

PUBLIC POLICY TO SUPPORT ICT DEVELOPMENT IN JAPAN

Andreea Drăgoi, George Dumitrescu*

Abstract

Japan was the first major non-Western nation that proved able to fully benefit from the sustained technological advances that characterized the 20th century. From this point of view, the Japanese economy represents a model for many less technologically advanced countries. The Japanese people were very creative in searching for new technologies and learning how to use them. The Japanese government has played an important role in promoting continuous innovation. Our paper aims to analyze the role of Japanese policies in the field of ICT development. Combining its manufacturing and technological prowess with the support for innovation, Japan's economy is an example of an arena in which investing in ICT can lead to a global breakthrough. Investments in research and higher education make sure that young Japanese have the skills and the mind-set needed to succeed in the era of globalization. Markets don't easily make these structural transformations by themselves. This is the reason why the government support in the field should be mandatory. Our analysis will focus also on the Japanese policies regarding public investment in ICT, highlighting to what extent these reforms can contribute to a real growth in the field.

Key words: ICT, technological advance, public policy, Abenomics

JEL CLASSIFICATION: F, O, O2, O3, O31

I. Short history of economic development in Japan

Developing a thriving information and communication technology (ICT) sector is a priority for many developed and emerging countries, since it drives private sector productivity and competitiveness, creates employment and spurs innovation. Its contribution to economic growth is twofold. First, the ICT sector itself contributes to GDP growth. Second, firms, organizations as well as individuals have greater opportunities to use ICT productively when local firms are available to provide relevant ICT products and services at affordable prices.

As stated in the literature in the field (Colecchia, Schreyer, 2001) in the XX century, economic growth was mainly achieved through increased or improved use

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of labor and capital or through a rise in multi-factor productivity. However, in Japan's case, a new factor has been driving growth public support for the development of information and communication technology (ICT) sector.

It is common knowledge that ICT is a source of capital services, delivering inputs to the production process. ICT also plays a role as an intermediate input to capital goods production. While potentially an important source of productivity gains, this contribution to output is not separately identified in the present framework.

Some analysts (Shigeyuki, Hausman, 2013) have emphasized that the Japanese economy has gone through a number of stages since the end of the WWII and only in the final year of the XX century, public authorities have started to rethink the growth strategy through investments in RDI and high technologies. After a recovery period during which Japan built its economy back up to the prewar level, a high growth period followed which was driven by the heavy chemical industry. Then, after the two oil crises, a stable growth period emerged, driven by technology intensive industries. In the 1990s, Japan was confronted with a prolonged recession triggered by the expansion and contraction of an economic bubble in the latter half of the 1980s. It is considered that the evidence of prolonged economic demise lies in Japan's 50- year-old postwar economic system as well as in an increasing inability to respond flexibly to internal and external changes. Upon coming into power in April 2001, the Koizumi Cabinet has implemented policies covering regulatory reform, public company privatization (e.g. postal service privatization) and administrative reform.

Economic revitalization is being promoted with policies to improve efficiency in areas such as labor allocation, fund allocation and research and development. Major changes are also taking place in the corporate world as companies strive to increase competitiveness by moving away from traditional employment practices such as lifetime employment and seniority-based wages.

Regarding ICT contributions to economic growth, some analysts (UNCTAD, 2013) have shown that in Japan the role played by ICT in further increasing economic development of the country, as a productive sector in itself and, more importantly, as a enabler of productive use of information and communication technologies, has encouraged policy makers to put in place strategies in order to facilitate its development.

II. ICT sector in Japan – current stages, future trends

From the end of the 20th century to the beginning of the 21st century, a general boom of high technologies in the global market has been registered, ICT in particular.

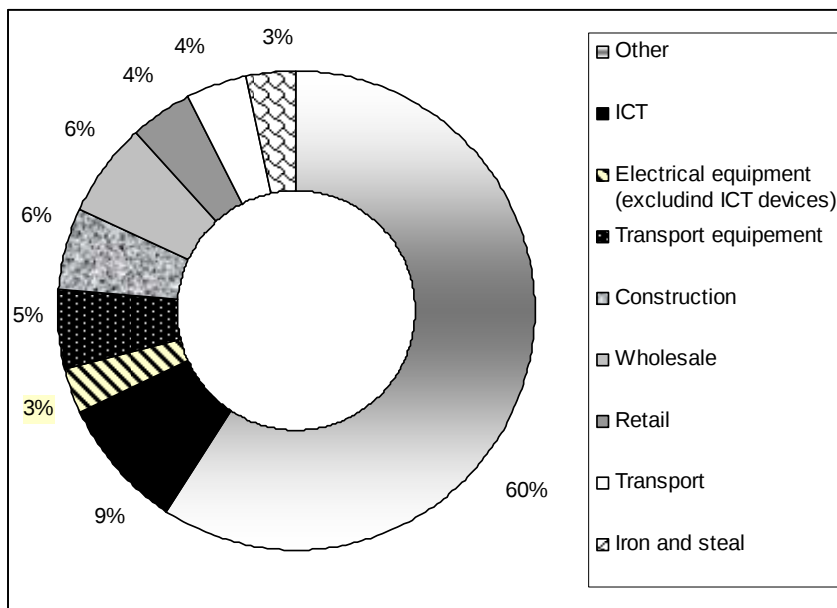
As stated in the literature in the field (Myoken, 2008) the ICT sector has an enormous impact on economic growth in Japan through productivity gains and

companies' efforts in the wide application of high - technologies. The Japanese ICT industry structure is unique. Japan can produce a whole range of devices and components, from LSI and printed circuit boards, to finished products, such as PCs, mobile phones, smart phones, telephone switches, and super computers.

The Japanese ICT sector has strengths in FTTH (Fibre to the Home), high definition image technology, home network, and mobile equipment technology. The Japanese competitive advantage is derived from its forte in optics and imaging, components for mobile telephones and TV, and advanced visual content. Japan has obtained a large share of the world's ICT market in other areas. For instance, its market share for DVD recorders dominates at 69.4%, with 54.1 % in plasma display TV, and 74.2% in digital cameras. While the market share of desktop PCs, notebooks both remain at low levels, the market share of electronic parts applied to mobile telephones, DVD, TV, and digital camera is high. On the other hand, total architecture, solution services, business models for global development, IP systems are remaining relatively weak areas, in which further investment are necessary.

Presently, ICT the industry plays an important role in the Japanese economy, accounting for 9% (82.7 trillion yen of the total output, which in 2011 totaled 918.6 trillion yen in 2011), as shown in Graph 1. By comparison, construction represented only 5.6% of economic activity (51.2 trillion yen), followed by transportation, at 4.3% of economic activity, or 39.4 trillion yen.

Graph 1: Market sizes of major industries in Japan in 2011

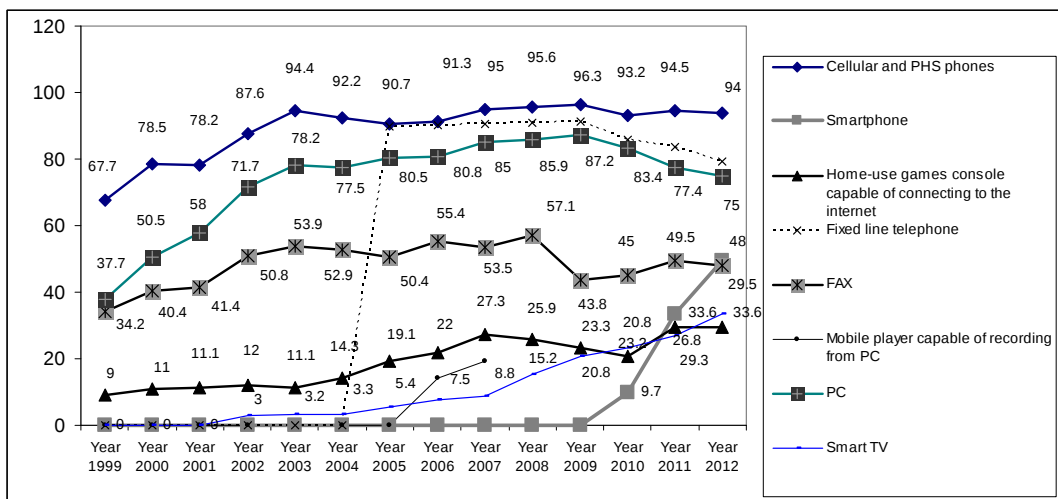


Source: Minister of Internal Affairs and Communication - *Survey on Economic Analyses on ICT*, 2013

According to Japan's Minister of Internal Affairs and Communication, the multiplier effect of ICT investment in 2015 may be as high as 1.98 in contrast with 1.19 for general investment and the ICT industry's economic spillover effects induced 87.6 trillion yen in added value and 7.713 million jobs in 2011.

As shown in Graph 2, the household penetration rate at the end of 2012 was 94.5% for cellular phones and personal handy phone systems and 75.8% for personal computers. The rate for smart phones included into the total number of cellular phones and PHSs stood at 49.5% (up 20.2 percentage points from a year earlier), indicating a rapid diffusion. Both the number of Internet users and the Internet population penetration rate continued to increase. The number of Internet users at the end of 2012 reached 96.52 million, an increase of 0.42 million (0.4%) from the end of 2010. The Internet population penetration rate was 79.5% (up 0.4 percentage points from the previous year). Those using personal computers at home to access the Internet accounted for 59.5% of total Internet users, the largest portion, followed by 42.8% for cellular phones, 34.1% for other personal computers and 31.4% for smart phones users at home, becoming the most frequently cited purpose for these users, followed by "browsing websites or blogs" (62.6%) and "purchasing and trading goods and services" (56.9%) (MIC, 2013).

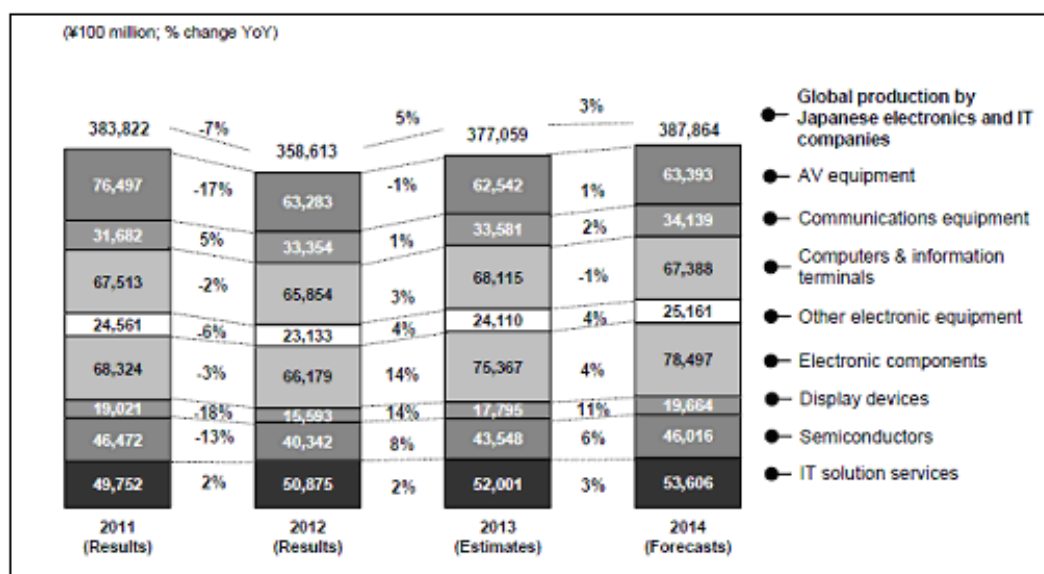
Graph 2: Household penetration rates for ICT terminals in Japan



Source: Minister of Internal Affairs and Communication – *Usage Trend Survey*, 2012.

According to Japan Electronics and Information Technologies Industries Association (JEITA) the proportion of households with Internet access is highest globally in the Republic of Korea (97%), followed by New Zealand (87%) and Japan (86%) (See Graph 3). In 2014, global domestic production of IT companies is set to increase, reflecting an anticipated recovery in the Japanese economy due to the continuation of Abenomics, coupled with the promotion of IT investments and other spillover effects on equipment for companies. As shown in the Graph 3, domestic production should remain strong for products offering high reliability and quality, such as display devices (88% manufactured in Japan), server/storage equipment (75%), semiconductors (64%), electric measuring instruments (64%), and electronic medical equipment (63%), even though domestic production's share of total production is trending downward (JEITA, 2013).

Graph 3: Global Production by Japanese Electronics and IT Companies



Source: JEITA - Production forecasts for the global electronics and information technology industries, December 2013.

According to International Telecommunication Union¹ (ITU) data, the regional digital divide is very pronounced in the Asia and the Pacific region. The region is home to some of the IDI's front runners, including the global number one, the Republic of Korea. Other economies with high IDI values, above the global (4.35)

¹ ITU (International Telecommunication Union) is the United Nations specialized agency for information and communication technologies – ICTs.

and the developed-country (6.78) averages, include Hong Kong (China), Australia, Japan, Macao (China), Singapore and New Zealand (ITU, 2013).

Japan has achieved marginal improvements in its ICT infrastructure, which has become more affordable, and maintains its competitive advantage in the high innovation capacity of local firms. Technology and innovation continue to play a key role in making Japan one of the most productive economies worldwide.

Table 1: Japan's ranking according ICT Development index in 2011 and 2012

ECONOMY	Rank 2012	IDI 2012	Rank 2011	IDI 2011
KOREA (REP.)	1	8.57	1	8.51
SWEDEN	2	8.45	2	8.41
ICELAND	3	8.36	3	8.12
DENMARK	4	8.35	4	8.18
FINLAND	5	8.24	5	7.99
NORWAY	6	8.13	6	7.97
NETHERLAND	7	8.00	7	7.85
UNITED KINGDOM	8	7.98	8	7.63
LUXEMBOURG	9	7.93	9	7.76
HONG KONG, CHINA	10	7.92	10	7.66
AUSTRALIA	11	7.90	11	7.54
JAPAN	12	7.82	12	7.77
SWITZERLAND	13	7.78	13	7.62
MACAO, CHINA	14	7.65	14	7.57
SINGAPORE	15	7.65	15	7.55
NEW ZEELAND	16	7.61	16	7.31
UNITED STATES	17	7.53	17	7.35
FRANCE	18	7.53	18	7.26
GERMANY	19	7.46	19	7.33
CANADA	20	7.38	20	7.14

Source: ITU 2013

III. Japan - a successful story regarding public support for technological development

In the literature in the field (Vallance, 2008) some analysts have underlined the fact that, in common perception, Japan is a nation whose image is that of high technology, robotics and creative media. The rapid development of the ICT sector has underpinned Japan's economic growth for the last few decades. This evolution was possible because, unlike other countries, Japan has started to develop, after 2000, public strategies to invest massively in high technologies.

First Public Strategy regarding ICT development was E-Japan, a strategy focused on the improvement of broadband infrastructure such as DSL, cable networks and fiber optics. E-Japan Strategy proposes to enhance the ICT usage by supporting the fields confronted with lack of means and knowledge. E-Japan attached high priority to developing infrastructure and making the most effective use of available IT resources. E-Japan was giving high priorities to the achievement of a secure and wealthy society by using IT and developing human capital, developing science, and strengthening industrial competitiveness. With such an aim, the development of a strong ICT sector underlined the need for a new system to maintain seamless investment from basic research to commercialization. Optics, mobiles, robot, electronic appliances were particularly considered key areas for investment. The largest amount of public investment was focused on next generation network technologies for convenience and comfort, ubiquitous network technologies, creating contents and technologies to use information and security technologies to achieve a safe and secure IT society.

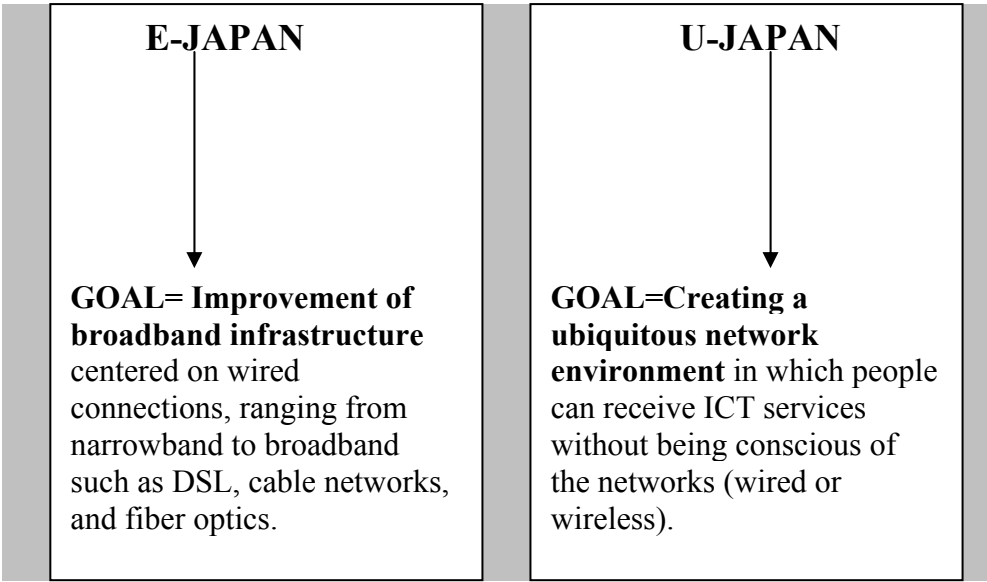
In 2006, the Ministry of Internal Affairs and Communications of Japan (MIC) announced its 'U-Japan' strategy with five policy packages: development of ubiquitous networks, advanced usage of ICT, upgrading enabling environment, international strategy and technology strategy (to promote R&D and standardization in priority areas, and to strengthen international competitiveness through innovations). To implement the U-Japan strategy, the MIC developed "UNS Strategic Program" (Universal communications, New generation networks, and Security and safety technology strategies) in July 2006. The program consists of three primary technologies and ten specific research projects with the goal of creating a society where anyone could benefit from IT, anytime and anywhere.

Another important strategy in the field of ICT, U-Japan was centered on creating ubiquitous networks in which people can receive ICT services without being conscious of the networks. The "U-Japan Strategy" focuses on integrating ICT

technologies into people's lives and developing a value-creation oriented society in which new values emerge one after another through creative ICT usage. Official documents (MIC, 2012) regarding U-Japan have shown that the “u” in “U-Japan” represents the “u” in not only “ubiquitous,” but also in “universal,” “ user oriented,” and “unique.” According to that vision, the fundamental concept of U-Japan is that it will “connect everyone and everything”, providing a huge increase in friendly communication that transcends generation, distance, and language, enabling people friendly "heart-to-heart" contact. U-Japan also proposes to transform society from one of uniformity and standardization to one that is creative and vigorous, and which strives to achieve more creative business approaches and services, as well as a new social system and values.

Those two Strategies, developed by the Minister of Internal Affairs and Communication, have managed to create an ICT environment in which networks are integrated into all aspects of everyday life, by organic cooperation between fixed networks and wireless networks, and between terminals and networks, or between authentication, data exchange and networks.

Figure 1: The national ICT strategies in Japan: From “e” (electronics) to “u”(ubiquitous)



Source: Authors conclusions based on literature in the field.

ICT development in Japan is also stimulated by the existence of a National Institute of Information and Communication Technology (NICT). NICT is an

incorporated administrative agency that supports national ICT policies by providing technological advice and co-operates with academia, industries, and overseas research institutes. NICT has been conducting R&D into ICT with the comprehensive objective of achieving a ubiquitous network society as it is the sole national research institute in the field of ICT. NICT has not merely conducted its own research but also support technology-intensive SMEs and promote their commercialization. Since 2006, NICT started a 5-year, mid-term plan. NICT consolidated ongoing projects into three R&D areas: new-generation network technologies, key technologies for universal communications and ICT for security and safety. As for new-generation technologies, NICT established next generation promotion headquarters regarding R&D, technology roadmap and ICT sector social and economic impacts.

Regarding Japanese public strategies to support ICT development, in the literature in the field (Myoken, 2008) the opinion was expressed that they contribute decisively to assessing national ongoing projects and selecting significant new research areas with experts from private and public sectors. Adding to these efforts for improving the method of selecting and concentrating significant research areas, noteworthy is the government strategies for promoting commercialization of technology and productivity. Through that initiative a special committee was formed to analyses the impact of international standardization and intellectual property rights on the growth of the ICT sector and to elaborate a measures package addressing the particular challenges in the field.

IV. Abenomics – a bold initiative with possible impact on ICT sector?

Presently, Japan's strategy regarding economic development can be summarized by a single word: *Abenomics*. *Abenomics* is the name given to a suite of measures introduced by Japanese Prime Minister Shinzo Abe after his December 2012 re-election to the post he last held since 2007. Abenomics' aim was to revive the sluggish Japanese economy with "three arrows": a massive fiscal stimulus, more aggressive monetary easing from the Bank of Japan, and structural reforms to boost Japan's competitiveness.

Regarding the development of the ICT sector, the main focus of Abenomics is the development of ubiquitous networks (a priority already expressed in the "U-Japan Strategy). In the current Abenomics, MIC aims to prepare the seamless access environment in every scene, by organic cooperation between fixed networks and wireless networks, and between terminals and networks, or between authentication, data exchange and networks. An important and little noted component of Abenomics, Japan's information and communications technology (ICT) growth

strategy propounded on June 14 2013, ostensibly aims at the evolution of a new model of efficient, resilient and green urban and rural infrastructures. Together with domestic businesses, Japan's central agencies, big local governments, and the Abe regime's regulatory and fiscal initiatives, have been working to deploy cutting-edge innovation in a swath of smart city initiatives as well as special zones.

Abenomics also aims to reduce corporate taxes, ease regulations, relax labor law and sign free trade agreements to revitalize industries and create new markets for IT and other sectors. Some analysts (Mitchel, 2013) have noted that most of Abenomics measures are expected to boost the demand for ICT specialists (9000-11500 new jobs are expected to be created in IT services and software development by 2015). Moreover, since Abenomics calls for Japan to raise annual public and private expenditures on R&D to 4% of GDP in five years, foreign ICT players, many of whom are already in the market, should look for regulatory changes to anticipate new business opportunities.

It also should be noted that through The Growth Strategy aiming to develop telecom infrastructure by investing in Photonic Network Technology and network virtualization technologies new opportunities will be created for national and foreigner investors in the field.

In 2015, the Japanese government plans to undertake cyber security measures for information sharing between business and governmental organizations. During the Information Security Policy Conference, held in June 2013, a cyber-security strategy was created in order to achieve cyber-security in Japan by building a reliable cyber space that ensures national security and the management of crisis contributing thus to the social and economic development of the country and to the people's safety and security.

A recent study (Chakravarti, 2013) found that Japanese businesses are adopting cloud computing at the highest rate in the Asia-Pacific region. Using cloud technology, Japanese authorities plan to deregulate the health sector. They aim to accelerate the usage of ICT in medical care and to create a medical network that enables safe recording, storage and viewing of medical and health data. Some analysts (Kushida, Murray, Zysman, 2011) have shown that, in the cloud computing field, take-up is strongest (36%) among companies with 10,000 employees or more because in the economic conditions, cost saving is a major focus for large companies and using cloud computing facilitate the reduction of hardware costs.

By the end of 2014, the Japanese government is expected to formulate policies to promote the utilization of big-data technologies to store public information. According to MIC statistics, the big data analytics market attained 109.7 billion yen in

2012 based on the sales of the businesses. This market is likely to be driven by increasing demands from the companies utilizing data for managing and operating business, by shipment of new statistics analytics software, and by new emerging industry that stems from mass production of sensor data. All these measures will attract investments and increase the presence on the Japanese market of some of the biggest ICT companies in the world (TCS, Infosys, NEC, Fujitsu and IBM). Also, the Japanese government aims to develop research ecosystems within universities by funding 1500 full time research positions by 2016. In order to attract skilled foreigners, the government plans to create preferential immigration policies. For example, the period of stay for attaining permanent residence is expected to be reduced from 5 to 3 years. This is expected to attract 100.000 skilled engineers and researchers in the country by 2020. Some analysts (Shigeyuki, Hausman, 2013) have shown that, although Abenomics can be viewed has a “bold initiative”, it can boost ICT development by prioritizing investment in R&D and enhancing the actual use of the existing infrastructure.

V. Conclusions

The Japanese miracle, based on economic development focused on knowledge and investment in ICT, led to an unprecedented advance of high technologies development. The development of ITC was coherent coordinated by Japanese authorities through strategic policies (E-Japan, U-Japan). Through its strategies, the Japanese government has succeeded to enhance ICT infrastructure in Japan by utilizing experts from industries and academia, by improving competition policy, by allocating resources to ICT related, prioritized areas, and by promoting cooperation between different industries. Given the government support for developing the ITC sector, Japan is now among the leading countries in the field of ITC with high rates of connectivity and utilization of computers and smart devices. Japan has a good world market share of home appliances and audio-visual equipment, although progress can be made regarding PC and related equipment and mobile telephone terminals. Also, Japan is a leader technology developer of displays, mobile terminals, digital home appliances, sensors, and radio frequency identifications. At the same time Japan is lagging in technologies for middleware such as security and authentication, and application development such as contents description language.

In the near future, digital home (and car) appliances will be equipped with advanced network functions, which will enable them to exchange data and information. This vision is often called Ubiquitous Networks, where everything communicates with everything. Since Japan has the world's leading networked

environment in the field, the Japanese manufacturers have a unique advantage to develop, design, and test such new products directly in Japan. Therefore, both the government and related industries expect that emerging technologies, products and services for the ubiquitous network society would drive Japanese economic growth, and increase her international competitive power.

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