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Japan Tech: The Foundations of the Innovation Revolution

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Abstract

All industrial nations agree that scientific and technological innovation holds the key to 21st century economic prosperity and competitiveness. Japan has responded to the challenges and opportunities of the current environment by investing heavily in basic science and emphasizing efforts to commercializing new discoveries and technologies. Japan's ability to marshal the resources of government research units, the private sector and a reformed public university system has been matched by substantial government investments and policy initiatives designed to ensure that the country stays at the forefront of the global innovation movement.

Keywords: innovation, research and development, Japan, cluster development.

Technology announcements no longer have the cache and market-grabbing attention that they had in the days of the dot.com boom, but they nonetheless provide fascinating glimpses of the future. In late November 2006, Sony Corporation and NXP (formerly Phillips) Semiconductors of the Netherlands informed the technology world that they were partnering on the development of a global standard for electronic wallets. To this point, the firms had been competing for a promising market, particularly strong in Asia and Europe, for the conversion of Internet-enabled phones into electronic wallets. The news release provided further evidence of the growing penetration of e-commerce into the Japanese market. Over 12.5 million Japanese people have a credit card in their mobile phone, allowing instant purchases and ready payment for buses and trains. The Sony chip, called the FeliCa, has been installed in 170 million units worldwide, with over 30 million of the chips already in use in Japanese mobile phones (Reuters, 2006).

For a complex set of reasons, western observers have been unnecessarily critical of Japanese commercial and scientific accomplishments in recent years, repeating the long-standing assertion that Japan was an imitative economy, skilled at reverse engineering but lacking the critical and analytical capacity to conduct truly original research. Furthermore, the prolonged recession after the "bubble" economy burst in the mid-1990s soured many outsiders on Japan's medium and long-term prospects. It appeared as though the rising sun had set; interest and attention shifted from Japan to China and India, now forecast to emerge as the most dynamic countries in Asia and the engines of regional and global economic growth.

Japan refused to play to type, however. Over the past few years, it has produced the longest period of uninterrupted economic growth since the end of World War II, albeit at reduced levels of expansion from the halcyon days of the 1980s and early 1990s. To the surprise of many, Japan re-emerged into industrial and commercial importance in large measure through the resurgence of its science and technology sector. Developments in a series of fields, including the mobile Internet, nanotechnology, robotics, and ubiquitous computing, have propelled the country to the forefront of international innovation.

This has not occurred by happenstance. Table 1 shows that most industrialized countries have been increasing their investments in research and development. Japan, however, stands out in the percentage of its GDP it has committed. While in 2002, for example, the EU average investment stood at 1.8% and the OECD average was 2.3%, Japan invested 3.1% of its extremely large GDP in research and development. Moreover, Japanese businesses continue to invest in innovation at a much higher rate than international norms. The commitment to development and international commerce symbolized by the Sony-NXP collaboration is clearly widely distributed within Japan.
This Japanese investment is paying off. Japan is responsible for over 25% of worldwide patents. When the percentage of triadic patent families are normalized using GDP and population, Japan ranks second worldwide after Finland (by GDP) and third after Finland and Switzerland (by population). (Triadic patent families are described by the OECD as a set of patents that are registered at the European Patent Office, the Japan Patent Office and the United States Patent and Trademark Office. Using triadic patent family data focuses on patents of higher value, as patentees only register in all three countries if they deem it worthwhile, and allows for greater international comparability.)

Table 1

R&D as a % of GDP				
	1995	2000	2001	2002
EU-25	1.72	1.80	1.83	1.83
Japan	2.69	2.99	3.07	3.12
United States	2.51	2.72	2.74	2.67
OECD	2.09	2.24	2.28	2.26

Business R&D as a % of GDP				
	1995	2000	2001	2002
EU-25	1.06	1.15	1.17	1.17
Japan	1.89	2.12	2.26	2.32
United States	1.80	2.04	2.00	1.87
OECD	1.40	1.56	1.58	1.54

Source: OECD Countries Spend More on Research and Development, Face New Challenge. 23 December 2004.
(http://www.oecd.org/document/2/0,2340,en_2649_201185_34100162_1_1_1_1,00.html

Analysts seeking to understand the rapid transformation of the Japanese economy, and particularly the emergence of new and cutting edge technologies in areas ranging from e-commerce and the mobile Internet to tele-health and biotechnology, need to appreciate that these developments have emerged from a comprehensive science and technology strategy and massive Japanese investments in preparing the nation for the new economy.

Japan determined that it would become an “S&T nation” in 1995, enacting the Science and Technology Basic Law and commencing wide-ranging reforms designed to modernize its research infrastructure and encouraged greater internal collaboration between companies, government agencies and university researchers. The government determined that greater emphasis on basic science and commercialization initiatives were crucial to national economic success and prosperity. The government created the Council for Science and Technology Policy (CSTP) in January 2001, ensuring the profile of this important group of corporate executives and academics by having it chaired by the Prime Minister. (Government of Japan).

Japan moved forward with increasingly aggressive and comprehensive steps. The First Science and Technology Basic Plan (FY1996-2000) expanded the level of government support for research and development to some 17 trillion yen. The Second S&T Basic Plan (FY2001-2005), spurred on by the CSTP, promoted basic research, in priority areas, and increased the emphasis on mobilizing science and technology researchers to address the most pressing national issues, such as the challenges of an aging population. Funding for competitive research grants was doubled and measures were added to improve collaboration between business, government and the universities. The First and Second Basic Plans strengthened the underpinnings of science and technology in Japan. The Government of Japan was extremely serious about transforming the nation into an advanced, science and technology-based country.

In 2006, the government launched the Third Science and Technology Basic Plan, calling for the expenditures of C$30 billion annually for five years. The plan further defines the expectations from the innovation agenda, focusing on enhancing the quality of life in Japan and commercializing basic science research to provide a foundation for future economic prosperity. The Government has declared its intention to create “innovator Japan” and to trumpet the success of the science-drive transformation internationally. At the same time, the authorities set clear directions for its researchers and research agencies: use the resources and infrastructure to improve the health of the Japanese, provide for greater security, and expand economic opportunity through a fundamental transformation of the scientific system in the country. The Government of Japan identified four priority fields: life sciences (including biotechnology), information technology, environmental research and nanotechnology/ material science. The latest Basic Plan also enumerates several secondary priorities, including energy, *monozukuri* (manufacturing) technology, scientific and technological infrastructure and frontier science (outer space and oceans). It promotes careers in research among young scientists and female researchers, allows companies and universities to attract more foreign researchers, and mandates stronger industry-academic-government collaborations through the continued transformation of the Japanese university system. The government placed very strong emphasis on patents and patent management, the funding of research through competitive grants, and maintaining a national system of evaluation.

Japan's commitment to the transformation of the country through science and technology investments extended to the urban and regional face of the nation. Japanese civil servants had long paid attention to Michael Porter's seminal work, The Competitive Advantage of Nations and believe in the value of clustering activities. The Japanese government adopted this approach to science and technology clustering, believing that combining industry, government and academic research in a single location would produce impressive economies of scale and greater commercialization of research results. In 2001, the METI (Ministry of Economy Trade and Industry) began promoting industrial clusters, hoping to revitalize regional economies in the process. The initial 19 projects were reduced to 17, with the clusters involving 250 universities and over 6000 companies. They ranged from the Project to Form Next Generation Key Industries in the Chugoku Region with 10 universities and 100 companies collaborating on environmental fields to the Greater Kanto Region Industrial Cluster Project with 58 universities and 1500 companies working on manufacturing projects alone. The initiative did not stop there. MEXT (the Ministry of Education, Culture, Sports, Science and Technology) launched an Intelligent Clusters Project in 2002, creating 12 clusters designed to enhance connections between academic knowledge and industrial development. Outside of the formal plan, existing academic-industry-government clusters expanded, including two massive science-based urban developments, Tsukuba Science City near Tokyo and Kansai Science City near Osaka and Kobe. In the promotion of clustering, as in other areas, the government used direct investment, its dominance over universities, and its commitment to science and technology research to cajole, encourage and compel widespread engagement, all with considerable success.

Japan's economic resurgence has been much quieter in the 2000s than it was 20 years ago. Bruised, perhaps, by the harsh reaction to Japan's aggressive international FDI activities and rapid economic growth during the bubble economy, the Government of Japan and its major corporations have taken a more muted approach. Many of Japan's major international engagements are, as with Sony and NXP, through joint ventures and commercial alliances rather than through take-overs of foreign firms. In Asia, where Japanese commercial and technological influence is pervasive, lingering resentment of Japanese expansion (particularly in the 1930s and 1940s) has convinced the Japanese to keep a low profile. As a consequence, Japan's considerable and impressive performance, both in science and technology and in general economic activity, has largely been ignored by companies and governments that are overwhelmed by the growth in China and India.

Readers of this journal will know, better than most, of Japan's significant advances in ecommerce (the country has many of the most profitable ecommerce companies in the world) and Internet-based commercial transactions. The Sony-NXP deal is, in many ways, more of an international "coming out" party for an impressive Japanese technology than it is a startling development for Japanese commerce and industry. Japan has developed and implemented a strategy that it believes will ensure the country's scientific and technological pre-eminence well into the 21st century; the success to date suggests that their plan is well underway. Two areas of high priority – the mobile Internet (where Japan's status is a world leader is likely rivaled only by South Korea) and ubiquitous computing (where Japanese inventors and commercial developers hope to set global standards)—have the potential to have a pronounced impact on Internet banking and commerce. If recent developments are any indication, the country will continue to make great strides in the use of electronic wallets, POP e-payments, micro-charging, remote account management, and Internet-empowered security and monitoring systems which promise an even greater flow of client, product and marketing information to companies. Given the scale and intensity of the Government of Japan's commitment to the scientific and technological innovation, it stands to reason that in Internet banking and commerce, as in other technology-intensive fields, Japan will remain or become a world leader in practical and commercial applications of technology.

References:

Government of Japan, Cabinet Office Government of Japan, "Council for Science and Technology Policy" – http://www8.cao.go.jp/cstp/english/about/administration.html.

Reuters, "Sony, NXP Team Up to Standardize Mobile Wallets," November 20, 2006 (http://www.eweek.com/article2/0,1895,2061774,00.asp?rsDis=Sony,_NXP_Team_Up_to_Standardize_Mobile_Wallets-Page001-194470)