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Japan

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Population	127.76 million[a]
GDP per capita (PPP)	USD 34,312[b]
Key economic sectors	ICT, construction, wholesale, manufacturing[c]
Computers per 100 inhabitants	54.15[d]
Fixed-line telephone per 100 inhabitants	37.7[e]
Mobile phone subscribers per 100 inhabitants	76.8[e]
Internet users per 100 inhabitants	68.5[e]
Domain names registered under .jp	1,012,199[f]
Broadband penetration rate per 100 inhabitants	20.70[e]
Internet domestic bandwidth	812.9 Gbps (monthly average)[g]
Internet international bandwidth	81.3 Gbps (monthly average)[g]

(Sources: [a]IPSS 2006; [b]IMF 2008; [c]MIC 2007b; [d]ITU 2007; [e]MIC 2007c; [f]JPRS 2008; [g]MIC 2008e)

INTRODUCTION

A generation of Japanese has grown up with the understanding that they live in the world's second largest economy, and this ranking has become a brand, both domestically and internationally, representing Japan as a powerhouse of manufacturing and leadership in high technology. But the rank is under threat. Already by some measures China has jumped ahead. For example, China is now second to the United States (US) in purchasing power parity. Although Japan still leads in the more useful measure of real Gross Domestic Product (GDP), economic forecasts show Japan falling behind China by 2020 and India soon after, with Brazil catching up by the middle of the century (Goldman Sachs 2007).

Indicators of the health of the economy, such as the Tankan (Short-period Economy Observation), a poll of leading Japanese firms conducted quarterly by the Bank of Japan to track business confidence, have been negative. The most recent cabinet office survey of the economy show recent improvements in corporate profits and employment to be slowing, and business investment declining moderately. A concern for the information and communication technology (ICT) sector in particular is that private consumption is almost flat. It would appear that Japan's economy is mirroring that of the US by entering a recessionary phase.

However, for now Japan remains among the ICT leaders in the Asia Pacific region and in many areas is a global trend-setter for advanced use of consumer ICT devices and services. Broadband services in Japan remain the cheapest and the fastest in the world[1] (OECD 2007), and while mobile telephone services in Japan are not cheap, mobile devices and services are sophisticated and continue to evolve at a rapid pace as operators

try to capture revenue in a very saturated and competitive market (Hall 2007).

Over 42 percent of Japan's real GDP growth is driven by growth from the ICT sector. The sector is expected to retain this important position in the economy as current trends continue, new products emerge around media convergence, and further reform of the telecommunications sector is implemented. With recent developments such as the unification of the future digital versatile disc (DVD) storage market behind the Blu-Ray standard, a new generation of super-slim flat panel displays, and increased service competition on wireline and wireless broadband, the outlook for the ICT (digital) sector is positive.

TECHNOLOGY INFRASTRUCTURE

The number of competitive telecommunications carriers has increased dramatically since competition was introduced in 1984, with 14,449 such companies in August 2007 from 87 in April 1985. However, while competition in the overall market has been increasing, at the end of March 2007 the two Nippon Telegraph and Telephone (NTT) regional companies, NTT East and NTT West, still owned 93 percent of all access lines. At the end of December 2007 NTT East and NTT West controlled 87.2 percent of contracts for subscriber telephones, indicating a drop of 0.7 percent from the previous quarter (MIC 2008a). Although NTT's market share is decreasing as more subscribers switch to IP telephony service provided by competitive carriers, after more than two decades of competition NTT remains dominant in the local access market.

As of December 2007 there were 28.3 million broadband subscribers in Japan, approximately 58 percent of the country's 49 million households. From October to December 2007, 555,593 new subscribers took up broadband services. This is a marked slow-down in growth rate compared to the boom days of broadband in Japan when for a seven-month period between November 2002 and May 2003 subscribers increased by more than 500,000 each month. However, the overall market con-tinues to grow and a projection of subscriber growth trends from 2007 suggests that fibre-to-the-home (FTTH) is becoming the most common form of broadband access. The decline in the number of Direct Subscriber Line subscribers began in 2006 when year-on-year growth fell for the first time as users began to migrate to the high-speed, more reliable, and almost-as-cheap FTTH service. The proportion of Direct Subscriber Line contracts dropped below 50 percent of the total in September 2007. The number of cable television, common antenna television (CATV) broadband contracts continues to increase slowly, but overall market share is declining.

Increasing ultra-high-speed access (defined as 30 Mbps symmetrical access), as FTTH is described, is an important element of Japan's mid-term ICT policy. However, from the point of view of competition policy it raises concerns for the regulator as the incumbent telecommunications operator, NTT, is proving dominant in the FTTH market. In 2001 the Ministry of Internal Affairs and Communications (MIC) introduced an open access regime to the broadband market that required the NTT regional companies to release their copper access lines to broadband Direct Subscriber Line providers at low tariffed rates, and to share their networks and facilities. Access to low-cost copper and open access to elements of NTT's fiber network provided the foundation for the rapid growth of affordable broadband. It also created a new market where NTT is not dominant. Throughout the history of Direct Subscriber Line, despite NTT's control of the copper on which the service is based, the combined market share of NTT companies did not exceed 40 percent. In December 2007 SoftBank accounted for 37.6 percent of Direct Subscriber Line subscribers and the combined share of NTT East and NTT West was 37.1 percent, the first time that NTT had been outperformed in the national Direct Subscriber Line market. The successful introduction of competition to a new and essential market was a significant policy achievement for the MIC. However, NTT is now dominating the newer and faster growing FTTH market.

At the end of December 2007, NTT East and NTT West shared 71.4 percent of the FTTH market, an increase of 0.7 per-cent from the previous quarter and a year-on-year increase of 3.9 percent. Meanwhile, among NTT's main competitors, the power utility group carriers had a market share of 10.2 percent, no change from the previous quarter, and KDDI 6.1 percent,

down 0.2 percent in the quarter. In terms of overall broadband subscriptions the NTT companies controlled 45.8 percent of the market and at current growth rates can be expected to take more than 50 percent by the final quarter of 2008. Given that Japan's ICT policy aims for 20 million FTTH subscribers by the end of 2010, NTT's increasing dominance in the technology is a concern for the MIC.

With recent trends in broadband use, network capacity appears to be reaching saturation point. The estimated download traffic of broadband users in November 2007 was 812.9 Gbps, up from 721.7 Gbps in May 2007 and equivalent to 2.5 times the traffic three years ago (Esaki 2008). There are significant differences between daily peak traffic loads, which can be up to 95 percent of available bandwidth, and normal daily average use, which tends to be nearer 40–50 percent. Surveys have shown a significant increase in download from overseas, which may be explained by the popularity of video sharing sites and peer-to-peer (P2P) downloads of movies and other video content. Internet service provider (ISP) surveys show that a small number of users tend to use a disproportionately large amount of bandwidth. One Japanese ISP reported that 10 percent of users take between 60–90 percent of bandwidth and the top 1 percent, 60 percent of total bandwidth.

Internet Exchange points, data centres, and major networks are finding it hard to deal with the additional and somewhat unexpected demand. With the MIC as an observer, four major ISP associations have drawn up guidelines for traffic manage-ment practices that ISPs may adopt to address the congestion problem. The draft guidelines include recommendations to allow packet shaping of excessive bandwidth consuming applications such as P2P, and means to restrict or cancel the contracts of heavy users who exceed certain traffic thresholds. However, the guidelines also emphasize the underlying principle that ISPs should increase network capacity in line with increases in network traffic — i.e. packet shaping cannot be used as an excuse for not making necessary infrastructure investments. The guidelines also follow the network neutrality principles and general open and fair access principles that characterize Japan's communication policy. As Japan leads broadband deployment, it faces policy issues not yet encountered by other countries. Unusually for Japan, it must take the lead in an important area of policy development rather than following the lead of either the US or Europe.[2]

At the end of March 2008, the number of cellular phone sub-scribers exceeded 104 million, with more than 91 million subscribers to third generation (3G) services and 89 million sub-scribers to mobile Internet services (TCA 2008). Revenues remain high but are declining. The average revenue per user (ARPU) across all providers in 2006 was JPY 6,662, down from JPY 6,769 in 2005 and a high of JPY 8,235 in 2001 (JPY 1 = USD

0.0089290, JPY 1,000,000 = USD 8,929 as of 1 January 2008). In 2006, voice ARPU was JPY 4,670 and data ARPU JPY 1,992. Data ARPU is increasing both in real terms and as a proportion of the total ARPU, a trend since 2001 (Taniwaki 2008) due in part to users making increased use of mobile devices to access Internet services, as well as to strong competition in voice plans to encourage subscribers to switch operators.

Digital mobile broadcasting is known as 'One-Seg' in Japan, from the digital terrestrial broadcasting channel being divided into 13 segments of which 12 are used for high-definition broadcasting and one segment is made available for mobile use. All free-to-air digital television broadcasts available to ordinary high definition television (HDTV) viewers are also available to mobile One-Seg viewers. The service is free, but handsets capable of receiving the broadcasts are required. One-Seg was launched in April 2006, and between June 2006 and December 2007 20 million One-Seg handsets have been shipped. According to the Japan Electronics and Information Technology Association (JEITA), these high-end expensive handsets boosted retail sales during the 2007 end-of-year shopping season.[3]

Another important development in the mobile sector has been the introduction of mobile virtual network operators (MVNO). To introduce new types of competition particularly at the service level, and to encourage more innovation and user choice, the MIC has introduced a policy that makes it possible for companies to lease operators' cellular networks and provide services of their own on top. The first MVNO, although not officially known as such, was eMobile, the mobile subsidiary of the Direct Subscriber Line wired broadband provider eAccess. eMobile offers 3G/HSDPA communications with speeds up to 7.2 Mbps nationwide. The company launched the service in March 2007 and with over 500,000 subscribers after one year of operation (TCA 2008) exceeded first year targets by more than 25 percent. One of eMobile's advantages is that it is able to offer a flat rate unlimited use plan nationwide by leasing capacity as a 'stealth' MVNO on DoCoMo's 3G network until it is able to complete building a full network of its own. In February 2008, eMobile announced that it would partner with Internet Initiative Japan Inc. (IIJ) to enable IIJ to become a MVNO operating on its HSDPA network. IIJ plans to use the high-speed data mobile service to complement the services it offers to business customers.

The first official MVNO was Japan Communications Inc. (JCI), which signed an agreement with DoCoMo in July 2007 to offer its own branded services over DoCoMo's network.

Japan's Mobile Ecosystem

Over 100 million mobile phones are in use in Japan, with approximately 50 million new handsets sold each year.[4] Handsets are becoming extremely sophisticated devices: many have high-resolution LCD screens, over 40 million are contactless wallet phones, 22 million have the One-Seg digital TV function, and over 85 million are 3G. Thus, to be successful, any new Internet service must be available for both mobile and fixed access, whether the service is for individual use (such as video sharing or online shopping) or for business use (such as services built around Software as a Service or SaaS).

At the user service level, Japan is experiencing the first generation of Fixed Mobile Convergence. This dynamic market is built around a unique industry ecosystem, formed through interaction and collaboration between players in a given environment. First NTT DoCoMo with its renowned i-mode wireless Internet service, and later KDDI and Softbank, adopted a business model where they as network operators sit at the middle of an industry structure that enjoys an almost symbiotic relationship with handset makers, content providers, and platform vendors (or portals). Together they all serve the user in a market designed for their mutual benefit. Network operators benefit by providing opportunities to the handset makers, content providers, and platform vendors: when they gain more customers or sales, the network operators gain from an increased number of subscribers and increased traffic.

This is different from the model we see elsewhere in the world where the handset manufacturer is at the centre of the market and where it controls the relationship with network operators, content providers and platform vendors, usually through co-marketing activities. The Japanese model has created a situation where customer loyalty is first to the network operator, second to the handset, and third to content accessed through the handset. One outcome is the incredible success of the market: Japan accounts for approximately three percent of the world's mobile subscribers but 40 percent of total mobile data revenues.

Note: The authors are grateful to their colleagues at the International University of Japan, Philip Sugai and his students at the Mobile Consumer Behaviour Lab (http://www.mocolab.net/), for the source material for this case study.

JCI's services target enterprise customers, allowing them to match mobile with fixed line and other types of communications services. The MVNO option gives JCI the opportunity to add mobile voice and data service to an existing portfolio of communications and data products.

The MIC regards MVNOs as a means to stimulate new types of competition in a maturing traditional market. Openness to MVNO businesses sharing their network was a requirement when the MIC allocated a parcel of 2.5 GHz wireless spectrum for advanced mobile broadband. The two 'winners' in the process, which was conducted as a beauty contest rather than as an auction, were KDDI and the personal handy-phone system (PHS) operator WILLCOM. Both will open their new networks to MVNOs. KDDI will use the 2.5 GHz spectrum for services based on WiMAX technology to be launched commercially in the summer of 2009. WILLCOM will begin next-generation PHS targeting 20 Mbps downloads using orthogonal frequency division multiplex access (OFDMA) and MIMO technologies. WILLCOM aims to begin test services in April 2009 and commercial services in October 2009.

On 10 July 2008, one day before the iPhone was launched nationwide in Japan, eMobile began selling Eee PC 4G mini computers for just 100 yen, the first 'one dollar' laptop. Made by Taiwan-based ASUSTeK Computer Incorporated (Asus), the Eee PC is small, with a seven-inch screen, but is a fully functioning Linux or Microsoft Windows PC. The low price is possible because eMobile bundled sales of the Eee PC with a two-year subscription to either their 3.6 Mbps or 7.2 Mbps flat-rate mobile data service, at approximately USD 60 per month. Sales are reported to have been brisk (Takizawa and Sasaki 2008). The business model of subsidizing the cost of a device by subscription fees for related services is borrowed directly from the mobile phone market, where the cost of calls and monthly calling plans have long subsidized the high price of handsets (see 'Japan's Mobile Ecosystem').

KEY INSTITUTIONS AND ORGANIZATIONS DEALING WITH ICT

The IT Strategic Headquarters chaired by the prime minister was established in 2000 under the cabinet. It provides recommendations on key policy issues related to ICT.

The Council on Economic and Fiscal Policy (CEFP) is a consultative body chaired by the prime minister and administered by the cabinet office. It conducts consultations with industry experts on economic and fiscal policy formulation to achieve growth, innovation, and international competitiveness, and provides advisory services on ICT.

In September 2006, the MIC introduced the New Competition Promotion Program 2010 to review the framework of competition rules necessary for the transition to IP-based networks. The program is designing the roadmap for the discussions that will take place after 2010 regarding NTT reform and media convergence. A rolling series of working groups and councils is being formed to consider key issues, and the outcome of each is a building block in the creation of a comprehensive policy.

One of the MIC's key policy concerns is how to extend the principles of open access to the dominant operator's networks to the new next generation networks now being developed. Clearly, regulation based on old telephony models such as the inter-prefectural design that divided NTT's local access network into separate companies each serving different geographic regions of the country, has no relevance in the IP age. However, competitors will still need access to NTT's networks if they are to provide services. The MIC has developed a basic framework for network neutrality based on three principles:

- IP networks should be accessible to users and easy to use, allowing ready access to content and application layers.
- IP-based networks should be accessible and available to any terminal that meets relevant technical standards and should support terminal-to-terminal (or 'end-to-end') communication.
- Users (meaning both individual end users or network subscribers and content providers and other related companies conducting business using the Internet) should be provided with equality of access to telecommunications and platform layers at a reasonable price.

The MIC has also created a P2P task force to investigate the opportunities posed by P2P technologies for addressing network congestion. Although the MIC recognizes that P2P traffic is the cause of much of the current congestion, the MIC also believes that P2P technologies will be the answer to congestion in the future because of the efficiencies in traffic management that they can offer.

The Ministry of Economy, Trade and Industry (METI) is responsible for devices, hardware and software, but not the communications medium. Its new economic growth strategy is based around enhancing innovation and improving productivity through better utilization of ICTs. It has developed for different industry areas a raft of policies with a strong focus on accelerating technology innovation and knowledge sharing in the firm. METI notes that service industries account for 70 percent of Japan's economy, but many of those outside the IT sector make inefficient and ineffective use of IT, particularly in management.

Reducing these inefficiencies is one of METI's core policy goals and it is promoting the use of IT in Japanese business particularly with programs focused on improved training, business software applications, and programs designed to build trust in IT and the Internet (METI 2007).

ICT AND ICT-RELATED INDUSTRIES

The ICT industry, which includes organizations in the 'business of producing, processing, distributing and delivering information, and of providing required materials and equipment', is composed of the following industry segments: telecommunication, broadcasting, information services, audio-visual and textual content production, ICT manufacturing, information and telecommunication services, and ICT-related construction (MIC 2007b). In 2005, the ICT industry contributed JPY 93.7 trillion, or 9.9 percent of the nominal GDP of JPY 947.1 trillion, and accounted for 42.4 percent of the real GDP growth (MIC 2007b).

Japan's ICT industry is faced with the challenge of international competitiveness. Although it has the advantage in advanced consumer electronics, such as digital cameras, high-definition television, and state-of-the-art mobile handsets, it is lagging behind the US and Europe in core technologies such as routing and switching, encryption, and operating platforms. Moreover, Japan is likely to lose its edge in advanced consumer devices as other countries catch up and these products are commoditized.

KEY ICT POLICIES, THRUSTS, AND PROGRAMS

Since taking office in September 2007, Prime Minister Takeo Fukuda has made the revitalization of local communities in the rural areas one of the foci of his administration and ICT is expected to play a significant role in this effort. In June 2007, the Council on Economic and Fiscal Policy headed by the prime minister announced the basic policies toward economic and fiscal reform of government and the nation to achieve growth, innovation, and international competitiveness (Cabinet Office 2007). ICT is referred to as a driver to improve the productivity of industry, particularly of the service industry.

The transition to digital television broadcasting and the termination of terrestrial analogue television broadcasts are to be completed by 2011. Fibre access is expected to reach 30 million households[5] and broadband will be available in all local communities across Japan by 2010. Likewise, discussion about the status of NTT and how the dominant telecommunications group should be regulated will begin in 2010.

These developments are only part of greater change where both broadcasting and communication are converging and will cause a comprehensive revision of the existing regulatory frameworks and business structures for both sectors.

The New IT Reform Strategy is a comprehensive schedule of policies addressing social reforms and the technology development required to enable Japan's vision of a 'ubiquitous network society'. The strategy seeks solutions to the problems Japan is facing now, such as the aging of society, the increasing divide between urban and rural areas, the revitalization of the economy, and improvement of national competitiveness. Its overall goal is to ensure that by 2010:

- Hundred percent of the population has high-speed or ultra-high-speed Internet access;
- Eighty percent of the population is able to appreciate the role of ICT in resolving social problems; and
- Eighty percent of the population feels comfortable with ICT.

The first and third goals are well developed. Eliminating 'zero broadband' areas is the cornerstone of the MIC's Next Generation Broadband Strategy, which is targeting that by 2010, 90 percent of households will be covered by ultra-high-speed broadband access, and other means of high-speed broadband access will be available in all areas of the country. The third goal involves strategies for improving security, safety, and trust in use of the Internet, including programs such as the 'cyber clean' centre supported by METI and the MIC, Keidanren, JPCERT, and leading businesses; the Internet Hotline Center for reporting illegal information and online conduct supported by the Internet Association Japan, the National Police Agency and METI; and the MIC's anti-spam initiative. The second goal is less developed. It was once estimated that only 45 percent of ICT users valued ICT as useful for solving problems such as those related to health, social welfare, education, and employment (MIC 2008c). While a more recent survey has found that 80 percent of respondents realize that ICT could serve various social needs, on average only 46 percent have actually used ICT to meet these social needs (MIC 2008d).

LEGAL AND REGULATORY ENVIRONMENT FOR ICT DEVELOPMENT

At present, broadcasting and telecommunication in Japan are administered under separate laws. However, as information communication networks become available nationwide and all communications move to IP-based networks, there is less need for this institutionalized separation. In 2006, an advisory

panel convened by then MIC Minister Dr Heizo Takenaka recommended that the current regulation, which is based on the vertical integration of industries, should be reformed based on a horizontal layer model, composed of transmission infrastructure (e.g. network and broadcast delivery), platform (e.g. content aggregation), and content (e.g. programming) layers supported by integrated communications regulation. The MIC is taking initial steps toward the convergence of broadcasting and telecommunications, and is consulting with various experts' groups to be able to meet the 2010 deadline.

Inter-ministerial efforts to ensure information security are administered by the National Information Security Center (NISC, http://www.nisc.go.jp/eng/index.html) under the Cabinet Secretariat. The basic strategy, released in February 2006, aims to 'make Japan an information security advanced nation through [the] establishment of a new public-private partnership model'. Information security is considered from four perspectives: national and local government, business infrastructure, personal safety and security, and national security. An initial three-year plan led to the creation of common information sharing and analysis functions called Capability for Engineering of Protection, Technical Operation, Analysis and Response, or CEPTOAR. Once a significant information security risk is revealed or an incident takes place, CEPTOAR works to bridge the activities of government and critical infrastructure operators and helps them share information for disaster prevention, response, or recovery. In 2007, the policy focused on upgrading information security measures to create an environment in which people can use IT safely and securely. In 2008 the strategy focus is on intensive efforts to enhance information security infrastructure: developing and improving human resources engaged in information security, adopting information security measures on an international scale, and enhancing information security in the provision of e-government services.

The protection of personal information is a high policy priority in fostering a secure and safe information society. The Act on the Protection of Personal Information, enacted in 2003, sets forth high-level principles that have subsequently been elaborated by a series of cabinet and ministerial orders. As of March 2007, 35 such guidelines had been published in 22 industry sectors. In principle, each ministry is responsible for personal data protection in its own 'jurisdiction' or area of policy competence. The cabinet office takes the lead in coordinating inter-agency level activities, but it does not have overarching authority to exercise government-wide enforcement.

Japanese data protection arrangements embody many aspects of self-regulation and co-regulation. Businesses handling personal information are expected to take the initiative in pursuing protection of personal information. Industry groups and trade associations can be designated as 'Authorized Personal Information Protection Organizations' to promote industry-wide personal information protection. Labelling schemes such as Privacy Mark (http://privacymark.org/) and TRUSTe (http://www.truste.or.jp/) are also becoming common in Japanese industry.

DIGITAL CONTENT

The content industry as a whole, which includes both analogue and digital content, is estimated to be worth JPY 13,989 billion (DCAj 2007). The digital content industry was estimated to be worth JPY 3,663 billion at the end of 2007, a 10.7 percent increase from 2006. Packaged content represents 67.5 percent of the total revenues of digital content. Internet-delivered and mobile content represent 16.7 percent and 15.9 percent, respectively. Although packaged content still has a major share of the market, it is beginning to shrink and Internet and mobile content are growing steadily.

The 'Web of the Year' Awards (http://woy2007.sbcr.jp/nominate/) nominated 15 services for the special prize section in 2007. Some of the nominations were international, such as iPhone, Second Life, Wii, Google Earth, twitter, and YouTube, but the others were Japanese in origin, such as Kao Checki, Rimo, Nico Nico Douga (video posting and subtitling service), Hatsune Miku (desktop music software with a voice avatar), and Yahoo! Politics. These nominations show that user participation in content creation and sharing is increasingly important.

'Kao Checki' literally means 'Check your face'. Users submit a digital photo of their faces and the site returns images of celebrities who look similar to them. Rimo provides a 'couch potato' interface for YouTube and other video sites. It selects and plays back video clips based on user's preferences instead of users searching and browsing directly for the video clips of their choice. These services represent a trend of Internet users increasingly looking to the Internet for entertainment.

Nico Nico Douga (http://www.nicovideo.jp/), which literally means 'Smiling Video' and which is one of the most successful new services of 2007, is similar to YouTube in that it publishes video clips posted by users, but it has the unique feature of allowing users to add comments within the video. These superimposed comments, which appear as a continuous stream of subtitle-like text appearing over the top of the video image, are often little more than graffiti, but they add an aspect of user interaction within the video clip that anyone can respond or add to. The concept has gained wide appeal and Nico Nico Douga now has almost 8 million registered users, in addition to 204,000 premium users paying JPY 500 per month for additional privileges (Nico Nico Douga Ltd 2008). Nico Nico

Douga's business model is advertising-based, mixing advertisement placement mechanisms such as Google Ads, and a unique system that allows users to place banner advertisements on each video page.

A digitally networked environment allows users to generate and disseminate information. This trend is well accepted by Japanese Internet users with consumer-generated media now a rapidly growing genre of online content in Japan. An MIC survey on the uptake of blogging and social networking services (SNS) found that as of March 2005 3.35 million Japanese had a blog, of which 950,000 were considered to be active (defined as blogs updated at least once a month), and 16.51 million read blogs (MIC 2005).

ONLINE SERVICES

e-Government

In the UN Global e-Government Readiness Report Japan ranked 26th in 2002 and 14th in 2005, after the US, Denmark, Sweden, the United Kingdom (UK), and the Republic of Korea. From a technical point of view, Japanese e-government readiness should be much higher. For example, as of August 2006, 96 percent of transactions (such as filings and applications) with national government agencies could be carried out online. However, it is not clear how many transactions are actually being carried out online. Moreover, many services available online are poorly designed and they are not widely used. For example, the National Taxation Agency started to receive tax filings online in 2004 (e-Tax system), but businesses and citizens had to purchase dedicated software that is compliant with e-Tax requirements as well as electronic certificates, to actually file tax reports online. In 2008, the NTA redesigned part of its online service such that citizens can now file their income tax without dedicated software. This is expected to drive the usage rate upward.

e-Business

According to a 2007 METI survey of electronic commerce, Internet-based e-commerce transactions amounted to JPY 148 trillion in 2006, an increase of 5.3 percent from 2005. The largest user segment is manufacturing, accounting for 56 percent of the total transaction value. The volume of Japanese business-to-business (B2B) e-commerce in 2006 was estimated to be 147.9 trillion yen, larger than that of the US (JPY 95 trillion), although business-to-consumer segment is much smaller. While in the US e-commerce transactions between business and consumer amounted to JPY 15.9 trillion in 2005 and JPY 19.3 trillion in 2006, in Japan the volume of such transactions

was only JPY 3.5 trillion in 2005 and JPY 4.4 trillion in 2006 — a low figure considering that Japan's economy is roughly half that of the US. METI reports that Japanese consumers purchase information and content online more than other products, whereas American consumers purchase general retail products more than others (see 'SaaS: A New Hope for the Japanese Software Industry?').

e-Banking and e-Trading

Both consumers and businesses are making increased use of electronic banking. In many cases, PC-based and mobile Internet banking transactions are charged less than face-to-face or ATM transactions, an important factor in encouraging people to use online transaction channels. However, e-banking is not the major method for payment in e-commerce; credit cards and cash payment at convenience stores are commonly used to pay for online purchases.

The online trade of stocks and securities is also becoming common. Whereas from October 2001 to March 2002, only 1.8 percent of the total trading value was dealt with online, five years later, 24.7 percent, or JPY 128 trillion, of total trading value came from online trade (JSDA 2007).

One of the significant challenges for any online service, particularly e-banking and e-finance, is identity management. An increasing number of services are issuing user IDs, passwords, and electronic certificates that users have to manage and keep secure without losing track of them. Currently, a typical user might end up with a dozen or more user accounts. Some identities (IDs) can be changed, while others cannot. Some passwords can be in either lower or upper-case letters; others require only upper-case letters; and others require a combination of letters, numbers, and symbols. The point is that the whole chain of user IDs, passwords and electronic certificates, and the level of complexity involved, may be prohibitively high for many people who are not expert PC and Internet users. Indeed, it has become a somewhat commonly shared understanding that Japan is so obsessed with securing the system and protecting personal information that users cannot feel confident about using these systems.

ICT-RELATED EDUCATION AND CAPACITY-BUILDING PROGRAMS

ICT is now widely used in education as a tool to aid learning and as a subject of study in its own right, although substantial benefits in terms of improvements to the education system as a whole are yet to be seen. The Ministry of Education, Science and Technology is also focusing on introducing ICT in school management and administration, and addressing issues

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SaaS: A New Hope for the Japanese Software Industry?

Web-based service providers such as Google and a host of other companies are moving applications onto the Web. These applications range from generic office productivity suites such as word processing and spreadsheet, to more specialized software like customer relations management. Because they are hosted by the service provider through the Internet, client companies can concentrate on using the application without the bother of installing and maintaining software environment. This trend is often referred to as software as a service or SaaS because software is not packaged and sold as a product but is offered when and where users need it.

   Both government and the ICT industry in Japan are paying close attention to SaaS as a way of revitalising a previous model of software development where software vendors develop customized software on a made-to-order basis. In 2007, the MIC and the application service provider (ASP) Industry Consortium Japan jointly established the ASP/SaaS Promotion Conference.

   From a user's perspective, SaaS can make the operation and maintenance of software more reliable and efficient because software runs on the service platform of specialised service providers rather than that of users. The risk is that SaaS will not work when the system at the service provider's side or the network in between fails. In other words, users give away control over the service and service providers face the big challenge of ensuring the reliability and usability of the service.

   Still, software vendors in Japan seem to be quite positive about going forward with the idea because SaaS reduces the total cost of business, and it is creating a new business opportunity based on aggregated user demands. At present the Japanese software industry is suffering from falling user demand due to factors such as the negative growth of the market and offshoring. SaaS could stabilize the revenue of software vendors as fees are incurred on an ongoing basis. In the long term, it could lead to the restructuring of the industry as a whole.

(Source: MIC 2007)

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around information disclosure in schools, such as privacy, security, transparency, and accountability.

   The Programme for International Student Assessment (PISA) 2006 Survey of the Organisation for Economic Co-operation and Development (OECD) found that the rate of Internet use by Japanese students is much less than the OECD average: 22.3 percent for searching information compared to the OECD average of 52.3 percent; 5.7 percent for collaborating online compared to the OECD average of 29.4 percent; and 3.9 percent for referencing compared to the OECD average of 28 percent (OECD 2006). The overall low rate of Internet use is interpreted to show that Japan has lagged behind in the exploitation of ICT in spite of the relative abundance of technology and equipment (Nakamura 2008). But one possible explanation is that Japanese students are more familiar with mobile terminals rather than full-scale PCs, and while mobile terminals have many advanced functions, they fall short in terms of flexibility and programmability compared to PCs and they leave little room for user creativity. In the long term, this may undermine the ICT capability of the younger generation in Japan.

   At the tertiary-education level, the take-up of e-learning is relatively slow. Many universities now have online content for non-degree or recurrent education purposes, but only a few universities (e.g. Shinshu University) offer a full four-year degree course where students can take most of the coursework online. The Cyber University (http://www.cyber-u.ac.jp/), established in Fukuoka in April 2007, offers four-year online courses, and allows students to obtain a bachelor's degree after at least four years of enrolment. As of November 2007, the university had 620 students enrolled in two faculties.

   Tertiary education in Japan is often criticized as not being capable of training IT students to the level that the industry requires. To meet industry demands, the MEXT has started a three-year training program for 'advanced IT specialists'.

OPEN SOURCE SOFTWARE

Although open source software has become an essential component of ICT infrastructure in Japan, it is not likely to replace software made available under other licence schemes. Open source software is frequently used at the server side, but not at the desktop, except for browsers and other specialized tools.

   The Open Handset Alliance announced an open source software platform for mobile handsets and services, and NTT

DoCoMo and KDDI were early supporters. This may point to a new dimension in open source software use in one of Japan's leading ICT markets.

In March 2007, the government published a set of guidelines for the government procurement of information systems (MIC 2007a). The guidelines require that information systems be based on specifications that are agreed in open participatory processes, that can be implemented by any party, and that have multiple implementations available in the market. The guidelines do not specify open source as a procurement requirement, although it clearly favours the open source approach.

ICT RESEARCH AND DEVELOPMENT

In November 2007, the MIC, the National Institute of Information and Communications Technology (NICT), and a number of major Japanese electronics manufacturers jointly established a new research and development (R&D) consortium called the New Generation Network Promotion Forum (http://forum.nwgn.jp/). This coincides with the Future Internet Design (FIND) initiative of the National Science Foundation in the US and the Future Internet Research and Experimentation Initiative under the 7th Framework Programme of the European Commission. The forum is expected to deliver a new generation of technology offering high speed and adaptability, high usability and quality, security, and efficient energy consumption (MIC 2007d).

CONCLUSION

To sum up, Japan is implementing various state-of-the-art technologies and services, ranging from broadband to mobile to digital television, and the ICT industry has a positive impact on overall economic performance. While there are growing concerns about the competitiveness of the fixed broadband market, fast and cheap services are very widely available, and mobile services are among the most advanced in the world. Together, the fixed and mobile communications sectors provide a strong foundation on which many innovative businesses and services are flourishing and the goal of achieving a 'ubiquitous network society' is realistic.

But while e-business is growing significantly, particularly in B2B transactions, and many innovative services are emerging (e.g. Nico Nico Douga Ltd), these tend to cater to entertainment and fun, rather than addressing real-world problems and providing new services for consumers. Moreover, the Japanese software industry is not internationally competitive, although the emerging area of SaaS shows promise in changing this situation

for the better. As previously noted, the use of ICT in education is not yet building competitive ICT capability among students. Overall, the transformative impact of ICT on daily life has yet to be seen. An important challenge for ICT in Japan is how to make sure that technological innovations contribute to improving society, particularly as tools for solving real-world problems such as unemployment and poverty, and as tools for social welfare management and corporate governance. Otherwise, the impact of ICT may be undermined in the long term.

A good sign is that government, industry, and individuals are becoming more concerned about what they do with ICT. Indeed, Japan needs to become a test bed not just for new cutting-edge technologies but also for using ICT to share information, communicate with people, and improve all aspects of life in society as a whole.

NOTES

1. Actual prices depend on types of service package taken, promotional offers and other incentives, but Direct Subscriber Line services with speeds ranging from 8 Mbps to more than 50 Mbps are available with service packages priced from USD 22 per month, and 100 Mbps FTTH from approximately USD 35 per month.
2. Two presentations providing a comprehensive overview of Japanese communications policy, including broadband and P2P, are available from http://www.too-much.tv/2008/03/japan-broadband.html (Too-Much-TV 2008).
3. One-Seg is not limited to mobile phones. Many devices with a screen such as electronic dictionaries and encyclopaedias now come with One-Seg capability, as do some laptop and desktop computers and USB devices.
4. According to the Japan Electronics and Information Technology Industries Association (JEITA, www.jeita.or.jp), 44,908,000 handsets were shipped between April 2007 and February 2008.
5. NTT lowered the target down to 20 million households in 2007. It is not yet known how it affects the policy setting of the MIC.

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