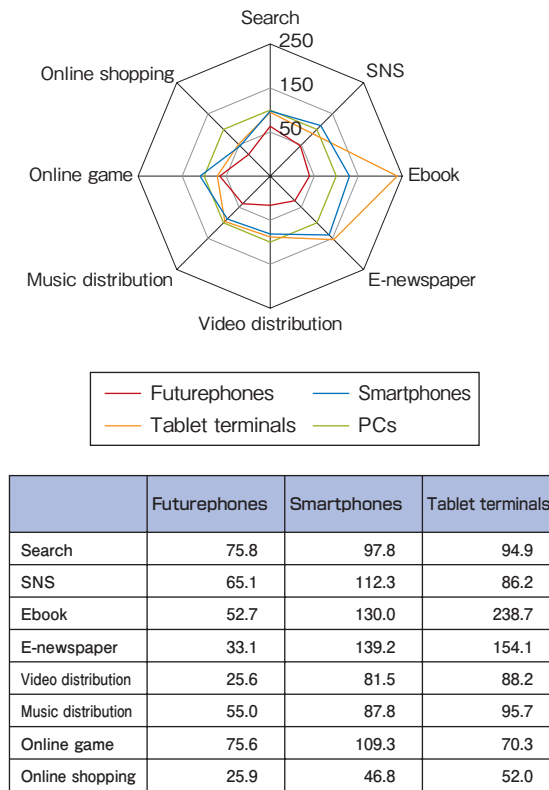
	Futurephones	Smartphones	Tablet terminals
Search	75.8	97.8	94.9
SNS	65.1	112.3	86.2
Ebook	52.7	130.0	238.7
E-newspaper	33.1	139.2	154.1
Video distribution	25.6	81.5	88.2
Music distribution	55.0	87.8	95.7
Online game	75.6	109.3	70.3
Online shopping	25.9	46.8	52.0

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

higher than for conventional phones. It suggests that the spread of smartphones has the potential to boost users' Internet shopping.

An additional web-poll survey for the purpose of the further analysis of the changes in terminal usage-share in Internet-use and the factors affecting the terminal choice shows the following:

As for the hours of using terminals in a day inside the house or outside the house, the hours spent using smartphones are twice those for conventional mobile phones, regardless of the location where a terminal is used (inside or outside the house).

As for the mobile-related monthly expense,[6] the total communication service-charge including basic monthly charge, call charge and packet charge paid by a smartphone user or a tablet terminal user is more than twice that by a feature phone user, and a tablet terminal user spends more on purchasing goods on-line than the others.

Regarding the major services available on the Internet, Figure 2-2-3-5, shows in a radar chart the service-usage frequency by each type of terminal, feature phones, smartphones, tablet terminals and personal computers, normalized by that of personal computers. The figure reveals that, as for a tablet terminal, e-book services stands out, suggesting that the use of tablet terminals is closely related to e-book services.

(2) Factors affecting the selection of smartphone

The previously-mentioned poll-survey investigated factors that users recognize as critical for selection of terminals, and changes in the users' recognition since the emergence of the smartphone or the tablet terminal, through asking questions such as, "What factors do you consider when selecting a terminal?" "What are the critical factors now that smartphones and tablet terminals are available?"
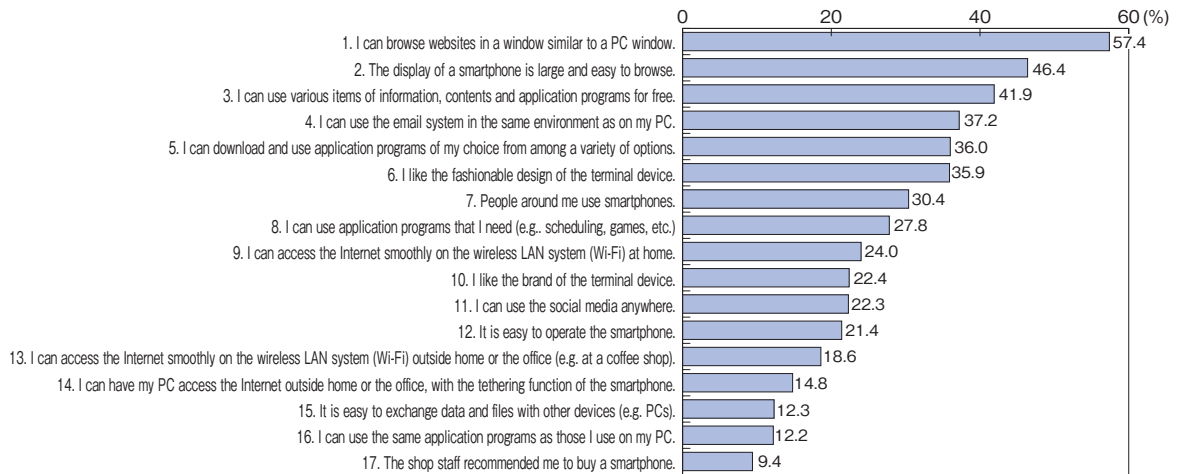
The investigation reveals the following:

With regard to the rank of importance of each factor and how it changed due to the emergence of the smartphone and the tablet terminal, the following significant difference exists between the factor of terminal price and the factor of accessibility to network services: although feature phone users recognize the factor of terminal price as critical and have maintained this recognition even since the emergence of the smartphone and the tablet terminal, smartphone users recognize the accessibility to network services as critical, and now recognize it as more critical, after the emergence of the smartphone and the tablet terminal. No other factors, while some differences are observed depending on the user type, show such a significant dependence on user-
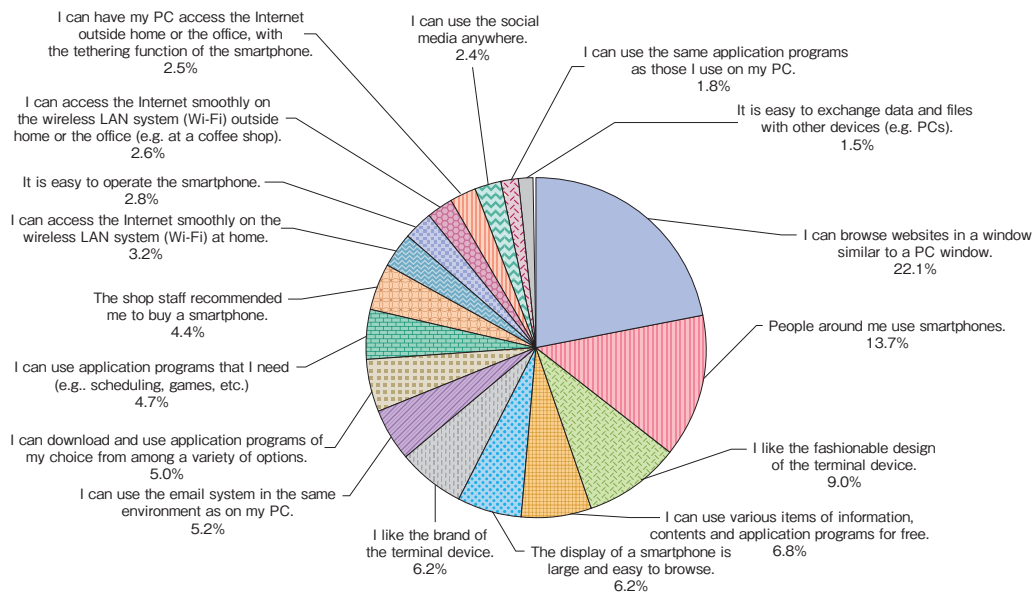
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[6] Total expense per user, including users who own more than one phone; not the cost per phone

Figure 2-2-3-6 Critical-factors for Choosing Smartphones

【Reasons for the shift to a smartphone (multiple answers)】

	%
1. I can browse websites in a window similar to a PC window.	57.4
2. The display of a smartphone is large and easy to browse.	46.4
3. I can use various items of information, contents and application programs for free.	41.9
4. I can use the email system in the same environment as on my PC.	37.2
5. I can download and use application programs of my choice from among a variety of options.	36.0
6. I like the fashionable design of the terminal device.	35.9
7. People around me use smartphones.	30.4
8. I can use application programs that I need (e.g.. scheduling, games, etc.)	27.8
9. I can access the Internet smoothly on the wireless LAN system (Wi-Fi) at home.	24.0
10. I like the brand of the terminal device.	22.4
11. I can use the social media anywhere.	22.3
12. It is easy to operate the smartphone.	21.4
13. I can access the Internet smoothly on the wireless LAN system (Wi-Fi) outside home or the office (e.g. at a coffee shop).	18.6
14. I can have my PC access the Internet outside home or the office, with the tethering function of the smartphone.	14.8
15. It is easy to exchange data and files with other devices (e.g. PCs).	12.3
16. I can use the same application programs as those I use on my PC.	12.2
17. The shop staff recommended me to buy a smartphone.	9.4

【The most decisive factor (only one answer)】

- I can have my PC access the Internet outside home or the office, with the tethering function of the smartphone. 2.5%
- I can access the Internet smoothly on the wireless LAN system (Wi-Fi) outside home or the office (e.g. at a coffee shop). 2.6%
- It is easy to operate the smartphone. 2.8%
- I can access the Internet smoothly on the wireless LAN system (Wi-Fi) at home. 3.2%
- The shop staff recommended me to buy a smartphone. 4.4%
- I can use application programs that I need (e.g.. scheduling, games, etc.) 4.7%
- I can download and use application programs of my choice from among a variety of options. 5.0%
- I can use the email system in the same environment as on my PC. 5.2%
- I like the brand of the terminal device. 6.2%
- The display of a smartphone is large and easy to browse. 6.2%
- I can use various items of information, contents and application programs for free. 6.8%
- I like the fashionable design of the terminal device. 9.0%
- I like the fashionable design of the terminal device. 9.0%
- People around me use smartphones. 13.7%
- I can browse websites in a window similar to a PC window. 22.1%
- I can use the social media anywhere. 2.4%
- I can use the same application programs as those I use on my PC. 1.8%
- It is easy to exchange data and files with other devices (e.g. PCs). 1.5%

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

type.

In addition, the smartphone users, when asked about why they shifted from feature phones to smartphones and when requested to ① list all the reasons, and ②choose the most critical reason, responded as follows (Figure 2-2-3-6):

As for request ① (all the reasons), "Able to use the same pages for browsing" is the most frequently chosen reason (getting 57.4 % of all the votes), and "Equipped with a wide and easy-to-read display" is the next (46.4 %); as for the question ② (most critical reason), "Able to use the same pages for browsing" is the first again (22 %). Such a high support-rating for ① and ② suggests that the smartphone's feature of having the same level of browsing capability as personal computers is the key factor of the shift to the smartphone.

(3) Potential of the tablet terminal to be a terminal for seniors

Although, at present, tablet terminals are dominated by the younger generations — 30s or 40s —,and are not recognized as a device for seniors, a small but increasing number of trial services on tablet terminals are senior-friendly and are expected to develop as senior-oriented services. Tablet-terminals have the potential to be used by seniors if one-stop services that are easy-to-use with tablet terminals are provided.

For the purpose of proving the possibility of such a scenario, a web-poll-survey (by-mail in some situations) was conducted for seniors on the desired one-stop services available on tablet terminals, the required features, and expectations for the services. Figure 2-2-3-7, as a result of conjoint analysis of the responses of the poll-survey, shows the willingness-to-pay for the services if they

Figure 2-2-3-7   Amount Seniors are willing to pay for Services

Amount of money users are willing-to-pay per month for senior-oriented services (yen per month)

Categories (left to right):
- Delivery from supermarkets or convenience stores
- Payment or pension claims from home
- Health management indicators such as blood pressure or steps per day
- Automatic response in emergency
- Chat with grandkids on picture phone
- Easy to use, like a mobile phone: ready to use off the shelf, no need to set-up
- Persons near-by have same type of terminals: easy to consult
- Vendors can provide support when trouble occurs.
- No fear of fraud or viruses
- Not use

Legend: Seniors (not a PC user) / Seniors (PC user) / Sons and daughters who want to make a gift to their parents

(Source) MIC "Research and Survey on Current-and-Future Usage of Smartphones or Tablet Terminals" (2012)

are available on tablet terminals as follows:

In general, respondent seniors using personal computers responded that the amount of money they can pay for a service is over 1,000 yen, suggesting that, if a tablet terminal is supplied at a monthly rent of about 500 yen including service fees, seniors interested in PCs will probably accept tablet terminals.

The results of the poll-survey on the persons who are the children of those seniors conducted concurrently with the above-mentioned survey show similar inclinations; it suggests that the activities for providing the "child-generations" with information on such terminals and services, will possibly help such terminal and services spread among seniors.

An additional mail-survey targeting the seniors who are not using personal computers shows no significant contradiction with the results of the above two surveys regarding the sum they are willing to pay; it suggests that seniors, as a whole, potentially require such tablet terminals and services.

4. Economic Ripple Effects of Spread of Smartphones/ Tablet-terminals

The spread of smartphones/tablet-terminals is expected to bring about economic effects through stimulating consumer-spending on the Internet in a variety of fields, expanding mobile advertisement on the terminals, and expanding the smartphone/terminal market.

The analysis for the purpose of estimating the economic effects on the consumer market induced by the spread of smartphones/tablet terminals, in which the impact (direct value and increment) induced by the spread of smartphones/tablet terminals is estimated and the total economic ripple effects to all the industries (value of induced production) are estimated by using the interindustry table, shows the following: the absolute value of the direct effect is about 3.7 trillion yen annually, and the total ripple effects (increment) obtained by using interindustry analysis is about 7.2 trillion yen annually; the total job-creation (increment) is, based on the job number (for the year 2010) and the value of induced production, estimated to be 338 thousand annually (including 99 thousand in the information and communication industry, and 239 thousand in the general industries).

Note that more than half of the economic ripple effect is generated in the general industries covering a wide range of fields, including the ICT industry, which suggests that the spread of smartphone brings about economic effects on a wide variety of industries in addition to the information and communication industries.

Section 3

Transformation of Media driven by the Completion of Digital Network

The nationwide switchover to the digital terrestrial television broadcasting service was completed at the end of March 2012 when the termination of the analog terrestrial television broadcasting was carried-out in the

three distressed prefectures, which had been suspended in the Tohoku district because of the occurrence of the Great East Japan Earthquake. The completion of the ubiquitous network environments is driving the rapid transformation of the broadcasting media, shown in the examples of the emergence of the program-distribution services via Internet, or the program-production based on the collaboration with social media.

1. Completion of the switchover to the digital terrestrial broadcasting service, and the new expansion of broadcasting media

The switchover to the digital terrestrial broadcasting service has been completed as follows: in December 2002, the service started in the three greater metropolitan regions of Kanto (around Tokyo), Chukyo (around Nagoya), and Kinki (around Osaka); in December 2006, the nation-wide service was started; on July 24 2011, in the 44 prefectures, excluding the three prefectures in the Tohoku district, Iwate, Miyagi, and Fukushima, the analog terrestrial broadcasting service was terminated; on March 31 2012, in the three prefectures in the Tohoku district, the analog terrestrial broadcasting service was terminated. The Ministry of Internal Affairs and Communications had promoted the switchover to digital terrestrial broadcasting, based on the cooperation of each individual in the country, in collaboration with each of the ministries and agencies, local government, broadcasting organizations, equipment producers and other related parties.

Specifically, for the purpose of the development of the broadcasting receiving environment, the ministry promoted the analog frequency band shift at first, the construction of digital relay-stations, and aids to the cable-TV subscribers for digital-conversion service; in addition, the ministry promoted consultation to viewers by opening a "MIC Digital Support Center (Degi-Sapo)" in every prefecture in February 2011, helping the viewers suffering from digital reception difficulty or visiting their home depending on the situation.

After the start of the switchover to digital terrestrial broadcasting, it was found that in the areas where analog broadcasting had been successfully received by a home-antennae, some households are actually having difficulty in receiving digital broadcasting using a home-antenna (comprising another poor-reception area); according to surveys, 279,000 households nation-wide (14,119 areas) were identified as poor-reception households. The ministry, in collaboration with the local government and the residents in each of the areas, deter-

mined and implemented countermeasures, and, for some areas where the countermeasures could not be completed before the termination of the analog broadcasting, the ministry decided to tentatively broadcast programs via a satellite.

The ministry will continue to provide such measures for the elimination of digital-poor-reception areas, and plans to terminate the tentative satellite broadcasting by the end of March 2015, which is received by 111,000 household at present.

As for TV sets, the ministry has conducted the promotion of measures such as digital-TV-purchase-aid (eco-points), and the digital-tuner-purchase-aid to the economically-disadvantaged; as a result, nationwide sales (excluding the three distressed prefectures in the Tohoku district) were 122.18 million units as of June 2011, just before the termination of the analog broadcasting, which was plus 124.7 % of the original target at the time of completion of the switchover. In addition, the preparation of reception environments has reached the level of that originally targeted or an equivalent level.

In the final stage of the completion of switchover to the digital broadcasting, in addition to about 1,600 nationwide degi-sapos and temporary-support-corners, volunteers from various organizations such as scout-associations, mom-clubs, local-governments and affiliates, volunteer associations, local welfare commissioners and convenience-stores participated in the publicity or material-distribution for raising awareness regarding digital broadcasting. The ministry will acknowledge and remember that the completion of the digital-switchover would not be possible without the grass-roots" cooperation by the entire nation.

Japan's broadcasting media, generally completing the digitalization by the completion of the switchover to the digital terrestrial broadcasting, has proceeded into the next stage where they are faced with the issue of how to utilize the digital networks suitable for a high degree of collaborative or integrated services of communications and broadcasting. New-ways of broadcasting, such as V-High multimedia broadcasting which has started in April 2012, are emerging.

2. Smart-TV and promotion of integration and collaboration of broadcasting and social-media

(1) Acceleration of smart TV

The term "smart TV" is used differently by each of the broadcasting organizations, equipment manufacturers, network-related businesses and other players. In this article, a smart TV is classified as a TV receiver with features that are expandable through Internet connection,

Figure 2-3-2-1　Significant Trends in Activities around Smart TV
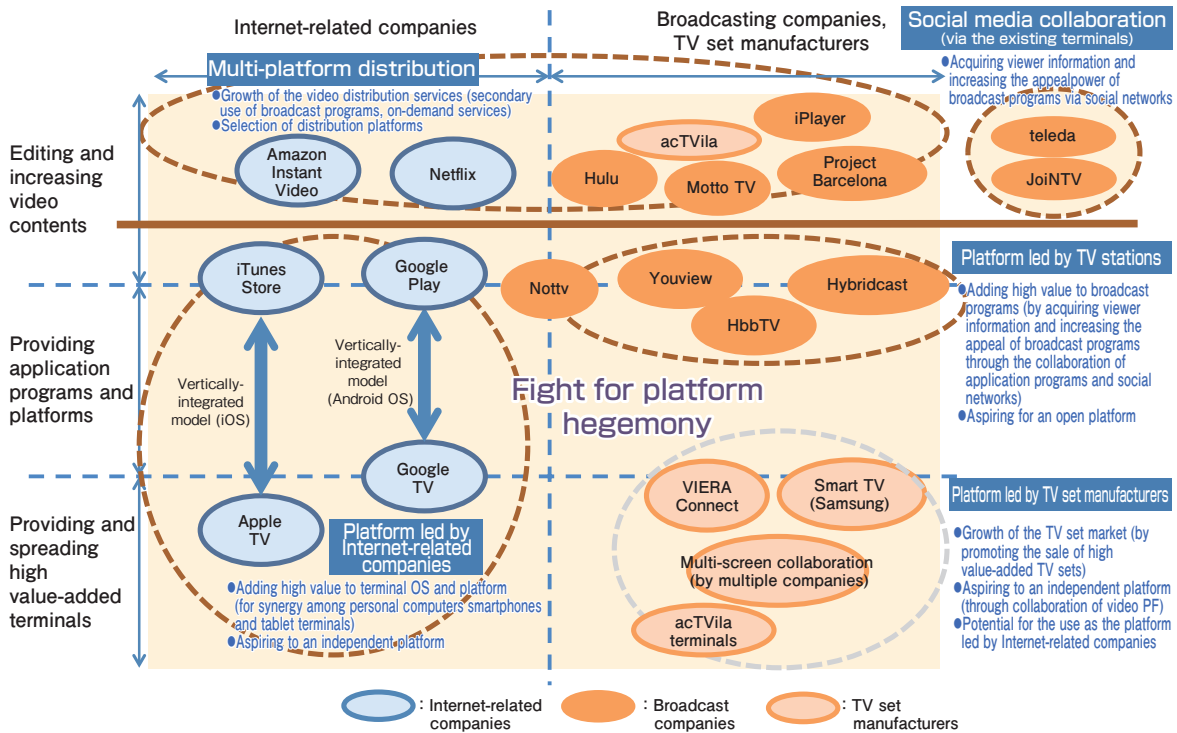
(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)
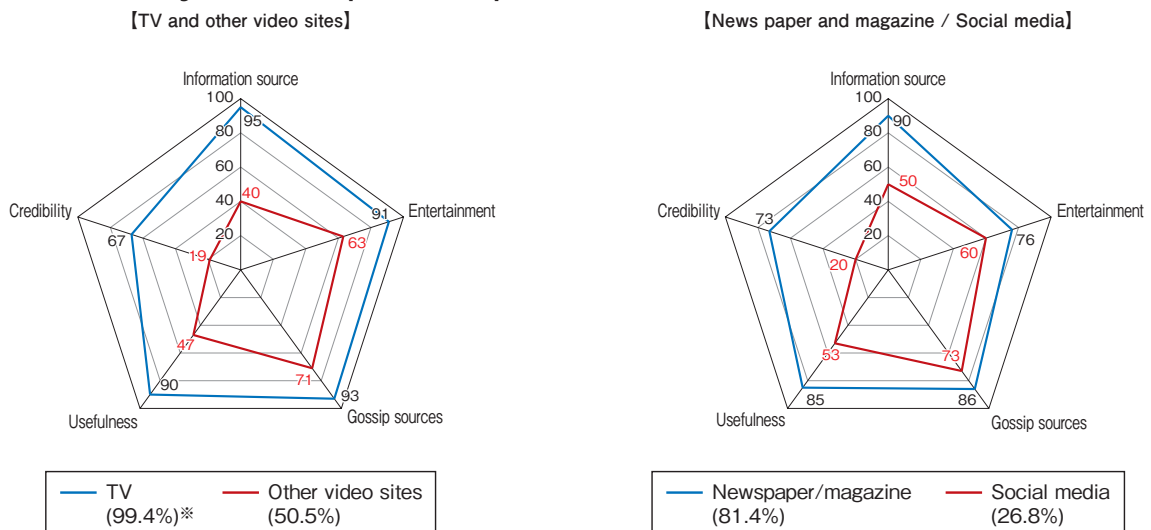
and then defined broadly as " a TV terminal or set-top box enabling such features expanded through Internet connection as web-browsing, social-media access, utilization of applications, or device-to-device connection." The trends in smart TV are classified following the definition as shown in Figure 2-3-2-1 focusing on what business models the players are seeking.

a. Enhancement of video-subscription through Internet (multi-platform business model)

As for the Internet-video-subscription-service, which has been accepted as a video-distribution media particularly in overseas countries, a growing number of such trials have been started in Japan; for example, "Motto-TV", which has been in service since April 2012 — established jointly by the five terrestrial commercial TV key stations and Dentsu Inc. — has started services focusing on Internet-video-subscription for compatible TV terminals (expansion to smartphones and tablet terminals are in the planning phase).

b. Smart TVs enabled by open-platforms

As for trials of enabling smart TV by open-platforms, activities are seen in the "platform-creation model" seeking to enable features on platforms, such as provision of subtitles by synchronized applications with programs, or collaboration with social media.

●Hybridcast

Hybridcast is a system infrastructure for integrated

services of broadcasting and communication under development in the NHK Science and Technical Research Institute for the purpose of providing a variety of services, where TV programs and internet services delivered through communication lines collaborate in an integrated and synchronized way. It works under a basic mechanism where various information is provided via communication lines in a collaborated and synchronized way with programs broadcast through the current terrestrial/BS broadcasting, and is able to provide "hybrid" services. To receive the Hybridcast, a dedicated receiver with enhanced features is required in place of a conventional digital-terrestrial-broadcasting receiver.

There, applications provide services through communication lines and are used through the web browser installed in a receiver, compatible with HTML 5, which is scheduled to be an international standard; the applications are divided into two types, "synchronized," available only with programs, and "non-synchronized," available independent of programs.

●International standardization of smart-TV platform

W3C (The World Wide Web Consortium), a non-government organization promoting the open-standardization of web-technologies available on Internet, has been discussing the standardization of smart-TV platforms. Discussions are ongoing toward the completion of the official recommendation scheduled to be released in 2014, and as a member Japan is scheduled to submit a draft in 2012.

Figure 2-3-2-2 Cases of Broadcasting Providing Social-media Integrated-Service

Broadcasting Business Operators	Cases	Summary	Description
NHK	News Web 24	●Programs proceed with an MC looking at hashed tweets on the program (for example, the MC requests comments to a guest following a tweet).	
	teleda	●A proof-of-concept experiment on the integration of SNS and video distribution (for PCs) is ongoing under a collaboration of NHK Science and Technical Laboratories and NHK Broadcasting Culture Research Institute. ●Services leading to new type of viewing behaviors will be studied through the proof-of-concept experiment.	Proof-of-concept experiment
NTV	JoiNTV	●Using Facebook on TV: enjoying a TV program with friends on Facebook. Available features at present are displaying "friends," sharing "like," and clipping a description of "like," and accessing a "winner list for a present" during a program. ●On the TV side, BML browser and bi-directional features for data-broadcasting are used for data transmission. Graph API is used on Facebook for data acquisition. Communication with other services will be studied in future.	Proof-of-concept experiment
TV Asahi	Yavatar	●BBS: a TV program where avatars are allowed. ●Also incorporates elements of the online game (for example, porchase medals and play Gacha using the points). ●Purchased medals are accepted at the site "TV Asahi Doga."	
TBS	Utilization of social media in news programs	●News programs are divided into one-minute cells for the deployment in other medias. ●Those cells are deployed in the net-medias: Twitter (text only), YouTube Official Accounts, and Facebook Page.	
TV Tokyo	Facebook is used in the program "World Business Satellite"	●Word-of-mouth communication in the program page on Facebook influences the viewer rating. ●The Facebook page for the program, having over 140,000 fans, is one of the largest single-program pages.	
Fuji Television	Ima-tsubu	●Mini-blog, participated in by cast and staff, etc. ●Tweets are used in the program.	

(Source) MIC "Research and Survey on International Comparison and Trends in Information and Telecom Industries and Services" (2012)

The Ministry of Internal Affairs and Communications, for the purpose of promoting the activities for the development and adoption of smart-TV, has drawn-up and revealed the comprehensive basic strategies in June in 2012, including ① proposition of the basic features of a smart-TV platform to be internationally-standardized, ② promoting proof-of-concept experiments conducible to the development of applications, and ③ promotion of public-relation activities including technical demonstrations at international events.

(2) Promotion of integration/collaboration of broadcasting and social media

The number of social-media users is rapidly increasing, in part driven by the spread of smartphones, resulting in the acceleration of business utilization of social media such as social-commerce. TV broadcasting orga-

nizations are also trying to incorporate social media to create connections to viewers through collaborating their programs and social media, which could lead to not only increased attractiveness of the programs, but also the enhancement of the program-planning and increased value of the advertisements they provide by utilizing the viewers information obtained through social media. As for the smart-TV previously mentioned, each of the mechanisms seeking for platform-deployment includes, as an enhanced feature, the social-media collaboration. Therefore, judging from the trends introduced above, the broadcasting and social media integration and collaboration is expected to expand along with the spread of smartphones.

Figure 2-3-3-1 Comprehensive Comparison of Media-evaluation Indices: Information Source 1

【TV and other video sites】　　　　　　　　　　　【News paper and magazine / Social media】

TV (99.4%)※	Other video sites (50.5%)

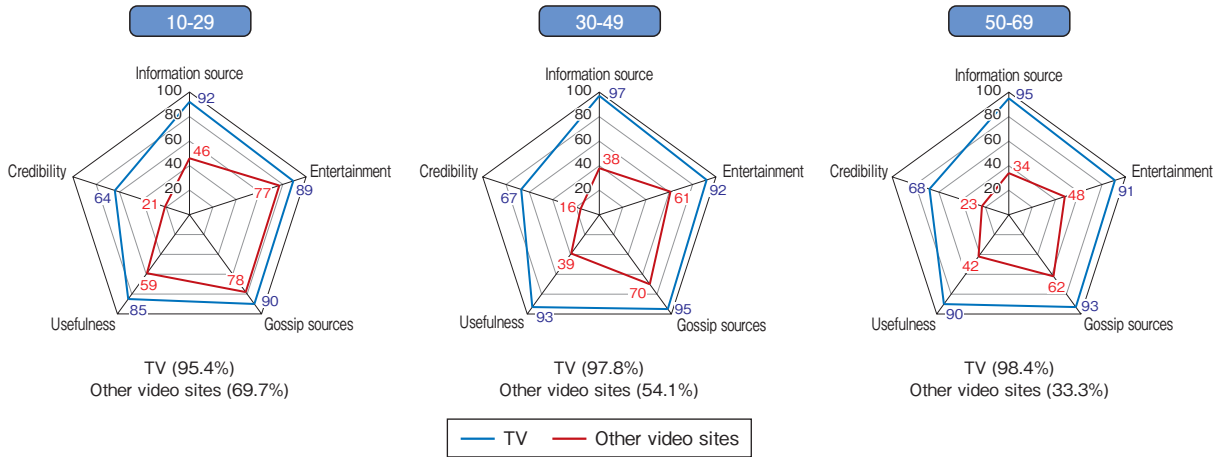| Newspaper/magazine (81.4%)	Social media (26.8%)

※Note: Ratio of the media users to the entire respondents (excluding respondents who did not reply to the corresponding question)
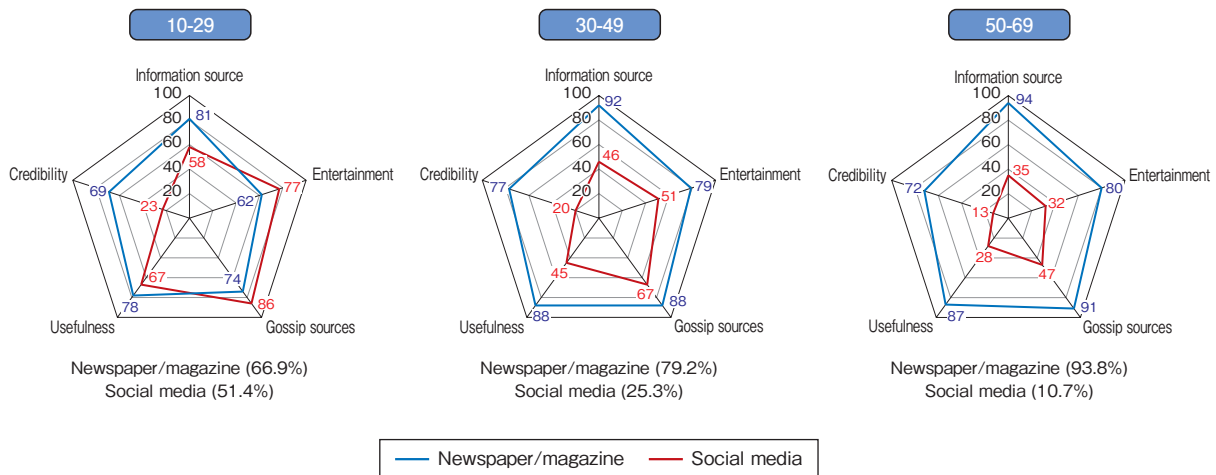
(Source) MIC "Research and Survey on Trends of Users' Recognition through the Improvement of ICT Infrastructure and Services (2012)"

Figure 2-3-3-2   Comprehensive Comparison of Media-evaluation Indices: Information Source 2

【TV and other video sites】

TV (95.4%)
Other video sites (69.7%)

TV (97.8%)
Other video sites (54.1%)

TV (98.4%)
Other video sites (33.3%)

— TV   — Other video sites

【News paper and magazine / Social media】

Newspaper/magazine (66.9%)
Social media (51.4%)

Newspaper/magazine (79.2%)
Social media (25.3%)

Newspaper/magazine (93.8%)
Social media (10.7%)

— Newspaper/magazine   — Social media

(Source) MIC "Research and Survey on Trends of Users' Recognition through the Improvement of ICT Infrastructure and Services (2012)"

3. Changes in users' recognition to the information media

In addition to the descriptions presented in the previous articles of the changes in the media environments, how the Japanese people's recognition of the various information-providing media has been affected by the changes in the media environments is introduced showing the result of a mail-poll-survey. The comprehensive comparison of evaluations of each media is introduced below, where the rating indices for measuring the media's social-influence are ① rate of utilization (access frequency, access hours), ② importance (benefits to viewers, or social status), ③ credibility (quality and quality of provided information), ④ Contribution (contribution to daily life), and ⑤ news value (it indicates to what extent the user wants to tell the information to others); note that the index ② is a vector with two axes,

"importance as an information source" and "importance as an entertainment." For the comprehensive comparison, the rating indices are presented in a form of a radar chart, where the ratio of positive answers to the total answers for each rating-index is plotted to each corresponding axis.

For the comparison of users' recognition as an information source of the media, the following media groups are selected: video-oriented medias, including "TV" and "other video-sites" for example, video-distribution/sharing sites such as You Tube or Niko-Niko Douga; text-oriented medias including "newspapers and magazines; social medias such as , mixi, Gree, Facebook, and Twitter.
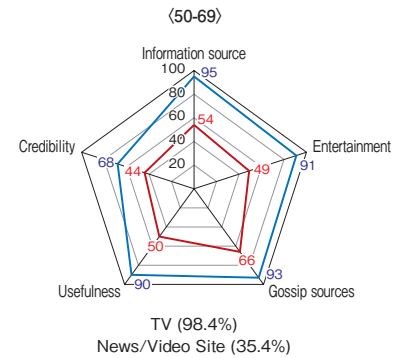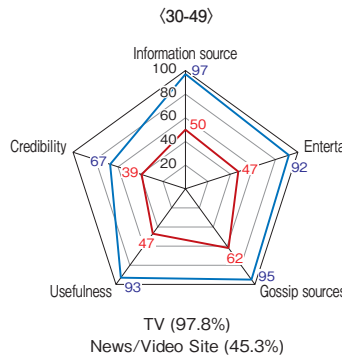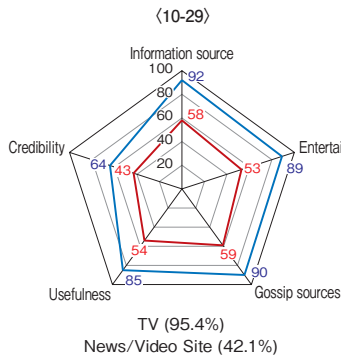
Each of the radar-charts for the video-oriented media and the document-oriented media show that as for "importance as an entertainment" and "news value", the importance difference between the group members (ex. Newspaper/magazine and social media as for the text-

Figure 2-3-3-3　Comprehensive Comparison of Media-evaluation Indices: Media Type and Transmission Type
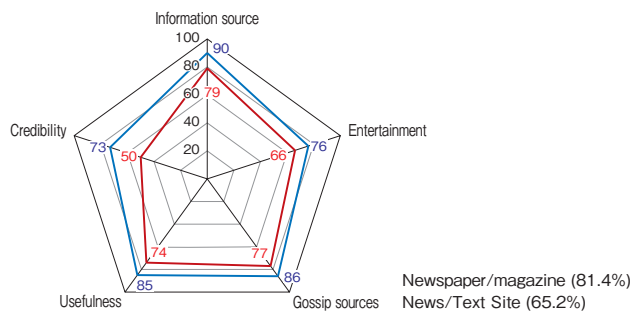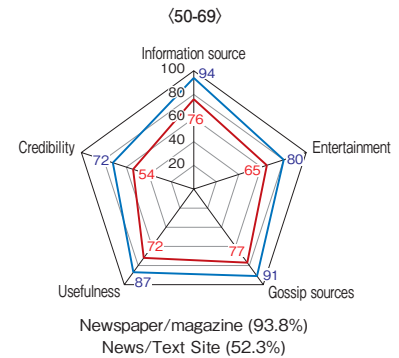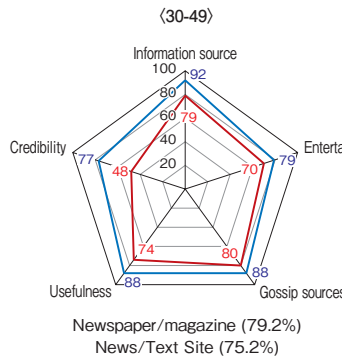
【Video-oriented Media】

Information source
100
95
80
53
60
40
20
Credibility 67 42
Entertainment 49 91
50 62
Usefulness 90 93 Gossip sources

TV (97.4%)
News/Video Site (40.7%)

Based on the analysis by Approach 1

〈10-29〉

Information source
100
92
80
58
60
40
20
Credibility 64 43
Entertainment 53 89
54 59
Usefulness 85 90 Gossip sources

TV (95.4%)
News/Video Site (42.1%)

〈30-49〉

Information source
100
97
80
50
60
40
20
Credibility 67 39
Entertainment 47 92
47 62
Usefulness 93 95 Gossip sources

TV (97.8%)
News/Video Site (45.3%)

〈50-69〉

Information source
100
95
80
54
60
40
20
Credibility 68 44
Entertainment 49 91
50 66
Usefulness 90 93 Gossip sources

TV (98.4%)
News/Video Site (35.4%)

— TV　— News/Video Site

【Text-oriented Media】

Information source
100
90
80
79
60
40
20
Credibility 73 50
Entertainment 66 76
74 77
Usefulness 85 86 Gossip sources

Newspaper/magazine (81.4%)
News/Text Site (65.2%)

Based on the analysis by Approach 1

〈10-29〉

Information source
100
83
80 81
60
40
20
Credibility 69 47
Entertainment 61 62
76 75
Usefulness 78 74 Gossip sources

Newspaper/magazine (66.9%)
News/Text Site (69.9%)

〈30-49〉

Information source
100
92
80
79
60
40
20
Credibility 77 48
Entertainment 70 79
74 80
Usefulness 88 88 Gossip sources

Newspaper/magazine (79.2%)
News/Text Site (75.2%)

〈50-69〉

Information source
100
94
80
76
60
40
20
Credibility 72 54
Entertainment 65 80
72 77
Usefulness 87 91 Gossip sources

Newspaper/magazine (93.8%)
News/Text Site (52.3%)

— Newspaper/magazine　— News/Text Site

Based on the analysis by Approach 1

*excluding no-response

(Source) MIC "Research and Survey on Trends of Users' Recognition through the Improvement of ICT Infrastructure and Services (2012)"

oriented media) is smaller than for other axes. As for the shape of the radar chart, the shape of TV and newspaper/magazine radar-chart looks like that of other video-site and social media.

A close look at radar charts for each generation group shows the following: in the generation group of 10s to 20s, as for the video-oriented medias and the text-oriented medias, similar to the results mentioned above, the difference between the group members is small; distinctly, as for the text-oriented medias, in the generation group of 10s to 20s, social medias are more highly evaluated than newspapers/magazines on the axes of "importance as an entertainment" and "news-value."

For the comparison of media of which contents are provided by the press organizations, "TV," "Press/Video site," "Newspapers/Magazines," and "Text News site" are selected and their evaluations are represented in radar charts. Those radar charts show the following: as for video-oriented medias, TV is evaluated much more highly than Press/Video site, and no generation difference in such inclination is seen except for the 10s to 20s group where the difference is smaller; on the other hand as for text-oriented medias, the evaluation-difference of the newspaper/magazines and the text-press site is very small, and the 10s to 20s group gives the equivalent level of evaluation to each axis except for the axis of "credibility", and such inclination is seen in other generation groups.

Section 4

Towards the Steps for the New Growth by ICT

In the previous sections, the relation of ICT to the economic growth has been described. The following articles are on the role of ICT for Japan's rebirth.

1. International trends in "growth by ICT" and the difficult situation of Japan

Every country around the world has come to share the recognition of ICT as a growth engine. Particularly, the swift growth of the Internet as a social infrastructure and the development of mobile communication networks (later than 2G to LTE) has become a critical path connecting ICT to the growth or the prosperity, in every country whether it is advanced or developing.

On the other hand, a close look at Japan's position in ICT results in no other conclusion than "Japan stands still." However, the essence of the various strategic ICT policies that have been promoted in countries worldwide and regions such as EU or ASEAN is the development of

broadband wireless networks and the promotion of ICT utilization, which is not so much different from the ICT strategies that Japan has promoted. Japan still has advantages such as highly-profitable mobile industries, the large domestic market, and its sophisticated consumers, and at the same Japan still holds the advantages in mobile Internet or Internet services, which Japan has acquired through running as a front runner in their marketization. Therefore, it is desirable to abandon the notion that Japan is in the leading position around the world, and then strengthen the power to drive the activities in ICT to utilize such advantages for its growth.

2. Economic Growth Driving Force and International Expansion of ICT Industries

Japan's ICT industries, as a whole, are driving the Japanese economy, judging from the size of their domestic production. In addition, a close look into the sectors shows that the ICT industries are going well; the software/service sector still performs well, and the platform businesses have earned record profits. However, the value of ICT industries as a big accumulator of foreign reserves has declined as they are losing export competitiveness; the ICT industries have become domestic-market-oriented.

A look at the low-middle income countries around the world shows the continuing growth in ICT-related markets resulted from the growth in communication-infrastructure investment, ICT system investment, and the growth in the number of terminals, accompanying their economic growth. In addition to the US or European ICT corporations, Chinese/Taiwanese/Korean corporations have been aggressively penetrating those markets. As for smartphones, their large production lot-size resulting from such global deployment is suspected to have caused Japanese manufactures to fall behind of not only Apple but those Asian players in the global market and to face fierce competitions even in the domestic market. These factors suggest that Japanese ICT industries are required to enhance their management strategies covering the global market. Therefore, it would be an option for Japan to promote global deployment of ICT industries through the activities in which Japan's advantage are used in synergetic ways, such as the integration of hardware and software-services, or collaboration of ICT corporations with their clients.

3. Challenges for ICT User Sector Growth

As the informatization-index-analysis shows, in Japan, the sector-by-sector difference is large for ICT invest-

ment. However, if seen from the other side, such uneven sector-by-sector information-investment is a proof of growth capacity in service innovation/productivity-improvement, but it is dependent on future investment. The international comparison also shows that Japan's informatization-index is the lowest among the surveyed countries; it is another proof of growth capacity which could be capitalized by ICT investment promotion.

Various macro/semi-macro analysis and micro-analysis based on the poll-survey to businesses has proved the growth-driving power of ICT investment. It is clear that the ICT investment is the key, and now is the time for action.

The situation is the same also in the public sectors, particularly in "Administration," "Medical Service," and "Education" which have long been chosen as key -fields. The nation's evaluation or recognition of the ICT utilization in those fields is not particularly high; even for the services of tax submission/payment which have been used relatively frequently, its necessity is not so highly recognized. The purpose of ICT utilization in public sectors is not only the improvement of convenience of each individual service, but synergetic effects such as efficient provision of services or the realization of social fairness. The meaning of ICT utilization in public sectors should be recognized by every nation from a standpoint covering all aspects of ICT utilization.

4. The spread of smartphones and the growth of mobile industries

While the emergence of the smartphone is changing the mobile industries, the "Smartphone economy" is expected to widely expand to the other sectors through stimulating the demand of the services on the Internet or accelerating the ICT use by seniors, such as a net-supermarket. Smartphones, which are widely expanding, should actively be used for not only the growth of the mobile industries but for the growth of Japan as a whole.

On the other hand, the spread of smartphones has stimulated "competitions among eco-systems," particularly in mobile-Internet field; ICT-industry players including mobile-communication operators, through the rapid integration beyond the layer barriers or beyond the business field barriers, involving a wide variety of business sectors, are competing to enhance the added value of their services. The key to the success of such strategies is the platform strategy; platforms are the cores of "eco-systems." Therefore, attention should be paid to the global deployment of made-in-Japan platforms.

On the other hand, taking lessons from the "Galapagos" phones that once led the world but failed to go out

of the domestic market, paying attention to the shift from the smartphone or tablet terminal to the forth-coming smart TV, Japan should actively participate in the international standardization activities of open platforms, of which HTML 5 is a representative example, that will work as a foundation of higher-layer or terminal-layer services.

Therefore, the activities based on an involvement of the government and businesses will become critical.

5. Realization of ICT Potentiality through the "Smart Revolution"

The "Smart Revolution" realized by the completion of ubiquitous networks combined with the utilization of the Big Data has the potential to of dramatically improving ICT's growth-induction power and problem-resolution power. On the other hand, ICT will contribute to the progress of the broadcasting media in the era after the shift-to-digital-broadcasting. In those circumstances where the nation's recognition of broadcasting media is going to be diversified, not only the will the multi-use of broadcast programs through the Internet contribute to the growth of the media, but the utilization by broadcasting media of the Internet and social media that have high-growth capability which has been proven by the rapidly-growing Internet advertising, will contribute to the enhancement of the "connection" with the viewers", improvement of media value through the utilization of data, and the resolution of other issues such as radio-poor-reception-areas.

As a final remark, the Internet, which has become a social infrastructure, not only has made clear the necessity of international regulation of cyberspace, but has exposed a variety of challenges such as the cyber-attack damages for which the severity has worsened and the protection measures of personal information. It is needless to say that the growth potential of ICT is based on the assumption that these challenges will be properly resolved.