

LA-UR-96-1831

CONF-9605202--1

Title:

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ADVANCED INFO-COMMUNICATIONS INFRASTRUCTURE

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JUN 28 1996
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Submitted to:

United States Library of Congress, Japan Documentation
Center for publication in the proceedings of the Symposium
on "Cyber Japan: Technology, Policy, and Society",
May 31, 1996.

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Form No. 836 R5
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JAPANESE GOVERNMENT POLICIES FOR THE DEVELOPMENT OF AN ADVANCED INFO-COMMUNICATIONS INFRASTRUCTURE¹

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Executive Summary

Contrary to much of what passes as the conventional wisdom in the United States, Japan remains highly competitive in the computing, information and telecommunications technologies that form the essential building blocks of the emerging information superhighway. This strength finds dramatic expression in the fact that Japanese firms in the info-communications sector remain the leading manufacturers of many of the high value-added hardware components that go into most of today's personal digital assistants, cellular phones, laptops, PCs, workstations and other products of the information age. Consequently, the United States ran an almost \$12 billion trade deficit in information technology with Japan in 1994.

The national info-communications infrastructure (ICI) program that the Japanese government launched in 1994 promises to help build upon this position of strength. This paper shows that Japan's ICI program is well-funded, comprehensive, and consciously designed to address national weaknesses in areas like computer diffusion and software development. The analysis demonstrates that there is little reason to conclude that inter-ministerial politics is negatively affecting the national ICI program in a significant way; still less that the ministries are likely to repeat the mistakes that characterized government-led information technology development efforts of the 1970s and 1980s.

In the past few years, the issue of deregulating Japan's telecommunications sector to promote greater competition has become confounded with the question of whether Nippon Telegraph & Telephone (NTT) should be broken up. Though the passionate politics that the proposed divestiture evokes makes for dramatic theater and generates a great deal of interesting material for students of Japanese politics,

¹ This paper was prepared for the Japan Documentation Center of the United States Library of Congress, Symposium on "CyberJapan: Technology, Policy & Society", Washington, D.C., May 31, 1996. I would like to thank the University of New Mexico Center for the Study of Japanese Industry and Management of Technology for providing a grant that made much of this research possible.

² The opinions expressed in this paper are mine alone and do not necessarily represent those of Los Alamos National Laboratory or the U.S. Department of Energy.

the NTT question is, nonetheless, essentially a red herring issue. Therefore, American observers of Japan should not confuse political immobility on the NTT question with a Japanese inability to make progress in world telecommunications markets. Indeed, greater competition in Japan's domestic market can be achieved without breaking up NTT by ensuring fair interconnection access, while NTT's size and strength are positive attributes as the Japanese telecommunications industry opens up to and competes against global competition.

Introduction

At the time when President Clinton outlined his vision and policy for a National Information Infrastructure (NII) in September 1993, Japanese employees were five times less likely to have a personal computer (PC) on their desk and six times less likely to be connected to a Local Area Network (LAN) than their counterparts in U.S. firms, while Japanese business managers were eight times less likely to use a PC than managers in the United States. Moreover, Japanese citizens were nine times less likely than persons living in America to have a mobile telephone subscription and almost 12 times less likely to have cable television (CATV) linkage to their homes.³ In the same year, Japan had only 3.13 million electronic mail boxes, as compared with 40 million in the United States.⁴ On top of these comparatively weak computer and telecommunications diffusion rates, Japanese information technology firms noticeably trailed U.S. firms in global markets in several high value-added technologies and associated services including packaged software, innovative computer architectures and standards, microprocessors, and computer and telecommunications related services, that constitute some of the critical, high-

³ See Telecommunications Council, Ministry of Posts and Telecommunications, *Reforms Toward the Intellectually Creative Society of the 21st Century: Program for the Establishment of High-Performance Info-Communications Infrastructure*, May 31, 1994, p. 31, hereafter referred to as *MPT Program*; and Japan Information Processing Development Center, "Ministry of International Trade and Industry Program for Advanced Information Infrastructure," *JIPDEC Informatization Quarterly*, JIQ No. 98, August 1994, pp. 10-11. Hereafter referred to as *MITI Program*.

⁴ *The Nikkei Weekly*, "Fight Over NTT Putting Drag on Competitiveness," May 6, 1996. Hereafter referred to as *Fight Over NTT*.

growth, high-margin, building blocks of any nation's plans for developing an advanced information infrastructure.

Such an advanced information infrastructure, or "information superhighway", as it has colloquially, if misleadingly, come to be called, has been described by the Clinton Administration as a "seamless web of communications networks, computers, databases, and consumer electronics" that will put vast amounts of information at users' fingertips thus unleashing "an information revolution that will change forever the way people live, work, and interact with each other."⁵ Improved economic growth, competitiveness, and job creation, as well as social and cultural enrichment are the promised payoffs of realizing this new infrastructure. In the brief two and a half years since the President's announcement, no fewer than fourteen nations, including all the G7 nations, have articulated their own development policies for advanced information infrastructures, most of which share similar technological, economic, and social assumptions.⁶

For Japan, at least judging by the rhetoric that has come to characterize the national reception and discussion of the U.S. NII policy, President Clinton's announcement seems to have had an effect similar to that of Captain Perry's famous "black" ships. Thus, citing the sorts of diffusion statistics and technological trends referred to above, Japanese politicians, pundits, journalists and bureaucratic panels have been quick to lament that Japan is significantly behind the United States in the technologies and infrastructure necessary to the emerging information society, warning that unless Japan catches up it simply cannot remain an economically

⁵ Information Infrastructure Task Force, *The National Information Infrastructure: Agenda for Action*, National Technical Information Service, U.S. Department of Commerce, September 15, 1993, p. 3.

⁶ For a discussion of these programs, see Organization for Economic Co-operation & Development, *Information Technology Outlook 1995*, Paris, France: OECD Publications, 1995, pp. 99-128. Hereafter referred to as OECD.

prosperous nation in the next century. While some Japanese journalists and academics have written books on the subject that strike an unequivocally techno-nationalist tone, portraying a zero-sum competition with the United States that can be met only through decisive governmental orchestration and support reminiscent of the industrial policies of 1950s through mid-1970s,⁷ the Ministry of Posts & Telecommunications (MPT) and the Ministry of International Trade & Industry (MITI) -- the central Japanese bureaucratic actors in this realm -- have begun implementing developmental programs and policies that, though grounded in less overtly techno-nationalist terms, are remarkably similar in scale and ambition to the government's past industrial policies and far more pro-active than the U.S. NII and information infrastructure policies in the European Union.

It is Japanese government policies for the development of its own national information infrastructure, or as the main program statement from the MPT prefers, advanced "info-communications infrastructure" (ICI) that is the subject of this paper. The essay consists of four principal sections:

1. a discussion of the importance of Japanese info-communications policy as an object of ongoing study,
2. an overview of the players and structure involved in the Japanese government's ICI policy response to the U.S. NII Program, including a short discussion of the goals and budgets of Japan's two principal ICI programs --

⁷ Three representative works include, *Nichi-Bei Multimedia Senso: Nihon wa Sekai Ichi no Multimedia Superpower ni Naru!* [U.S.-Japan Multimedia War: Japan will Become the World's Premier Multimedia Superpower!], *Joho Superhighway no Hasha: Nihon Joho Sangyo Ikinokori no Michi* [The Victor of the Information Superhighway: The Path of Survival for Japan's Information Industry], and *Joho Superhighway no Kyoi: Nihon Joho Sangyo Kaimetsu no Kiki* [The Threat of the Superhighway: The Crisis of the Annihilation of the Japanese Information Industry], all three of which are discussed in Glen S. Fukushima, "Multimedia Wars?", *Tokyo Business*, January 1995, p. 52.

those of MITI and MPT -- and a note on the efforts that Japanese industry has launched in response to or in conjunction with those programs,

3. an in-depth review and discussion of MITI's and MPT's ICI programs, including analysis of how their ICI projects (i) address Japan's key weaknesses in the info-communications realm and (ii) differ from past government info-communications-related policy programs; and,
4. a conclusion that summarizes the key issues and preliminary conclusions of the paper.

Why Study Japanese Governmental Policies in ICI?

Few would deny the importance and intellectual challenge of monitoring and analyzing info-communications policies and strategies as we approach the 21st Century. After all, they are generated to influence one of the largest and fastest growing markets in the world, conservatively estimated at U.S. \$431 billion in 1994 (excluding telecommunications) and expanding at an average of roughly 10 percent per annum since 1987.⁸ The technologies and markets of computing, information, and telecommunications are the focus of expanding world trade and investment and the source of new, and in many instances, relatively higher paying jobs than other markets. The technologies that comprise these markets are undergoing a rapid pace of change and convergence (hence the term info-communications) with new generations of products coming onto markets, often in 18 months or less. In light of such trends, it is not surprising, though it is still somewhat breathtaking, to consider that in the computer segment of the info-communications markets alone, 78 percent of the revenues come from products that have been on the market for less than two years.⁹ One of the most intellectually exciting and socially significant

⁸ OECD, pp. 7-8.

⁹ Council on Competitiveness, *Endless Frontier, Limited Resources*, (Washington, D.C.: Council on Competitiveness, April 1996), p. 26. Hereafter referred to as *Council*.

reasons to study info-communications policies is the fact that the change and convergence that have come to characterize the technologies and markets of info-communications hold out the potential of influencing not just some of our daily activity and habits, but more profoundly, our very ideas and structures of political and economic life.

The question is not, therefore, why study info-communications policies, but why study *Japanese policies* in this realm. The study of Japanese ICI policies promises to contribute to at least three interrelated debates that today frequently arise in scholarly as well as policy discussions of Japan's political economy. In brief, these debates concern (i) Japan's standing and prospects in the rapidly evolving, info-communications sectors, (ii) the efficacy of Japanese technology development programs on the high-technology frontier, and (iii) the relevance of national technology policies in general in a global economy.

The Issue of Japan's Standing in Info-Communications Markets

The first of these debates concerns the contention that Japan is decidedly behind the United States, and in some cases several European countries, in the provision of advanced technologies and services that comprise the critical building blocks of the emerging information superhighway. As touched upon already, this theme of lagging behind the United States permeates most official and unofficial discussions of ICI in Japan. There are several possible reasons why Japanese in positions of responsibility might see merit in repeating this claim, not the least of which is, of course, that they might actually believe it. It is not clear whether this is so. What is clear, however, and should be foremost in the minds of Americans analyzing Japan's public discussion and actions in the info-communications realm, is that the history of Japan from the Meiji period forward provides numerous examples of the

political utility of fostering national rallying cries, the objectives of which are to focus energies and investment across society. In this respect, the national call to "catch-up" to the West carries particular historical resonance with the Japanese. Curiously, many Americans have come to accept the claim of U.S. dominance in information technology. According to the conventional wisdom, there is little reason to study the policies of a nation whose sun seems to have set in the high-technology world of computing, information, and communications.

Closer scrutiny of the issue of U.S.-Japanese standing in information technology leads to a much more complex and certainly more balanced perspective, one that should serve as an antidote to American bravado and its side-effect of creeping complacency. It is true that U.S. firms like Microsoft, Adobe, and Novell lead the world in packaged software sales; that U.S. firms, and in particular Intel, dominate the world microprocessors' market; that U.S. firms like Compaq, IBM, Dell, and Gateway remain world leaders in PC sales; and that U.S. firms like EDS are the leaders in the computer services markets. It is also true that these same markets, namely packaged software, microprocessors, PCs, and computer services, constitute the fastest-growing segments of information technology expenditures, experiencing compound average growth rates well above industry averages, with software and services having experienced the highest rates of return in the industry since 1988.¹⁰

Such trends and statistics paint an undeniable picture of U.S. leadership in certain, strategically important areas of ICI related technologies. Moreover, when Japan's comparative weaknesses are seen against the backdrop of a now five year long, post-bubble recession, an export dampening high-yen problem, a banking and bad loan crisis that has seemingly been aggravated by bureaucratic mismanagement, and

¹⁰ Council, *Ibid.*, pp. 26-38.

political turmoil that has seen five or six new Prime Ministers cycle through Japan's political system in just the past few years, then it is not hard to understand why some Western observers might conclude that Japan is destined to be a weak follower of the United States in the rapidly emerging information economy.

Such conclusions are simply unwarranted, however, because they are drawn from only one half of the economic story. The other part of the story begins with the recognition that in FY 1994, Japan's information and communications industry produced \$244 billion in sales, representing 5.4 percent of the nation's gross domestic product (GDP). The sector employed a little over one million people and accounted for 9.2 percent of the nation's overall capital spending.¹¹ With this Japanese industry, the United States has run, and continues to run, a trade deficit since the late 1980s. In 1994, this deficit totaled almost \$12 billion.¹² Comprising this deficit is Japanese manufactured facsimile equipment, paper copiers, laser printer engines, microcontrollers, memory semiconductors, optical fiber, flash memories, flat panel displays, and advanced telecommunications equipment like routers, bridges, and Asynchronous Transfer Mode (ATM) technology. While it is true that the first five of these hardware technologies fall into comparatively low-margin and low-growth markets in which other Asian economies and especially South Korea are making competitive inroads, it is also true that the last four technologies are the critical components of some of the fastest growing markets in the information technology field.¹³ Consider flat panel displays (FPDs) and flash memories.¹⁴

¹¹ *Fight Over NTT*.

¹² *Council*, p. 26-27.

¹³ An increasing number of technical experts are beginning to doubt the future market strength of ATM in light of the alluring technical merits of emerging alternatives such as gigabit Ethernet, IP switching or Cells in Frames. For a discussion, see Jodi Cohen, "ATM Under the Gun," *Network World*, Vol. 13, No. 20, May 13, 1996.

¹⁴ In fact, the following discussion does not address one of the key, recent Japanese innovations in communications technology, the Personal Handy System or PHS. PHS handsets are cordless, mobile phones that are much cheaper to use than cellular phones, though they cannot be used while traveling

FPDs are the lightweight, compact, low power consumption screens that are strategically important to the fast growing markets for notebook and sub-notebook PCs. The OECD reports that Japan commanded 50 percent of the \$11.5 billion world market for FPDs in 1995. As essentially the only provider in that year of the two technologies experiencing the greatest demand within the FPD market (thin film transistors or TFT and super twisted nematic/color or STN/C), Japan is well positioned to take advantage of the estimated doubling of the size of the FPD world market (to ~ \$22.5 billion) by 2001.¹⁵

Japanese firms like Sharp, Fujitsu, and Toshiba are almost as well positioned in the rapidly expanding world market for flash memories. This market grew from \$565 million in 1993 to almost \$1 billion in 1994 and is contested by such U.S. firms as Intel and Advanced Micro Devices, which often are found collaborating with Japanese firms in this technology area.¹⁶ Flash memories are a type of memory that permits the retention of stored information without power. They are currently associated with the credit card slots around the edges of sub-notebook PCs and other personal digital assistants (PDAs), but are also found in cellular handsets, digital

in a car, train or other modes of rapid transportation. Introduced into the Japanese market in July 1995, PHS handsets were the first consumer electronics product to reach the one million unit mark in their first year of sales, according to a report by David Kahaner of the Asian Technology Information Program. Kahaner reports that within Japan, PHS has seen a dramatic increase in the number of subscribers in the first three months of 1996, belieing the claims of many observers that PHS would fail. See David Kahaner, "Japan's PHS Dramatic Turnaround," *ATIP Report 96.043*, Asian Technology Information Program, May 8, 1996. Because of its affordability, PHS is being aggressively marketed outside Japan in the fast-growing economies of China and Southeast Asia. To date, PHS has been adopted in Hong Kong, Singapore and Australia, and Indonesia is currently considering making PHS its standard mobile-communications system to supplement cellular. See *The Nikkei Weekly*, "NTT Joins Indonesia Handy-Phone Project," February 19, 1996.

¹⁵ OECD, pp. 47-49.

¹⁶ OECD, *Ibid.*, p. 41.

cameras and telephone answering machines, all of which are experiencing rapid growth owing to the convenience and productivity increases that they offer.¹⁷

Finally, consider that most of these Japanese-produced technologies constitute the components for many of the PCs and much of the office machinery which otherwise has an American corporate name on the outside. Focusing on PCs, with the exception of the microprocessor, the operating system, and the software, the rest of the hardware is manufactured in Asia, much of it by Japanese firms. In this light, many U.S. computer firms are perhaps better understood as value-added systems integrators and distributors.

Taken together these three considerations add up to more than just a multi-billion U.S. trade deficit in information technology with Japan. They also constitute a large part of the reason that direct employment in Japan's information technology sector is higher than in the United States and still growing. This Japanese pattern stands in stark contrast to the situation of the U.S. information technology sector, which has experienced a 30 percent decline in computer manufacturing employment over the past decade and nearly a 22 percent decline in the telecommunications sector employment over the past 15 years.¹⁸ Assertions of regained U.S. competitiveness and leadership in the info-communications area as well as boasts of record profits and stellar market performance can be properly understood only when assessed in light of statistical trends such as these. At a minimum, then, study of Japan's ICI policies compels us to come to grips with the details of technologies and associated trends that paint a more balanced, if sobering, perspective than is often found in the prevailing conventional wisdom.

¹⁷ See Mel Phelps, "Flash Forward to the Future," *Upside*, Vol. 6, July 1994, p. 12.

¹⁸ *Council*, p 26-28.

The Issue of the Efficacy of Japanese Technology Development Programs on the High-Technology Frontier

The second debate that study of Japan's ICI policies promises to shed light on concerns the issue of the efficacy of that nation's traditional large-scale government-industry cooperative technology development projects in successfully producing world-leading technological innovations in fields in which the Japanese are already more or less qualitatively even with the United States. There is now a large body of scholarship which convincingly demonstrates that Japan's government-led cooperative projects with industry were critical elements in what Mowery and Rosenberg refer to as Japan's "fast-second" strategy, a national strategy whose central objective was to "catch-up" with the West in technology and industry.¹⁹ The heart of the "fast-second" strategy was the adoption and improvement of technological innovations derived elsewhere. Examples of important, and by most accounts, especially effective "fast-second" oriented, projects that targeted information technology included:

- MITI's Very High Speed Computer System Project (VHSCS), 1966-72, and Nippon Telegraph & Telephone's (NTT) DIPS-I Project, 1968-71, both of which were introduced as central pieces of the governments' response to the release of IBM's System 360;
- MITI's Mainframe Computer Project (also referred to as the 3.5 Generation Project), and NTT's DIPS-II Project, both of which were introduced in the 1970s as central pieces of the government's response to the release of IBM's System 370; and
- MITI's and NTT's Very Large Scale Integration (VLSI) Projects, both of which ran from the mid-1970s through the early 1980s and were central to the government's

¹⁹ David C. Mowery and Nathan Rosenberg, *Technology and the Pursuit of Economic Growth*, (New York: Cambridge University Press, 1989), pp. 221-229.

strategy of developing VLSI memory semiconductors similar in capability to those developed by IBM.²⁰

But, while the "fast-second" technology policies of the Japanese government are generally credited with helping Japanese firms catch-up to their U.S. counterparts, the policies aimed at stimulating the development of new technologies on the frontier have been generally judged as somewhat less than effective. This has been the case in a number of Japanese government programs targeted at developing advanced technologies for the information technology sector. Examples include:

- MITI's Pattern Information Processing System (PIPS) Project, 1971-80, which focused on the development of pattern recognition and processing software technology as a way to leapfrog the introduction of IBM's System 370;
- MITI's Supercomputer Project, 1981-90, which focused on the development of III-V compound semiconductor technology (and somewhat more successfully parallel processing techniques) for use in next-generation supercomputers; and
- MITI's Fifth Generation Computer Project, 1982-91, which focused on the development of logic programming for use in artificial intelligence applications.²¹

There are at least four explanations offered for the relative failure of Japanese government-coordinated technology policies aimed at developing innovations on the frontier. One explanation that might be termed the funding inadequacy argument is offered by Fransman, who points out that MITI's expenditures on R&D projects are fairly meager, both in comparison to what other government agencies like the Science & Technology Agency (STA) and the Ministry of Education (MOE)

²⁰ For an excellent discussion of government-coordinated programs in the information technology area from which these examples are drawn, see Martin Fransman, *Japan's Computer and Communications Industry: The Evolution of Industrial Giants and Global Competitiveness*, (New York: Oxford University Press, 1995), esp. pp. 139-167. Henceforth cited as *Fransman, 1995-a*.

²¹ *Fransman, 1995-a, Ibid.*, esp. pp. 147-48; 165-67; and 201-02. For an in-depth treatment of the many less-than-effective Japanese government coordinated software development projects, see Michael A. Cusumano, *Japan's Software Factories: A Challenge to U.S. Management*, (New York: Oxford University Press, 1991), esp. pp. 388-420.

spend and in comparison to Japanese industry investments in R&D. Thus, he concludes that it is "unreasonable" to expect MITI's projects to lead to significant breakthroughs.

Fransman also offers a second explanation that might be usefully designated as the high-technology unpredictability account. Here Fransman notes that technologies such as optical lithography and silicon semiconductors have exhibited a remarkable "durability" that has essentially obviated the anticipated commercial importance of technologies like electron-beam lithography and III-V based semiconductors that were the focus of the government-coordinated efforts.²² This latter observation would seem to lend added strength to the well-known claim advanced by many critics of technology policies that government targeting strategies, especially in dynamic technology-based markets, are very risky and often counterproductive undertakings. A particularly politicized and partisan version of this account goes on to conclude that government policies that attempt to "pick of winners and losers", be it winning technologies or firms, are unlikely to payoff because no one, least of all government bureaucrats, can outguess the market. In any case, addressing the Japanese context specifically, Okimoto offers a parsimonious explanation of the uncertainties and risks inherent in Japan's move from the older "fast-second" mode of government technology policy to the newer, more research intensive mode of technology policy on the frontier. He observes:

When Japan was a latecomer the research directions to take were fairly clear. All that was required was to observe the successes and false-starts of the front-runners. Now that Japan has come to the frontiers of technology, the natural paths to take are no longer clear. If MITI sets industry off in pursuit of the wrong set of technological goals, or charts the

²² Fransman, 1995-a., p. 202.

wrong pathways to discovery, the miscalculations might be exceedingly costly -- not only in terms of the investment in financial and human resources but also in terms of lost time and foregone commercial opportunities.²³

Over the next few years, Japanese ICI policies will provide the opportunity to analyze the results of several recently launched government-coordinated and supported technology development projects designed to foster competitive innovations in frontier areas like computer architectures and advanced software. Will they produce substantive results like the DIPS and VLSI projects, or come up with relatively little to show like the PIPS and Fifth Generation Computer projects? Though Japan's government-coordinated ICI R&D projects are far too new to have produced any significant results, this study does take up below the ways in which those programs are structured, paying particular attention to how they are similar to and different from previous technology development efforts.

Nakatani advances a third argument meant to explain the relative failure of Japan's private as well as public sectors in producing technical breakthroughs and creating new markets in software.²⁴ According to this socio-cultural argument, Japanese society, through its central institutions which inculcate values, that is its schools and corporations, shuns the nonconformist and individualistic values that are central to innovation and creativity. What passes for education in Japan is really rote memorization skills that crush individual thinking and are useful only for passing the nation's battery of university entrance examinations. The "brightest" pass through these exams and enter a corporate world that rewards conformity and

²³ Daniel I. Okimoto, *Between MITI and the Market: Japanese Industrial Policy for High-Technology*, (Stanford, Ca.: Stanford University Press, 1989), p. 72.

²⁴ Iwao Nakatani, "Societal Factors Stifle Innovation in Japan," *The Nikkei Weekly*, September 25, 1995.

promotes stability through seniority based promotion systems. As proof of his case, he points to the video-game software industry, the one sector of Japan's software industry that is a world success. According to Nakatani, the firms in this industry are headed by and employ highly creative individualists lucky enough not to have persevered through Japan's intellectually stultifying educational system and thence into Japan's tradition-bound corporate world.

The problem with Nakatani's socio-cultural argument is that it rests on at least two faulty assumptions. The first of these is that the Japanese private sector is not innovative in software. It is true that Japanese computer firms have not made significant inroads into the packaged software market, but this is because, until 1994, they concentrated the bulk of their software development energies on developing bundled software for use with their principal products, namely mainframe computers and workstations. That is to say, the overwhelming demand expressed by software users in these firms' largest marketplace, Japan, was for customized software; consequently, that is what the computer firms focused on.²⁵ Moreover, a comparative study of software development in the U.S. and Japan found Japanese software to be uniformly of comparable quality and performance to U.S. software.²⁶ A second problem is that if Nakatani is right about the creativity stifling effects of Japanese culture, then it would seem reasonable to expect that the Japanese performance record in numerous other technical pursuits that demands high-levels of creativity and innovation would be just as poor as he asserts it is in software, which manifestly is not so.

²⁵ For a good discussion of how domestic demand has conditioned the Japanese software horizon, see William V. Rapp and Hugh T. Patrick, *The Future Evolution of Japanese-U.S. Competition in Software: Policy Challenges and Strategic Prospects*, unpublished report submitted to the Japan-United States Friendship Commission. Columbia Graduate School of Business, Columbia University, New York, New York, August 31, 1995.

²⁶ Michael A. Cusumano and C.F. Kemerer, "A Quantitative Analysis of U.S. and Japanese Practice and Performance in Software Development," *Management Science*, November 1990, pp. 1384-1406.

Despite these shortcomings, Nakatani's sort of socio-cultural argument attracts more than just a sympathetic hearing in Japan; indeed, for at least the past decade influential voices in Japan have been urging a thorough reform of Japan's educational system from Kindergarten through the university system. Typically, the objective of such reform efforts is to diminish the emphasis placed on rote memorization in the Japanese educational system and to adopt pedagogical methods that will produce more creative and individualistic students. Short of instituting the sort of sweeping reforms that Nakatani indicates are needed and then testing to see if there have been any changes in the relative position of Japan's software industry, it is difficult to see how an analyst could even begin to test his hypothesis. Indeed, it would seem that if Nakatani is right, then the present Japanese government ICI program, which makes no such changes in the educational system, is doomed to fail at least in so far as strengthening Japan's software position is concerned.

A final explanation, which, like the socio-cultural argument, purports to account for the failure not only of government-coordinated technology development projects in software, but for the more general failure of Japanese firms in world software markets, holds that a bias that is intrinsic to the structures of Japan's leading governmental and industrial entities and that favors bureaucracy, hierarchy, stability, and bigness is to blame. According to this structural explanation, interventionist government and vertically-integrated firms, especially the more collusive firms enmeshed in *keiretsu*, though they may have been useful as elements of a catch-up strategy in an age dominated by heavy industries that thrived on economies of scale and scope, today serve to quell the entrepreneurial and creative energies essential to the generation and growth of a competitive software

industry. Citing the often-repeated claim that most new jobs and economic growth in the United States are generated by small, high-technology firms, advocates of the structural explanation argue that the virtual absence in Japan of a strong venture capital community, which otherwise would encourage and nurture entrepreneurial software start-up firms, is a particularly harmful structural shortcoming of Japan's political-economic system.²⁷ Japan's venture capital community is said to be underdeveloped because the large, dominant banks lend money typically only to the large, dominant industrial firms which happen to be members of their own same *keiretsu*. As for the dominant firms themselves, the structural account holds that the very size and with it the bureaucratic and risk-averse culture of such firms is anathema to the risk-embracing, fleet-of-foot characteristics of smaller firms. For its part, the Japanese government bureaucracy is too prone to intervene in financial and industrial markets to promote stability, and stability, at least in the short term, is precisely what they get. But high-technology firms such as software development houses thrive on instability, or what Schumpeter called "the gales of creative destruction."

Certainly, there is ample evidence to support certain of the structuralist characterizations of Japan's large businesses and its government bureaucracy without buying the overall thrust of the argument. The important implication to be drawn from this argument, as in the socio-cultural argument, is that absent thorough-going reform of Japan's dominant political and economic structures, government policies meant to promote high-technology sectors like software in particular and info-communications in general will produce modest results at best. In any event, because perceptions often drive policy, the extent to which the

²⁷ For an example of such an argument, see Ray K. Tsuchiyama, "Will Venture Businesses Ever Flourish in Japan?," *The Nikkei Weekly*, February 26, 1996.

structural explanation is perceived to be true is at least as important as the question of whether it is in fact true. In this regard, the implications of the socio-cultural and structural accounts could have profound effects on Japan's political economy. After all, all of the institutions and structures that come under criticism in these two accounts are central pillars of Japan's post-War economic success. Its educational system is credited for having produced one of the most literate and productive workforces in the world, its bureaucracy for having planned and coordinated Japan's stunning industrial development, and its corporate structures for having been responsible for producing not only world class competitive products but for having done so through institutions like Japan's unique "permanent" employment system that accord workers welfare a much higher priority than in any other advanced industrial nation. Thus, if accommodation to the information age comes to be broadly accepted as entailing the transformation of these central pillars of Japan's political economy, the consequences for Japan will be far more revolutionary than any changes wrought since the Meiji era.

The Issue of the Relevance of National Technology Policies in a Global Economy

A third debate to which study of Japanese government ICI policies promises to make a contribution is the issue of the relevance of national technology policies in a global economy. In brief, the debate centers on the contention that national technology policies are obsolete in a global economy increasingly characterized by transnational corporations that enter into strategic technology alliances with foreign firms and that willingly spread their production, engineering, and even R&D facilities around the world. According to this view, the increasingly dense web of activity in international technology trade, strategic technology alliances, and foreign investment presents multiple points through which technology can be knowingly transferred or inadvertently leaked across borders. The resulting global diffusion of

technology raises the technological sophistication, and therefore the capability of firms the world over to adapt new technologies, thus increasing the speed at which they can copy and adapt new technical innovations wherever they may occur. In such a global economy, Nelson and Wright maintain:

policies launched by governments with the objective of giving their national firms a particular edge in an area of technology . . . do not work very well anymore. It is increasingly difficult to create new technology that will stay contained within national borders for very long in a world where technological sophistication is widespread and firms of many nationalities are ready to make the investment needed to exploit new generic technology.²⁸

Few would deny that technology today spreads across national borders faster than ever before. Certainly, the large Japanese info-communications firms are not averse to entering into international strategic technology alliances that serve as conduits for international technology transfer.²⁹ The disagreement arises when such facts are used to argue that national technology policies are thereby rendered obsolete. Behind such techno-globalist logic there would appear to lie several assumptions that are very much open to question. These would include the assumptions that all borders are equally porous, that all transnational corporations behave pretty much the same, and that all governments conduct their economic affairs, including their

²⁸ Richard R. Nelson and G. Wright, "The Rise and Fall of American Technological Leadership: The Postwar Era in Historical Perspective," *Journal of Economic Literature*, Vol. XXX, December, 1992, p. 1961.

²⁹ The *Informatization White Paper* (p. 31) reports that over the past few years, Japanese computer manufacturers have entered into many international strategic alliances. The majority of these have been with US RISC chip manufacturers such as Sun Microsystems, Hewlett-Packard, Mips Technology, and DEC. Interestingly, in 1994-95, most of the major information and communications equipment manufacturers including Fujitsu, NEC, Toshiba, Matsushita Electric, Sony, Mitsubishi Electric, Oki Electric and NTT, concluded alliances with the American multimedia firm General Magic. Other alliances include IBM and Matsushita Electric Industrial to develop multimedia terminals for home use; IBM, Toshiba and Hitachi to procure PowerPC; and Fujitsu, NEC, Pioneer Electronic and Seiko to use Apple's recently released MacOS.

responses to the forces of globalization, along roughly equivalent lines. Work by Johnson³⁰, Fransman³¹, Freeman³², and Chimerine, Szamoszegi, and Prestowitz,³³ among others, uncovers ample evidence to suggest that all three of these assumptions are in need of fundamental revision, especially when it comes to attempts to fit Japan into the techno-globalist model. The issue is not that the Japanese do not ever adapt their political and economic institutions in the face of external pressures, they do; rather the question comes down to whether the adaptation undertaken preserves more that is unique about the Japanese political economy including the goals and values it holds high as well as the technological innovations that it fosters, or whether the adaptation involves the abandonment of these unique aspects and is yet another step on the road to global economic convergence. When economists like Krugman can marshal evidence which concludes that national technology policies are not merely obsolete but counterproductive in the globalized economy of the 1990s³⁴, and scholars of the political economy of technology like Fransman can marshal equally strong reasons to conclude that Japanese technology development projects oriented to national objectives can adapt and remain viable in the same world,³⁵ then clearly there is an issue that is in need of further exploration.

Because Japan's info-communications firms, next to its auto firms, constitute the nation's fastest "globalizing" sector, and because that same sector is being targeted

³⁰ Chalmers Johnson, "Comparative Capitalism: The Japanese Difference," *California Management Review*, Vol. 35, No. 4, Summer 1993, pp. 51-67.

³¹ Martin Fransman, "Is National Technology Policy Obsolete in a Globalised World? The Japanese Response," *Cambridge Journal of Economics*, Vol. 19, 1995, pp. 95-119. Hereafter referred to as *Fransman, 1995-b*.

³² Chris Freeman, "The 'National System of Innovation' in Historical Perspective," *Cambridge Journal of Economics*, Vol. 19, 1995, pp. 5-24.

³³ Lawrence Chimerine, Andrew Z. Szamoszegi, and Clyde V. Prestowitz, Jr., *Multinational Corporations and the U.S. Economy*, (Washington, D.C.: Economic Strategy Institute, 1995).

³⁴ Paul Krugman, "Competitiveness: A Dangerous Obsession," *Foreign Affairs*, March/April 1994.

³⁵ *Fransman, 1995-b*, esp. pp. 113-15.

for competitive strengthening by government ICI policies, study of such policies presents a unique opportunity to explore the evolving relationship between globalization and national technology policies, and in particular, the argument that the former has rendered the latter irrelevant. Of greater long term significance to students of international relations and comparative politics than whether Japanese technology policies are successful or not, is how Japan's political and economic system responds to the forces of globalization. For, just as in the case of the socio-cultural and structural accounts, how it responds could influence profoundly the nature of the relationship between the State and Society in Japan, the question of employment, the issue of inequality, relations between capital and labor, and the face that Japan presents to Asia and the rest of the world. In this sense, on-going study of Japan's policies in info-communications infrastructure can serve as a particularly fruitful window on actual and potential political-economic change on the eve of the 21st century.

Japan's Response to the U.S. NII: Structure, Goals, Budgets, Politics, Industry

The Japanese Government responded to President Clinton's 1993 announcement of a policy initiative in National Information Infrastructure (NII) by launching a comprehensive advanced info-communications infrastructure (ICI) program of its own. At the level of the national government, the Ministries of International Trade & Industry (MITI) and Posts & Telecommunications (MPT) established major efforts to help develop a nation-wide advanced info-communications infrastructure. Other ministries and agencies, especially, Construction, Home Affairs, Health & Welfare, Education, and the Science & Technology Agency (STA) more or less followed MITI and MPT supporting aspects of those two ministries' programs that most overlapped with their missions. Thus, Construction and Home Affairs have provided room in their budgets for optical fiber network investments, while

Education and STA have increased their support for research in information science and technology and computer diffusion to Japanese schools, including teacher education and remote education experiments using multimedia. The Ministry of Health & Welfare has supported the development of info-communications applications targeted at providing telemedicine, support for the elderly, alleviating urban congestion and bringing a myriad of public and private services to rural communities.³⁶

First funded in 1994, MITI's and MPT's programs emphasize (i) the development of new info-communications infrastructure, including establishment of a nation-wide fiber-optic network system, (ii) the promotion of info-communications diffusion within government, (iii) the development of novel info-communications applications for business, education, health and government services, (iv) support for R&D in info-communications technologies, especially multimedia technologies and computer software, and (v) the reform of regulations hindering the growth and competitiveness of Japan's telecommunications sector. Government support for these efforts is either direct as in the coordination and funding of cooperative technology development projects with industry, or indirect through tax incentives, targeted procurement policies, and special low-interest loans as are provided from the establishment of the nation-wide fiber-optic system. Since the establishment of their programs in FY 1994, MITI and MPT together have invested approximately \$1 billion each year in info-communications-related programs and their budgets continue to grow (See Figures 1 and 2). MITI's FY 94 info-communications budget of \$393 million grew \$151 million to \$544 million in FY 95, and is conservatively

³⁶ See Japan Information Processing Development Center, *Informatization White Paper, 1995 Edition*, (Tokyo: JIPDEC, 1995), pp. 60-63. Hereafter referred to as *Informatization White Paper*.

projected³⁷ to grow by a minimum of \$300 million in FY 96.³⁸ MPT's FY 94 info-communications related budget of \$396 billion increased \$61 million to \$457 million in FY 95, and is expected to grow by a massive \$293 million to \$750 million in FY 96.

Readily apparent from a comparison of the MITI and MPT budget figures, as from the discussion below, is the considerable overlap between the two ministries' ICI projects. For example, MITI and MPT are each supporting efforts to increase the diffusion of info-communications technologies in the public sector (at the national and local levels). Each is also working with industry to develop applications software that will meet the private sector's needs. There is no doubt that this overlap is a reflection of a lack of cooperation between MITI and MPT, which itself results from the continuing political struggle between the two ministries over control of information and telecommunications policy.³⁹ Sometimes this bureaucratic turf-consciousness results in perverse and costly policies as in the two ministries refusal to cooperate in the creation of a government-wide electronic mail system and a unified computer-aided logistics support (CALS) system. Consequently, each ministry is creating, at great expense, its own unique systems thus defeating any notions of efficient and inexpensive government-wide administrative coordination and communications. Lack of cooperation in the CALS effort raises concerns not only about governmental administrative inefficiencies, but also industrial competitiveness concerns as the effort is seen as critical to the

³⁷ See note **** in Figure 1.

³⁸ All dollar figures are converted are from yen amounts at the rate of ¥100 = \$1.

³⁹ For the classic discussion of the origins and character of this inter-ministerial struggle, see Chalmers Johnson, "MITI, MPT, and the Telecom Wars: How Japan Makes Policy for High Technology," in C. Johnson, Laura D'Andrea Tyson and John Zysman, eds., *Politics and Productivity: The Real Story of Why Japan Works* (Cambridge, MA: Ballinger, 1989), pp. 177-240.

Figure 1: MITI's Info-Communications-Related Budgets, FY 94-FY96 (Millions of ¥)

<u>Funded Areas/Projects</u>	<u>FY96 Request</u>	<u>FY 95</u>	<u>FY 94</u>
I. Leading-edge Computerization in the Public Sector			
1. Computerization in Education			
• Development of advanced educational systems		350	350
• Low-interest (5%) loans thru JDB for educ. enhancement		*	*
2. Computerization in Research			
• Construction of Interdisciplinary Res. Center for IT		450	0
• Computer install. & network connection of pub. res. orgs.	1,555	911	NA
3. Computerization in Medical Treatment/Welfare			
• Dev. of indiv./med. info. integrated utilization system		130	0
• Survey on individuals health info. filing system		0	91
• Remote medical treatment consultancy study		120	120
• Dev. of power-supply area comprehensive health control/improvement system		69	69
• Medical treatment image information system		*	*
• Promotion of the "Mellow Society Plan"			
- Dev. of aged pop. work style support info. system		21	0
- Dev. of aged pop. support comprehensive system		160	160
4. Computerization in Administration			
• Includes computer installation & network connection in MITI, enhancement of "New Industry Creation Database Center", public sector computerization model project, and multi-function IC Card Model Project	34,190	32,445	31,770
5. Computerization in Libraries			
• R&D on an electronic library system	1,034	820	1
6. Operations of Information Infrastructure Centers			
• Subsidies for Educational Software Dev. and Promotion Center and Multimedia Centers	-	519	45
7. Enhancement of Advanced Applications			
• Advanced applications enhancement projects for local govts.	1,800	800	0
8. Subsidized projects to promote dev. of advanced electronic techs.	130	0	0
II. Promotion of Computerization in the Priv. Sector incl. Industries			
1. Computerization in Industry			
• Dev. of CALS Systems	1,107	708	0
• R&D of Easy-to-Operate Elec. Design/Prod. Support System for Asian nations (ODA account)		290	20
• Promotion of computer installation & network connection (incl. dev. of EDI) for small & med. bus.	1,313	490	-
• Info. Proc. System to Handle Stand. Bus. Protocols	•	*	•
• Tax incents/low-interest loans for computer rental	•	*	*
2. Acquisition of Interoperability in Information Equipment			
• Survey & res. on next-gen. netwrk system		28	0
3. Improvement of Security and Privacy			
• Promotion of R&D into security measures		100	100
• Dev. of info. security for service industry		9	9
• Dev. of info. processing safety measures		**	**
4. Intellectual Property Right Problems			
• Construc. & maint. of IPR mangmt. facilities for local govts. and corporations	1,062	477	NA
5. Enhancement of Industry Infrastructure Base Locations			
• Construc. of Regional Industry Info. Cntrs		2,413	0
6. Financing the Information Technology Promotion Agency	6,200	4,300	-
III. Information Industry Infrastructure Enhancement			
1. Nurture of Computerization Personnel	NA		
• Reconsideration & Reform of IT engineers curriculum		150	150
2. Development of New Industry Creation Software		800	0
3. Enhancement of Multimedia Software Production Infrastructure			
• Survey on vizualization enhancement		57	57
• Dev. of multimedia for telemedicine		120	120
• Multimedia publicity for nuclear power generation		300***	249***
• Dev. of Regional Industry Databases		571	571

Figure 1: MITI's Info-Communications-Related Budgets FY94-FY96 Continued

• Enhancement of Visualization caps. for Petroleum Ind.	265	252
4. Enhancement of High-economic Value databases	74	74
IV. Basic Technological Development		
1. Real World Computing Project		
• New info. processing tech. development	6,007****	4,986
2. R&D on new software structuring models	291	197
3. R&D on energy-saving electronic equipment	50	0
4. R&D on opto-electronic femtosecond technology	60	46
TOTALS (do not include *, ** and ****)	¥84,400 M	¥54,381M
Totals in US\$ at 100 ¥/\$	\$844 M	\$393 M

* Included in 245 billion yen JDP special loan account for information and communications infrastructure enhancement.

** Included in 211 billion yen for local area development and 69 billion yen Hokkaido-Tohoku Development Finance Public Corporation Loans

*** An advertising budget hidden within an informatization effort

**** Since the FY96 budget for RWC was unavailable at the time this paper was written, the FY95 figure was repeated; consequently, the FY96 total is probably understated.

Sources: Japan Information Processing Development Center, *Informatization White Paper, 1995 Edition* (Tokyo: JIPDEC, 1995), pp. 65-73; *Nikkei Computer*, October 2, 1995.

Figure 2: MPT's Info-Communications -Related Budgets, FY 94-96 (millions of ¥)

<u>Funded Areas/Projects</u>	<u>FY96Request</u>	<u>FY 95</u>	<u>FY 94</u>
• Establish low-interest finance system (annual rate of 2.5%) to build a fiber optic network	-	[32,300]	0
• Construction & maintenance of facilities to dev. and disseminate methods to utilize telecom applications in the public arena	5,533	3,073	0
• Support facilities construction and R&D to create new industries in the telecom area	416	62	0
• Network globalization		2,498	2,383
• Computerization and network MPT operations; make post offices into information bases	67,550	40,082	37,191
• Support technology development to create new businesses in the telecom area	699	0	0
• Promotion of international joint projects	628	0	0
• Establish telecom infrastructure to survive disasters	180	0	0
• Establish low-interest finance systems to support startup venture companies in the telecom area	[2,100]	0	0
TOTALS	¥75,006M	¥45,715M	¥39,574M
Totals in US\$ at 100¥/\$	\$750M	\$457M	\$396M

Sources: *Nikkei Computer*, October 2, 1995; January 2, 1995.

development of a Japanese CALS standard.⁴⁰ Apparently, such inter-ministerial politics have even prevented efforts to establish networking links between the various private sector and government R&D entities operating in Tsukuba Science City – a city established precisely to foster cooperation among researchers from all sectors.⁴¹

Nonetheless, whatever other downsides the political turf-war entails, it does not seem to have fostered a zero-sum competition over budgets. Indeed, at least with respect to info-communications, both MITI and MPT have received the budgets they have requested each of the past two fiscal years with only minor changes. Were this not the case, so that one ministry's budget requests were being funded at the expense of the other, then the competition between the two could possibly have harmful effects on the overall advancement of national ICI objectives. If a number of projects with overlapping objectives result from such liberal funding, as appears to be the case in the info-communications area, then there is little reason to believe that such redundancy is necessarily a wasteful thing. In fact, in the case of high technology development and diffusion efforts, a little redundancy has often proven to be a good thing. This is because such efforts fall in terrain in which uncertainty and risk are high and no entity has arrived at an agreed upon best way. Though on the outside the projects might appear as redundant in terms of the objectives they share, on the inside, there is very probably a pluralism of alternative paths being taken to achieving those common objectives. Project overlap has certainly been a positive characteristic of some of the U.S. government's most successful R&D

⁴⁰ Foreign Broadcast Information Service, *FBIS Report-JST-95-058*, September 15, 1995, translation of articles from *Nihon Keizai Shimbun*, July 28, 1995, *Nikkan Kogyo Shimbun*, May 29, June 5 and July 25, 1995, *Nikkei Sangyo Shimbun*, July 31, 1995, and *Nikkei Mechanical*, May 1, 1995.

⁴¹ See Jon Choy, "A Decade of Deregulation and Counting: Japan's Telecommunications Market," *JEI Report*, No. 28 A, Washington, D.C.: Japan Economic Institute, July 28 1995, p. 18.

programs, including its High-Performance Computing & Communications Program. There, common objectives such as gigabit network communications were achieved through multiple, seemingly similar, testbed projects.

Whether as a result of the perception of a competition problem between two of its ministries is not clear, but following the announcement of MITI's and MPT's ICI programs in May 1994, an entire governmental superstructure reaching up to the Prime Minister's office was erected to support national efforts in this area. The lead entity, at least in so far as broad policy guidance is concerned, is the Advanced Information and Telecommunications Society Promotion Headquarters, comprised of top officials from each of the ministries and the Prime Minister's Office. In February of 1995, the Headquarters group released the official Japanese Government policy document relevant to this area at the "G7 Information Summit" held in Brussels. This document, called the "Basic Guidelines on the Promotion of an Advanced Information and Telecommunications Society,"⁴² formally outlined the government's intention to support a national info-communications infrastructure policy that would establish (i) a nation-wide fiber optic network as well as other wired and wireless networking means, (ii) multimedia access in public facilities, and (iii) promotion of basic technology development. According to the policy document, the development of a national ICI will help bring about a society (i) in which everyone has easy access to advanced information communications, (ii) that gives special consideration to the socially disadvantaged, and (iii) that is characterized by vital regional diversity. Similar to the U.S. NII, Japan's ICI program stipulates that the government's role is to promote R&D and the establishment of

⁴² Advanced Information and Telecommunications Society Promotion Headquarters, *Basic Guidelines on the Promotion of an Advanced Information and Telecommunications Society*, Provisional translation, February 1995.

infrastructure, but that general advancement of the ICI should be developed with "private sector leadership."

In fact, despite the asserted policy similarities, the Japanese government plays a much greater planning and coordinating role in Japan's ICI program than the U.S. government does in the U.S. NII effort. As a consequence of this high level of Japanese government support as well as new market opportunities, since 1994 Japanese firms in the computing, information and communications industry have undertaken major reorganization efforts and launched new research and product development programs designed to complement specific policies and projects emphasized in the MITI and MPT programs. For instance, consider the recent industry organization and development efforts launched in the areas of multimedia technology and continuous acquisition and logistics support (CALs) systems, both targeted by the MITI and MPT ICI programs. In 1994, around the same time that the two ministries' programs were outlined, five of Japan's leading information communications firms officially announced the formation of a major, new multimedia business.⁴³ Following MITI's coordination and establishment of a CALs development effort in 1995 (about which more below), Hitachi, NEC, and IBM-Japan each officially announced their intention to initiate significant CALs-related businesses.⁴⁴

⁴³ In 1994 alone new multimedia businesses were established by (i) Fujitsu, which in June launched its "Multimedia Business Development Group" and its "Digital Media and Network Group"; (ii) NEC, which in April opened a "C&C Multimedia Business Promotion Division" as well as a "Home Multimedia Development Division" in its U.S. affiliate; (iii) Toshiba, which in July established an "Advanced [Information] Group" to promote the fusion of information and communications business (in which light its strategic alliance with Time Warner should be understood); (iv) Hitachi, which in April and August, acted to establish its "Consumer Products and Information Media Systems Group"; and, (v) Mitsubishi Electric, which in April, started a multimedia business promotion project. See *Informatization White Paper*, esp. pp. 29-31.

⁴⁴ NEC will establish an internal CALs promotion center and intends to start a consulting business for CALs development with its affiliated companies. NEC's goal is to achieve 20 billion yen (\$220 million) in CALs-related sales in 1998. Hitachi will begin development of a CALs-compatible integrated product information management system for atomic power construction, which upon

Such examples of industry following government's lead are not new in Japan. In fact, Japanese firms have long followed the policy investment lead established by the bureaucracy, and in particular MITI, not because the funding levels for involvement in any specific program are especially large (they are not, at least in comparison to large U.S. government R&D programs), but because they see government interest in particular areas as signalling future market (including government procurement) opportunities. This is not to imply that Japanese industry does not take initiatives on its own.⁴⁵ It does; but sometimes it is difficult to sort out which is cause and which is effect, or if a new technology area in which both Japanese industry and government are simultaneously making complementary investments is being driven by market demands that neither can avoid. In this case, what is at work is not so much a follower-leader relationship as it is a bandwagon effect. Such would seem to be operating in the recent decisions of Japan's leading computer manufacturers like NEC and Fujitsu to devote an increasing percentage of their

completion will enable management of the entire process of plant construction through an company-wide integrated network system. IBM-Japan will introduce an open CALS-compatible information system. See Foreign Broadcast Information Service, *FBIS-JST-95-058*, September 15, 1995, translation of articles from the *Nikkei Sangyo Shimbun*, August 15, 1995 and July 27, 1995.

⁴⁵ It should be noted, however, that when industry does lead, the government very often does not follow, at least in the sense of *replicating* investments that the market is obviously willing to invest in on its own. This is because Japanese technology policy, though by design more activist and interventionist than U.S. technology initiatives, still has the overriding purpose of filling those technology development gaps that the private sector seems unwilling or unable to fill on its own. Of course, how widely defined that gap is makes all the difference. In contrast to the United States where the technology gap has come to be defined quite narrowly (i.e. almost solely in terms of long term or high-risk and high-cost public goods such as basic research and defense technology), in Japan, the government has traditionally adopted a much more liberal definition, stepping forward to develop a range of "strategic" technologies usually in cooperation with industry. Such strategic technologies encompass a range of generic technologies of high potential economic returns to a number of industries and the nation as a whole. A fair number of these fall into what Alic and Branscomb *et al.* call "gray area" technologies, which are understood to lie between basic research and product development and therefore somewhere between where, at least in the United States, a clear government role ends and interest of the private sector typically begins. For a discussion of this concept of a "gray area" see, John A. Alic, Lewis M. Branscomb, et al., *Beyond Spinoff: Military and Commercial Technologies in a Changing World* (Boston: Harvard Business School Press, 1992), esp. pp. 369-410.

development funds to small computer development including PCs, PDAs, and other mobile computers at the expense of their traditional mainframe computer investments.⁴⁶ Interestingly, at the same time, MITI has been promoting the greater procurement and diffusion of PCs throughout the traditionally mainframe-dominated Japanese government administrative apparatus.⁴⁷

Japan's Two Main ICI Programs: MITI and MPT

MITI's ICI Program

MITI's May 1994 program document on ICI asserts that moves toward the realization of an "advanced information infrastructure society" should be led by the private sector, while the government should "supplement and reinforce the initiatives" taken by the private sector.⁴⁸ However, it goes on to note that since government is a major user of information systems, then government should make special efforts to promote the introduction of such systems in the public sector. The report also calls upon the Japanese government to improve the environment for the introduction and large-scale acceptance of advanced information systems in the private sector by taking measures to strengthen computer security, promote standardization, review systems in response to the progressive introduction of information technology, and strengthen the protection of intellectual property rights.

⁴⁶ *Informatization White Paper*, pp. 29-31.

⁴⁷ Another example of a market driven bandwagon effect is the recent near wholesale abandonment by mainframe manufacturers of vector processing architectures in favor of parallel processing architectures featuring CMOS technology. Leading the way have been Fujitsu, which announced its new "Global Server M Series" in 1994; NEC, which announced its ACOS-4 family mid-size general purpose "PX7500 Series" in July 1994; and Hitachi, which in late 1995, announced a new bi-polar machine as the successor to its M880. See *Informatization White Paper, Ibid.*, pp. 29-31.

⁴⁸ *MITI Program*.

MITI's program targets the development of an info-communications infrastructure for applications relevant to five broad areas: education, research, medical and welfare services, administration, and electronic libraries. Concrete measures implemented in FY 1994 included⁴⁹ (i) the establishment of an "Educational Software Development and Utilization Center"⁵⁰, (ii) collaboration with MOE and the Ministry of Home Affairs to promote the allocation of new computers to all the nation's K-12 schools by the year 1999, (iii) the acquisition of 10 new massively parallel processing supercomputers to promote research collaborations between government laboratories and national universities, (iv) the development and promotion of an "Inter-Ministerial Research Information Network" (patterned after the US's five high-speed Gigabit network projects), (v) continued support for programs (with the Ministry of Health and Welfare) involving the exchange of medical image information using high-definition satellite communications⁵¹, (vi) establishment of a "New Industry Creation Database Center" within the Information Technology Promotion Agency, and (vii) development of a pilot electronic library system in cooperation with other local and national government entities.⁵²

Each one of MITI's ICI measures addresses one or more of Japan's comparative weaknesses in the info-communications realm, including the problems of computer

⁴⁹ Unless otherwise noted, discussion of specific aspects of MITI's ICI program is drawn from *Informatization White Paper*, esp. pp. 59-64.

⁵⁰ This center is devoted to the development of (i) advanced computer software to allow interactive study, (ii) computer software with user interfaces that can be easily used in educational facilities, (iii) computer software which enables more advanced intellectual activities through groupware, and (iv) computer software to handle and analyze diverse types of information.

⁵¹ These telemedicine applications projects involve the Aomori Prefectural Chuo Hospital, the Aomori Prefecture Kokuho Ohma Hospital, and the Mutsu City Polyclinic.

⁵² This effort includes R&D support for projects in such areas as advanced retrieval technology (e.g. semantic and fuzzy retrieval), automatic document processing and indexation technology, and high-speed browsing and high-definition display technology.

diffusion and usage in the schools and public places and underdeveloped computing and communications research infrastructure. Moreover, the measures seek to promote socially-useful info-communications infrastructure that the private sector cannot or will not invest in on its own.

MITI's ICI program also serves to coordinate and implement measures to improve (i) the security and reliability of information systems, (ii) the promotion of standards, and (iii) the development of multimedia software. An example of a major MITI-supported program in the information security realm is its FY 96 establishment of a series of 19 experimental projects aimed at developing improved security technologies essential to the realization of full-scale electronic commerce. MITI has budgeted about \$93.5 million to help launch the projects, which will involve more than 100 companies, and will focus on developing technologies that will allow consumers to send personal and financial information securely through the Internet.⁵³

Three examples of MITI projects in the area of standards are its CALS project (briefly mentioned above in reference to MITI's political competition with MPT), its EDI project for small- and medium-industry, and its Digital Vision Laboratory project. All three serve to promote the development and, just as important, the diffusion of cross-cutting ("gray area") technology and standards whose realization will help advance the competitiveness of Japanese firms in world markets.

⁵³ *The Nikkei Weekly*, "MITI Aims to Catch U.S. in Network Commerce," April, 18, 1996. According to the article, the largest project, led by Nomura Research Institute, will involve the credit card company JCB as well as Hitachi and several other companies. Another one of the MITI-supported projects involves a 25-company consortium, including Sumitomo Credit Card Service Co., Toshiba, Visa, Netscape Inc., Fujitsu, Asahi Bank, and Sakura Bank, among others, that will start an electronic-commerce trial late in 1996.

The CALS project is a three year, \$34 million effort to develop a computer-aided logistic support (CALS) system intended to improve manufacturers' competitiveness. CALS enables the monitoring and exchange within and among companies of information pertaining to the entire life-cycle of a product from design and development through production, maintenance, shipping and warranty service, thereby leading to shortened product development cycles, improved work efficiency, and reduced inventory. At the center of the MITI-coordinated project is a new CALS R&D association, called the Nippon CALS Research Partnership, in which more than 50 companies are participating including NTT, Sharp, NEC, Fujitsu, Toyota, Nissan, Matsushita, and Sanyo. According to Japanese press accounts, MITI and industry leaders from some of Japan's largest *keiretsu* organizations decided to launch the CALS project because of fear that European and U.S. companies would set the international standards in the CALS area that would force Japanese manufacturers to undertake major restructuring, lest their products be kept out of world markets.⁵⁴

In FY 1995, MITI also launched a project to develop a pilot model of an electronic data interchange (EDI) system for small- and medium-sized companies. EDI is recognized as a key enabling technology of future electronic commerce as it permits different companies to exchange business information thus allowing the streamlining of business operations. The objective of the project, which was funded at 27 million yen (\$270,000) in its first year, is to promote the introduction of an

⁵⁴ *FBIS Report-JST-95-058*. For this project, MITI budgeted 550 million yen (\$6.1 million) in FY 95, 1 billion yen (\$11 million) in FY 96 and has requested 1.5 billion yen (\$16.7 million) in FY 97. Interestingly, the Ministry of Construction (MOC), the Japan Defense Agency (JDA), and MPT have also established committees to study and promote CALS. But whereas MITI has willingly worked with MOC on its effort to develop an integrated public works support system, it has been reluctant to cooperate with MPT in its CALS plan to develop computerized postal services. This unwillingness to cooperate in CALS development is a prime example of the ongoing struggle between MITI and MPT over the control of information and telecommunications policy.

inexpensive, user-friendly EDI system capable of being run on notebook computers into small- and medium-sized companies, which generally trail large corporations in integration of advanced info-communications systems.⁵⁵

The Digital Vision Laboratories is a joint venture company involving seven of Japan's largest information and home electronics companies. Formed at MITI's instigation in March 1995, DVL's mission is to conduct R&D into core multimedia technologies, such as middleware and connectivity standards with the goal of ensuring uniform standards and compatibility among home electronics, computers, communications, and broadcasting systems beginning in the year 2000. DVL is capitalized at 6.1 billion yen (\$61 million), with 70 percent of those funds coming from the MITI-dominated half of the Japan Key Technology Center and 30 percent from participating firms, which includes ASCII Corporation, Sony, Toshiba, NEC, Hitachi, Fujitsu, and Matsushita. A 1996 report of a highly respected U.S. study group commissioned by the National Science Foundation concluded that "although DVL has just begun its mission, the company has established a clear commitment to data standards, including those for high definition (HD) imagery." It also asserted that DVL's "effort to produce 'middleware' will prove of benefit to participating shareholders, if not the entire world."⁵⁶

A review of MITI's ICI budget (see Figure 1) reveals almost \$21 million of support for multimedia software development in FY 95 alone.⁵⁷ One of the key projects

⁵⁵ Foreign Broadcast Information Service, *JPRS-JST-95-035*, June 7, 1995, translation of an article from the *Nikkan Kogyo Shimbun* of April 7, 1995.

⁵⁶ Japanese Technology Evaluation Center (JTEC) Panel, *Report on Human-Computer Interaction Technologies in Japan*, National Technical Information Service Report No. PB96-157490, U.S. Department of Commerce: Washington, D.C., March 1996, pp. 101-102. Hereafter referred to as *JTEC Panel Report*.

⁵⁷ See categories III. "Information Industry Infrastructure Enhancement" and IV. "Basic Technological Development".

within MITI's program is a three to five year, \$15 million "New Industry Creation Software Development Project" that involves a consortium of hardware and software firms to develop advanced multimedia software needed to create new industries, such as remote area medical services and home shopping services.⁵⁸ While some of MITI's software support is directed to subsidizing the costs of mundane "bricks-and-mortar" needs such as facilities construction (e.g. MITI's establishment of a new Regional Multimedia Center at Marukomachi in Nagano Prefecture), the bulk of the support is directed at supporting R&D of multimedia software including Virtual Reality software, most of which is based upon distributed and object-oriented approaches.

MITI's ICI program efforts in support of multimedia software development are helping to address what is generally agreed to be one of Japan's principal comparative weaknesses in the info-communications realm, namely software. Moreover, unlike its focus on developing leapfrog technologies in some of its "failed" software development projects of recent years, MITI's efforts in the ICI program are directed at developing technologies like object-oriented software whose utility and versatility are already proven and in increasing demand by world markets.⁵⁹ Complementing MITI's (and MPT's) support for software, especially multimedia software, are the 1994 strategic decisions of Fujitsu and NEC, two of

⁵⁸ Foreign Broadcast Information Service, *JPRS-JST-95-037*, June 14, 1995, translation of an article from *Nikkan Kogyo Shimbun*, September 2, 1994.

⁵⁹ That MITI seems to have learned from some of its earlier mistakes is corroborated by Rapp and Patrick, who write, "The researchers were surprised at how readily MITI officials admitted their past policies had failed and that they were no longer actively supporting the TRON and Sigma projects. Rather they were looking for new policies." See *Rapp and Patrick*, p. 5. The TRON ("The Real Time Operating Nucleus") project was started in 1984 with the objective of constructing an open family of computer architectures built around a 32-bit microprocessor, with a high-performance operating system able to perform multitasking and real-time applications. The Sigma Project was begun in 1985 with 25 billion yen of government and private funding. Coordinated by MITI's Information Processing Agency, Sigma's "ultimate goal is to produce [UNIX-based] software through manufacturing instead of manual labor." For a good discussion of both projects, see *Cusumano*, esp. pp 396-404, from which these descriptions are adapted.

Japan's largest info-communications firms, to move away from proprietary architectures to more open architectures and away from a focus on customized software to one that gives greater emphasis to packaged software for the global market.⁶⁰ According to Fransman, these latter moves were driven mostly by the fear generated by the 1993 introduction and rapid acceptance of Microsoft's DOS-V (a Japanese language capable packaged software for PCs) in the Japanese domestic market, and the consequent boom in demand for Compaq, Dell, Apple and other American-brand PCs, the combination of which significantly ate into the until then commanding market dominance of NEC's PC-98 series.⁶¹

Of course, even if MITI has learned from some of its mistakes, as seems to be the case, and Japan's computer firms have started to abandon some of the strategies and habits which have hindered their growth in the otherwise booming global markets for PCs and packaged software,⁶² it is still very much an open question whether the combination of the two complementary strategies of the Japanese will be sufficient to position Japan to compete head-to-head with the world dominant American duo of Microsoft and Intel. If the advocates of the socio-cultural and structural explanations of Japan's weakness in software (reviewed above) are correct, then

⁶⁰ *Informatization White Paper*, esp. pp. 30-32. More specifically, according to the White Paper, Fujitsu announced its intention to market several middleware packaged software products and NEC announced its decision to alter fundamentally its proprietary strategy in its PC-98 series so that users can use IBM compatible software such as Windows. In the same year, NEC established a "Personal Software Division" as part of its new, "multi-platform" software strategy that will focus on the development of software for IBM and UNIX compatibles.

⁶¹ *Fransman, 1995-a*, pp. 188-193.

⁶² Interestingly, though Rapp and Patrick offer reason to believe that MITI has learned from past experience, the case with industry is quite different. According to them, contrary to software industry observers like Fransman, the Japanese software industry does not plan to put much effort into packaged software and instead will continue to emphasize customization, even for PCs. This is because customization is what Japanese software customers are demanding as integral elements of their "strategies to maintain global competitive advantage and the security of their unique corporate information and proprietary operating systems." As a result, the authors conclude that the Japanese software industry will experience long-term fragmentation and Japan's packaged software market will continue to be dominated by U.S. firms. See *Rapp and Patrick*, esp. pp. 2-5.

Japan's government policies and corporate strategies in the software realm are doomed to failure from the beginning, and by implication, Japanese policies do not matter and a study of them is a waste of time.

But if Japan's government policies do matter, then the question becomes what, if anything, makes the current software/microprocessor market dominance of Microsoft and Intel so strong as to appear nearly invincible to some people. It seems that once one dismisses the individual-centric arguments that rest on an elaboration of instances of visionary leadership of a Bill Gates and an Andy Groves (in which case when they die or move on we are left wondering whether their firms pass overnight from positions of invincibility to positions of great vulnerability), the most common argument centers upon the assertion that the sheer size of the Microsoft/Intel user-base has created a *de facto* industry standard that as such positively self-reinforces itself through every use. Under this conception, old users of the *de facto* industry standard have no incentive to switch to another system that they would have to put the resources into learning how to use and what few alternatives to the *de facto* standard as do exist are too expensive or too far outside the mainstream to attract new users.⁶³

The problem with the invincibility thesis is that it does not adequately account for the rapid pace of technological change that characterizes high-technology markets and perhaps none more so than the markets for software and PCs. Certainly, Gates recognizes this and does not buy into the invincibility argument as Microsoft's

⁶³ This idea of the self-reinforcing qualities of *de facto* standards is addressed more formally by Paul David in his theoretical work on how the layout of typewriter keys in a particular sequence – the well-known QWERTY sequence – became over time and through the sheer numbers of users who preferred it the *de facto* standard for keyboard lay out. For the classic statement of this argument, see Paul David, "Clio and the Economics of QWERTY," *American Economic Review*, Vol. 72, No. 2, 1985, pp. 332-337. For a strong counterargument to David's notion, see Paul Krugman, *Peddling Prosperity: Economic Sense and Nonsense in an Age of Diminished Expectations* (New York: W.W. Norton, 1994).

interest in the Internet demonstrates. A perfect example of a radical technological innovation that threatens to alter fundamentally the present market for both packaged software and PCs (the fortes of Microsoft and Intel) is Sun Microsystems' Java language. Java holds out the prospect of being able to write compact software applications (applets) of all types -- word processing, database, spreadsheets, etc. -- that could be downloaded off the Internet. With the ability to download such software virtually for free or on a per use basis, not only would the market for pre-packaged software virtually disappear, but the need for powerful and expensive PCs would virtually disappear with it. At least such is the vision held out by many advocates of Java who foresee a time in the not distant future when an inexpensive terminal consisting simply of a screen, a keyboard, and a floppy disk drive to save personal materials all but replaces today's expensive PCs.⁶⁴ Almost as stunning as the vision of Java's future itself, is the fact that it appeared and rose to prominence in just the past year. Mention of Java a year or more ago would have stimulated thoughts of exotic tropical islands or mugs of strong coffee.

Another innovation that is enjoying increasing popularity and that could start eating into the markets for packaged software and PCs is distributed client/server computing where a number of PCs (clients) have access to common data and application programs through so-called middleware. The Internet is itself an example of client/server computing, and Netscape is an example of one of the currently dominant middleware packages. Lou Gerstner is staking much of IBM's future on a vision of a time when broadband networks interconnect computers and most applications, data, and processing power reside across the Internet or intranets, and when computing consists mostly of client terminals managed by powerful

⁶⁴ For a good description of the vision held by Java's advocates and a strong refutation of it, see Aaron Goldberg, "The Industry's Future Isn't Something Out of the Past," *PC Week*, Vol. 12, No. 49, December 11, 1995, p. A15.

servers. In Gerstner's vision, which is not dependent upon Java, IBM runs the broadband services and the servers are powerful IBM computers, and there is little need for PCs and their software.⁶⁵ If such a future were to come about, it would be a safe bet that Japanese computer makers like Fujitsu, NEC, and Hitachi with their proven strengths in powerful workstations and mainframes would be worthy competitors of U.S. firms like IBM. Whatever the particular strengths and weaknesses of the visions extrapolated from Java and client/server computing, the pertinent point for our purposes is that both are representative of remarkably recent technological innovations that hold the potential of profoundly reshaping, if not obliterating, much of the market for PCs and their associated packaged software.

MPT's ICI Program

Like MITI's info-communications program, the Ministry of Post & Telecommunications (MPT) "Program for the Establishment of High-Performance Info-Communications Infrastructure" was also announced in May 1994. The report in which the program was first articulated was entitled, "Reforms toward the Intellectually Creative Society of the 21st Century."⁶⁶ Produced by the Telecommunications Council within MPT, the program report holds out a vision of an intellectual society, based on high-level information and communication infrastructure.

The MPT report contains a much more conceptual introduction to the goals and shape of a 21st Century information infrastructure than the MITI report. MPT defines info-communications infrastructure as "a comprehensive entity that

⁶⁵ For a discussion of Gerstner's vision of distributed client/server computing, see Dan Farber, "Three Visions of the Future, No Jackpot," *PC Week*, Vol. 12, No. 46, November 20, 1995, p. 114.

⁶⁶ *MPT Program*. Unless otherwise noted, information in this section on MPT's ICI program is adapted from that report.

encompasses network infrastructure, terminals, software applications, human resources, public and private info-communications systems, as well as social values and lifestyles related to the information-oriented society." According to the MPT program, "anyone, regardless of where she/he is in Japan, should be able to enjoy their life, be able to secure employment, and have access to culture and cultural events at the same exceptional high level as anywhere else in the world." The program statement lists six areas of broad social benefit that the development of a national ICI will support. They are (i) dealing with an aging population through the realization of such applications as home communications systems for the elderly, (ii) rectifying overconcentration in urban areas through the realization of "stay-at-home" networked companies and telemedicine, (iii) reforming Japan's economic structure by, for example, increasing efficiency in office work as well as R&D and fostering new leading industries like electronic publishing, home shopping and multimedia, (iv) realizing a comfortable lifestyle through the development of such applications as intelligent road traffic information systems and advanced entertainment systems like video-on-demand, (v) promoting international community-oriented cooperation through the realization of international telemedicine, and (vi) addressing environmental concerns by realizing a net reduction in carbon dioxide emissions.

MPT's ICI program emphasizes four central goals: (i) the development of nationwide advanced broadband telecommunications network infrastructure, (ii) the development and introduction of applications especially into the public sector, (iii) technology development projects and (iv) the promotion of regulatory reforms to accommodate the convergence of telecommunications and broadcasting.

Pillar I: Development of a Nationwide Fiber-Optic Network

The central pillar of the MPT ICI program is definitely the development of a national fiber-optic network system extending to every home. MPT estimates that by 2010, the project will have created 2.43 million new jobs, or roughly twice as many jobs as existed in the Japanese automobile industry in 1990 and four times as many jobs as existed in the Japanese consumer electronics industry in 1990. Significantly, MPT never reveals whether the new job estimate represents a net figure, or whether the job gain in the fiber-optic category comes at the expense of some job loss in traditional industries like electronics and communications equipment and automobiles. Further, MPT claims that of the projected 123 trillion yen global market for the multimedia industry anticipated to exist in 2010, new markets associated with Japan's fiber optic network alone will total 56 trillion yen or about 2.49 percent of total domestic production in 1990.

The nationwide broadband fiber-optic network will combine high-capacity optical fibers with ATM technology. MPT is working closely with NTT and the Ministry of Construction which both perform and contract out the work to communication equipment manufacturers and software development firms. In September 1994, NTT began tests on the shared usage of the high-speed, wide-area backbone network with the objectives of establishing the technology to build the networks and to create the many applications that will run on it.⁶⁷ In 1995, MPT was able to secure from the Ministry of Finance a special loan account totaling some \$323 million to be made available at an interest rate of 2.5 percent for financing the construction of the fiber-optic network system.

⁶⁷ Foreign Broadcast Information Service, *JPRS-JST-95-025*, April 19, 1995, translation of an article from the *Nikkei Sangyo Shimbun*, February 16, 1995.

No one denies that MPT's plans for a nationwide fiber-optic network address a critical weakness in Japan's info-communications infrastructure. With a smaller percentage of its population able to access CATV, LANs, and even the common old telephone system (COTS) than is the case in the United States, Japan has a potentially disadvantageous infrastructure problem and consequently a diffusion weakness on its hands that an ambitious national goal of establishing Fiber-to-the-Home (FTTH) by 2010 will remedy in one undertaking, if accomplished.

However, MPT's plan has come under two principal criticisms. The first is that FTTH is seen as being neither necessary, nor cost-effective. The argument here is that not every household will need the sort of two-way interactive communications capabilities that FTTH is so well suited to delivering. Not needing such capabilities, why incur the cost of something that will not be used. The second criticism is that the reliance on fiber-optics as the optimal multimedia transmission medium for the nation is itself unwarranted in light of technological advances in such areas as compression technology, coaxial cable, and wireless technologies.⁶⁸ As the experience of MITI's Fifth Generation Computer Project warns, placing all of a bureaucracy's bet on just one technology in a field of rapidly evolving technologies, is simply too big a policy risk to run. The implication of the two criticisms is that MPT would do better to slow down some and spread its bets so as to see what possibilities technological innovation makes possible. To its credit, a new five-year R&D plan being developed inside MPT (reviewed below) indicates that the Ministry has backed away from its original position of almost sole reliance on fiber-optics.

Pillars II & III: Application and Technology Development

⁶⁸ One example of an emerging technology that holds out the prospects of turning regular phone lines into multimegabit pipes is ADSL, or Asymmetric Digital Subscriber Line. For a discussion see Tim Greene, "ADSL Prepped for Prime Time," *Network World*, Vol. 13, No. 17, April 22, 1996.

In one of the most uncharacteristic and therefore significant passages of the ICI program statement, the Telecommunications Council candidly asserts that MPT's "new media" projects of the 1980s were "failures" because they were "unable to generate enough consumer demand to justify their establishment as a field of business." The "principal causes" of the failure are said to include the fact "the hardware-oriented approach was taken largely from the suppliers' perspective without adequate consideration given to the development of applications, resulting in insufficient demand"; "the network services focused on those favoring the telephone, and a new tariff system for 'new media' was not introduced to accelerate such services"; and the numbers of experts committed to the operation as well as the budgets were both insufficient.⁶⁹ In contrast to its "new media" projects, MPT insists that its ICI projects will focus on the task of generating consumer demand by developing "a wide range of measures that concentrate on the inclusion of user interest." Such measures include "a new tariff system tailored for the multimedia age, assistance in the initial stages of utilization, protection of information assets, and burden sharing for software, maintenance, hardware and human resources." The significance of MPT's admission of failure in such a recent undertaking as the new media projects goes beyond just a political or rhetorical *mea culpa* to demonstrate that the Ministry has learned from its mistakes and is unlikely to commit the same mistakes again. As the ICI-related projects that MPT introduces begin to mature, analysts will want to review the extent to which the projects are structured to meet MPT's focus on meeting consumer demand.

In 1994 and 1995, MPT launched two of its largest ICI-related technology development projects in collaboration with private industry, universities, and local

⁶⁹ MPT Program, p. 29.

government. The two experimental projects, located in Kansai Science City, are aimed at developing next-generation technologies for an advanced information infrastructure. MPT has so far devoted about \$140 million to the establishment of the two projects, which includes about \$48 million for the establishment of a new branch of MPT's Communications Research Laboratory (CRL) in Kansai City for participation in the projects.⁷⁰ The first of these is the Broadband Integrated Services Digital Network (B-ISDN) Application Field Research Project, which is a 10-year project designed to test the practical uses of B-ISDN for such applications as multimedia on-line shopping, interactive remote education, electronic libraries, teleconferencing and high-speed local area network (LAN) communications. The second project is the Fiber-to-the-Home (FTTH) Multimedia Pilot Model Project, now formally known as the Association for Promotion of New Generation Service (PNGS). This is a 3-year project to test a system for providing private homes with combined telecommunications and broadcasting services, including video-on-demand and high density TV. However, an NSF-supported technical team that visited the PNGS project site in 1995 and studied its R&D activities gave the project an overall negative rating, reporting that the project is based on "obsolete

⁷⁰ National Science Foundation, Report Memorandum #95-11: *Japan's B-ISDN and Fiber-to-the-Home Projects in Kansai Science City*, National Science Foundation: Tokyo, July 10, 1995. According to the report, the B-ISDN Application Field Research Project consists of six general application projects aimed at promoting practical applications of B-ISDN of interest to the general public user and eleven specific application projects of interest to specialized users. The General Application Projects are in the areas of (i) Multipoint Symposium Using Large-Screen HDTVs, (ii) On-line HDTV-based Public Art Galleries, (iii) Improved HDTV-based Background Video Images, (iv) High-speed publicly accessible CD-ROM libraries, (v) High-speed Multimedia Information Services, and (vi) Multipoint, multimedia TV conferencing. The Fiber-to-the-Home (FTTH) Multimedia Pilot Model Project will determine the feasibility of next generation multimedia communications-broadcasting convergence services based on optical fiber networks. 250 households in the Kansai Science City area are participating in the project as model "subscribers". Each subscriber household is provided with about \$40,000 worth of advanced equipment including an HDTV terminal, an advanced TV game machine, a videotex terminal for video-on-demand applications, a video-telephone system, and an Optical Network Unit (ONU) device for conversion of optical signals to electronic signals and vice-versa.

technology" and that the current market trial is hampered by several weaknesses including a thinness in the number of services and software delays.⁷¹

The 1994 establishment of three new laboratories for R&D on high-speed (~1Terabit/second⁷²) networks, universal terminals, and advanced graphics information provides a second example of an MPT initiated technology development effort. One of the facilities focuses on the development of a new television with 2,000 scanning lines, approximately twice as many as in the HDTV already developed. This system will be applied to the display of medical X-rays for remote diagnosis via telemedicine applications. MPT's Communications Research Laboratory is also developing improved data compression capabilities and has invited manufacturing companies to participate in joint research.⁷³

Also in 1995, MPT coordinated the establishment of the Yokosuka Telecom Research Park (YRP), adjacent to NTT's Yokosuka R&D Center, to promote the development of next-generation mobile communications technology. The YRP's Promotion Association is headed by a former MPT executive, Shuzo Tokuda. NTT DoCoMo, Japan's largest mobile communications carrier, as well as NEC, Matsushita Communications Industries, Motorola, and Ericsson are participating in YRP. At the heart of YRP's facilities will be the YRP R&D Center, which will focus on the development of advanced mobile communications technologies. MPT is funding much of the cost of constructing the R&D Center, estimated at roughly eight billion yen (\$80 million).⁷⁴

⁷¹ *JTEC Panel Report*, pp. 90-92.

⁷² A Terabit is a trillion bits.

⁷³ *Nikkan Kogyo Shimbun*, August 27, 1994 and September 6, 1994.

⁷⁴ Foreign Broadcast Information Service, *JPRS-JST-95-035*, June 7, 1995, translation of an article from the *Nikkan Kogyo Shimbun*, April 6, 1995.

According to Japanese press accounts of January of this year,⁷⁵ MPT has committed itself to drawing up a five year basic R&D program for the development of advanced telecommunications technologies through FY 2000. In addition to the projects now underway, the plan is reported to budget and additional 31.5 trillion yen to support 11 R&D projects in the following areas:

1. development of an advanced optical fiber network system
2. initiation of the mobile communication system or Future Public Land Mobile Telecommunication System
3. development of the next-generation Internet
4. development of advanced imaging technology
5. start of comprehensive integrated services digital broadcasting (ISDN)
6. development of advanced satellite telecommunications
7. development of a new frequency source to meet increasing telecommunication business demands
8. promotion of unique, basic research with private sector firms
9. development of new devices for the next generation of telecommunication systems
10. study of biological functions and their possible application to telecommunications
11. application of telecommunication technologies to global ecology.

Clearly, MPT's technology development project agenda as reflected both in its current projects and in its five-year R&D plan demonstrates that the Ministry is committed to significant improvement in the generation, diffusion, and integration of advanced info-communications capabilities across the nation -- all areas in which Japan sees itself as lagging. Moreover, though it is putting substantial investments toward the development of the technologies necessary to a nation-wide broadband

⁷⁵ Foreign Broadcast Information Service, *FBIS-EAS-96-013*, January 19, 1996, translation of the article, "Japanese Telecommunications Ministry Outlines R&D Plans," *Nihon Keizai Shimbun*, January 12, 1996.

fiber-optic network system, MPT has backed away from the overriding emphasis given to the development of that system in its original 1994 ICI program statement. Finally, though only time will tell, it seems that MPT has identified the sources of failure of its "new media" projects of the 1980s and is determined to structure its ICI application development projects differently this time; specifically in ways that will emphasize user as opposed to supplier needs.

Pillar IV: Regulatory Reform

The fourth pillar of the MPT ICI program is regulatory reform of the telecommunications and broadcasting sectors. No other aspect of the entire national program in info-communications infrastructure has attracted as much attention or generated as much controversy as regulatory reform. No other aspect of Japan's policy so readily fosters comparisons with the starkly different situation in the United States. And, no other aspect of the national program is so deeply mired in competing agendas and vested interests. But, perhaps this is because no other aspect of the government's program -- not info-communications diffusion or broadband infrastructure development and certainly not R&D -- stands to transform so fundamentally and so quickly the structure and competitiveness of the info-communications sector in Japan and with them the services and prices available to the Japanese consumer.

The story of telecommunications regulatory reform is quite complex and a full exposition of the many issues would take up an entire book or more, and is, in any event, better left to specialists of the issue. Nonetheless, it is useful to summarize the main arguments concerning how regulatory reform will help advance Japan's national info-communications infrastructure and to identify the main unresolved issues in the reform agenda.

The case for deregulation of Japan's telecommunications sector is rather straightforward. Most of the current regulations were written for a time when traditional telephony was about the only telecommunications medium and when a government owned utility, NTT, was the legally recognized monopoly operator of the public telephone networks. However, technological advances and especially those resulting in the convergence of video, voice, and text have transformed often well-intended regulations into obstacles that serve to impede healthy competition, limit consumer choice, and keep prices artificially high.

The examples of such regulations are numerous. Until recently telecommunications and broadcasting regulations in both Japan and the United States prevented CATV providers from offering telephone service, and telephone providers from offering video. They prevented long-distance service companies from providing local service and local operators from providing long-distance. But, as most Japanese advocates of deregulation are quick to point out, with the passage in the United States of the Telecommunications Act of 1996, the United States has joined in a trend of deregulation started almost a decade ago in Britain and implemented in recent years in the European Union. The U.S. Telecommunications Act erased a host of regulations that segmented telecommunications service provision into local, long-distance, and CATV markets. It was expected that the Act would ignite a new round of fierce competition and increased industry restructuring -- a forecast made all the more likely by last Fall's announcement of a major reorganization plan by AT&T which was seen by most analysts as a move meant to better position AT&T in the competition for local telephone markets once the Act was passed.

At least the restructuring part of the forecast appears to have been right on mark as the April 1 merger of SBC Communications and Pacific Telesis (creating a \$21 billion telecommunications corporation) followed by the April 22 merger of Nynex and Bell Atlantic (creating a \$50 billion telecommunications giant) so dramatically illustrate. As far as the fierce competition part goes, it seems that will have to wait through the present wave of industry consolidations. In any case, it cannot be denied that in the United States there has been a great deal of significant activity on the telecommunications deregulation front, much of it just since the passage of the Telecommunications Act. By contrast, in Japan the issue is caught between powerful vested interests where the political activity, such as it is, seems to consist of endless cycles of calls for studying the issue, followed by recommendations, followed by delay, and in time, renewed efforts to re-study the issue.

The fact that Japan has not kept pace with the deregulatory movement in the United States and Great Britain should not be read to imply that there has been no progress on the deregulatory front. But the progress that has been made has been minor. For example, in December 1993, many of the regulations and restrictions on the CATV industry were abolished or relaxed with a view to promoting the convergence of communications and broadcasting. But while one of the potentially most significant measures allowed the entry of CATV service providers into the telephone market, MPT left the most difficult issue, that of working out the interconnection method to the public switched network and associated charges, up to negotiation between the new entrants and NTT, the monopolizer of the local network.⁷⁶ It will come as no surprise that the negotiations between the parties have been halting at best.

⁷⁶ See *Informatization White Paper*, pp. 50-51. Other minor reforms were implemented in 1994. In January, the mobile communications and satellites' communications services markets were liberalized,

And therein lies the rub. It is no exaggeration to state that until there are new broadband multimedia technologies that permit the public switched network to be bypassed entirely or until the Japanese political system is willing to diminish, either through breakup or some other means, the monopoly position of NTT, then the effort to introduce meaningful competition into Japanese telecommunications markets will only go so far before it hits the brick wall of reality. That reality is NTT itself and its principal antagonist is MPT.

NTT is the world's largest telecommunications company in market capitalization terms. In 1995 it produced consolidated operating revenues of 7 trillion yen (about \$70 billion).⁷⁷ Partially privatized in 1984 under the telecommunications reform law (the government still owns more than 60 percent of NTT's shares), NTT maintains a dominant and virtual monopoly position in the local telephone service market, retaining more than 90 percent of that market. The 1984 telecommunications reform law allowed the controlled entry of competitors into the market for local telecommunications services; but these New Common Carriers (NCCs) have been able to capture sizeable market positions only in some of the newer, non-traditional telecommunications markets like mobile communications, pagers, and high-speed digital transmission services.⁷⁸ Because NTT has a near-monopoly on local services, Japan's independent long-distance carriers -- DDI (Daini

while in June the Broadcast Act was revised so that NHK and private broadcasting companies can broadcast TV programs overseas using satellites.

⁷⁷ Stephen J. Anderson, "From Crisis to Information Society in Japan: NTT Reform," Speech to the American Chamber of Commerce in Japan, February 14, 1996, p. 4.

⁷⁸ See *Choy*, who reports that in just the past few years, NTT has lost some 42 percent of the market for mobile phone service, 40 percent of the pager service market, and 25 percent of the high-speed digital transmission service market, pp. 7-11.

Denden), Japan Telecom Company, and Teleway Japan Corporation -- have to pay as much as 50 percent of their total revenue to NTT in the form of access charges.⁷⁹

In December 1994, after the release of the MPT Telecommunication's Council ICI report, MPT asked the Telecommunications Council to turn its attention to the task of conducting a wide-ranging, basic examination of the policy framework for information communications as Japan enters the 21st century. A central aspect of the Council's examination was to be the development of a report on the role and recommended disposition of NTT in Japan's telecommunications system. The final report of the Council was released to MPT Minister Ichiro Hino on February 29 of this year and unsurprisingly called for splitting NTT into one long-distance and two regional telecommunications carriers within the next two years. Few were surprised at the report's main recommendation regarding NTT as it was the third of its kind since an advisory panel to the prime minister in 1982 recommended breaking NTT into one long-distance carrier and more than one regional company.⁸⁰ At least since the 1982 report, MPT officials have made known their belief that NTT sits like a colossus on the Japanese telecommunications market and that its breakup would stimulate greater competition and greater innovation which would result in better service and lower prices for Japanese consumers as well as stronger Japanese telecommunications firms, including NTT, in overseas markets.

Other key recommendations from the 155-page report included the call that the long-distance arm of NTT be fully privatized and allowed to enter international telecommunications while the present international carrier, KDD (Kokusai Denshin

⁷⁹ Martin Fransman, "The Future of Japanese Telecommunications," A 1996 essay found on GLOCOM's Inforum WWW Home Page at <<http://ifrm.glocom.ac.jp/doc/f01.001.html>>. Hereafter referred to as *Fransman 1996*.

⁸⁰ See *The Nikkei Weekly*, "Panel Officially Calls for NTT Breakup," March 4, 1996.

Denwa), be allowed to enter into domestic telecommunications services prior even to the restructuring of NTT. Allowing NTT to enter international telecommunications service markets would be a major boost for NTT's ability to compete on the global scale. At present, NTT is prevented by Japanese law from joining any of the major, strategic telecommunications alliances that are now setting the tone for global competition in telecommunications markets.⁸¹ The report also recommends that the new regional NTTs should be allowed to enter local telephone and CATV markets in each other's area and participate in overseas business, other than providing international connections. In the general area of deregulation, the report urges the government to (i) ease market entry for newcomers, (ii) allow the interconnection of private leased circuits with public switched networks at both ends by the end of 1996 domestically, and by the end of 1997 internationally, and (iii) to loosen foreign-investment restrictions in three NTT firms and KDD.

What most Western observers too often fail to note is that MPT has additional self-serving reasons to desire NTT's breakup that go unspoken. Chief among these is that with NTT's breakup MPT's regulatory power would very likely increase, not decline. In America, people often falsely equate the liberalization of a market from monopoly control with lesser regulation, but this was not the case when AT&T was broken up in 1984 (as the increased regulatory authority of the FCC since that time illustrates), and it probably would not be the case with a breakup of NTT.⁸² This is

⁸¹ The three major telecommunications alliances at present are (i) "Concert", an alliance between MCI and British Telecom, (ii) "Global One", an alliance involving Sprint, Deutsche Telekom, and France Telecom, and (iii) "World Partners", an alliance involving AT&T, KDD, Singapore Telecom, Hong Kong Telecom, Korea Telecom, Telstra (from Australia), a European consortium of firms and several others. See *The Nikkei Weekly*, "Global Firms Tone Up for Telecom Free-for-All," April 1, 1996.

⁸² For a discussion of how liberalization typically leads to greater, not lesser, regulatory oversight, see Steven K. Vogel, *Freer Markets, More Rules: Regulatory Reform in the Advanced Industrial Countries* (Ithaca, NY: Cornell University Press, forthcoming 1996).

because, as Vogel shows, the introduction of more competition within a market -- better understood as liberalization -- quite often entails, and in the case of Japanese telecommunications has almost always entailed, the reregulation of the market in order to prevent the dominant carrier from abusing its monopoly power. Breaking NTT into three separate entities, each enjoying dominance in its respective market, will not obviate the necessity of such reregulation. In other words, splitting up NTT would very likely augment MPT's ministerial discretion, an outcome consistent with Vogel's finding that the "most distinctive feature of Japanese regulatory reform has been the ministries' effort to protect and expand their authority."⁸³

Of course, the Telecommunications Council report came under immediate criticism from all those groups which oppose NTT's breakup. Aside from NTT itself, whose President Masashi Kojima declared the conclusions of the report to be "based on faulty estimates",⁸⁴ critics of the MPT Telecommunications Council report include the Japan Telecommunications Workers' Union (Zendantsu), one of Japan's most influential labor unions with 185,000 NTT workers in its membership, the Social Democratic Party, of which Zendantsu is one of its major supporters, and the Communications Industry Association, among whose 250 member companies are giant firms like NEC, Oki Electric, and Hitachi, all of which are part of the "NTT Family."⁸⁵

⁸³ Steven K. Vogel, "Deregulation Japanese-Style: A Contradiction in Terms?," Paper presented at the 1995 Annual Meeting of the American Political Science Association, Chicago, August 31-September 3, 1995.

⁸⁴ *Panel Officially Calls.*

⁸⁵ So called because they evolved in tandem with NTT over the course of the 20th century serving as its principal suppliers in a relationship of controlled competition. For a discussion of both the NTT Family and the concept of controlled competition, see *Fransman, 1995-a*, esp. chapters 2-4.

Aside from the obvious self-interests that are involved, the main public argument of the anti-breakup groups is that competition in Japan's telecommunications markets can be gained without breaking up NTT. NTT itself has been pressing this argument since late last year when it announced that it would open up its networks further and renegotiate access charges. NTT also argues that a fractured organization would not be able to provide universal service at low prices and pursue expensive cutting-edge research.⁸⁶

One of the more popular arguments against NTT's breakup is advanced by Hideo Seki in his 1984 bestseller, *Nichi-Bei Multimedia Senso: Nihon wa Sekai Ichi no Multimedia Superpower ni Naru!* (U.S.-Japan Multimedia War: Japn will Become the World's Premier Multimedia Superpower). Seki, a former NTT executive, argues that NTT in its present size is the only company large enough to prevent foreign firms from dominating Japan's market. NTT is also the technological backbone of Japan's entire thrust into the multimedia future, Seki maintains. Whatever the ultimate merits of this techno-nationalist argument, much of the information Seki relies on to construct the argument is true. Employing about 3,000 research scientists and engineers in 13 laboratories and boasting an annual R&D budget of approximately \$2.4 billion (in 1994), NTT is the largest performer of R&D in Japan today. Moreover, an NSF-sponsored technology evaluation team concluded from its 1995 review of NTT that its research is comparable in quantity and quality to that found in the very best private U.S. research institutions.⁸⁷ Finally, it is hard to deny Seki's point about the importance of NTT as presently constituted in Japan's ICI efforts. Indeed, because of its R&D strength as well as its size and market strength, NTT is a key player in Japan's ICI plans. A few of NTT's

⁸⁶ *The Nikkei Weekly*, "NTT Breakup Put on Hold Again," April 1, 1996. Hereafter referred to as *NTT Breakup*.

⁸⁷ *JTEC Panel Report*, pp. 136-139.

major new initiatives launched after the establishment of the government's ICI program in 1994 include:

- its announcement in April 1995 that it would establish a new software development research center in Kansai Science City. NTT's 15 billion yen (\$150 million) center will focus on enhancing basic research in artificial intelligence and on developing information security. Specifically, the center will emphasize research on translation processing and knowledge inference technology from which computers can make generalized judgements. NTT began construction of the center just this past March.⁸⁸
- its announcement in the same month that it would build an independent public circuit network exclusively for computer communications use by the end of FY 96. To be called the "Open Data Network" (ODN), the project represents the first attempt by a communications firm to build a public circuit network apart from existing telephone networks. Connection to the ODN will be through control software installed at the terminal side, thus simplifying equipment on the network side and permitting lower usage fees than through a system that relies on the telephone system.⁸⁹
- its announcement in February 1996 of plans to help develop a local telecommunications network in Indonesia. This is but the latest in a series of moves by NTT to establish itself as a major global player in telecommunications. Of particular interest to NTT is dominance in the Asian marketplace, where recent activities by NTT include its (i) installation of 1 million new local telephone lines in Thailand, (ii) development of local telephone networks in India, (iii) establishment of a Personal Handy System (PHS) international promotion venture in Hong Kong, and (iv) participation in the management of Smart Communications Inc., a newly established carrier in the Philippines.⁹⁰ Still, as noted above, in comparison with its western competitors like AT&T, Deutsche Telekom and France Telecom, NTT remains limited in what it can do outside

⁸⁸ Foreign Broadcast Information Service, *JPRS-JST-95-037*, June 14, 1995, translation of article from the *Nikkei Sangyo Shimbun*, April 13, 1995.

⁸⁹ *Nihon Keizai Shimbun*, 19 April 95, p. 13.

⁹⁰ *The Nikkei Weekly*, "NTT Takes Local Route to Global Goals", February 19, 1996.

Japan since Japanese law prohibits it from providing international telephone service.

On March 29, the Japanese Diet announced that a decision on whether to split up NTT would be postponed until the next regular Diet session in January 1997.

Though a government working group did recommend implementation of the other deregulatory measures in the February Telecommunications Council report, the postponement of the decision -- the third time in a decade that the Japanese government has postponed a decision on NTT's status -- has already sparked fears in Japan that Japanese telecommunications firms will fall further behind the United States and Europe in intensifying global competition.⁹¹ To be sure, the postponement came as no surprise to most close observers of Japanese politics. With one of the three coalition government party's, the Social Democratic Party, firmly opposed to NTT's breakup and a second, the Sakigake Party, expressing its desire to postpone a decision, it was highly improbable that the Liberal Democratic Party would endorse NTT's breakup at the certain risk of seeing the coalition government fracture. In addition, with a general election imminent, it would be political suicide for any Diet member to pick a fight with Zendentsu by embracing NTT's breakup.

So where does the government's announcement to delay a decision on NTT's fate leave the Japanese telecommunications industry and with it Japan's prospects in info-communications in general? Contrary to the centrality accorded splitting up NTT by MPT and many other observers in Japan and the United States, the introduction of fair and vigorous competition into Japan's telecommunications markets and a strengthening of Japan's telecommunications industry in global

⁹¹ *NTT Breakup.*

competition can be achieved without breaking up NTT. The fairness and vigor of competition within Japan's domestic telecommunications market is a function of the number and strength of market contestants and therefore of the number of new entrants into the market. Viable market entry and strength is, in turn, a function of the costs of interconnection to the public leased circuits, which are controlled by the dominant carrier. It is hard to understand how the proposed divestiture of a near monopolist, today controlling more than 90 percent of local services, into three separate but still dominant entities will render any of those new entities more prone to promote competition. In other words, will a new regional NTT be more any more likely to lower the access fees for local services for a DDI or a new aspiring market entrant than the current NTT? In fact, a distinguished, independent study team of authorities on Japanese info-communications-related issues concludes that the most direct and sure path to achieving fair and vigorous competition is not through NTT's divestiture, instead it is through ensuring fair interconnection to Japan's local telecommunications networks.⁹² In that case, MPT's regulatory authority would be needed in order to establish the rules that would ensure fair interconnection and to oversee the process for connectivity according to those rules.⁹³ As far as Japan's domestic telecommunications market is concerned, the asserted urgency of breaking up NTT would seem to be a red herring issue; the real focus of policy discussions should be on securing fair interconnection. If this argument is correct, then perhaps the threat of splitting up NTT does indeed have some political utility in as much as the threatened divestiture seems to have been

⁹² The Information Technology and Communications Policy Forum of Japan (ITCPF), *Policy Proposals*, October 12, 1995, esp. pp. 3-6. Hereafter referred to as *ITCPF*. Fransman also makes essentially the same argument, see *Fransman 1996*.

⁹³ To be sure, in light of MPT's history of discretionary regulation, the task would become ensuring that the rule establishment is itself fair and MPT's oversight not discretionary. To address this need, the ITCPF urges the government to emphasize openness, transparency, and procedural fairness in the deliberations of the Telecommunications Council. See *ITCPF, Ibid.*, esp. pp. 6-9.

the motive behind NTT's announcement late last year that it would independently open up its networks further and renegotiate access charges.

If the proposed divestiture of NTT makes little sense in achieving the goal of a strengthened and competitive domestic telecommunications market, it makes even less sense in terms of its purported effects on the strength of Japanese telecommunications firms in global markets. One does not have to be a techn-nationalist to appreciate that a fractured NTT would hardly produce a major global contender if permitted to offer international services. Again, the focus on breaking up NTT seems misplaced. A far more sensible proposal would be to abolish the rules that segment the provision of international telecommunications services (in which KDD, International Digital Communications and International Telecom Japan are the only players) and the provision of national services (in which NTT and the NCC's such as DDI, Japan Telecom, and Teleway Japan are the principal players).⁹⁴ As Fransman notes, not only is this demarcation of markets an anomaly in as much as Japan is the only industrialized country to make such a distinction, but by preventing NTT -- the only Japanese telecommunications firm with the size and strength to compete with such global powerhouses as France Telecom, AT&T, and Deutsche Telekom -- from fully entering the global market, it helps ensure the growing dominance of American and European firms and the strategic alliances they head, and it means that NTT foregoes the benefits to be gained from the international "learning process that occurs when a company competes in dynamic, strongly-contested markets."⁹⁵ By abolishing the legal demarcation between the different markets, thus allowing NTT to enter the global market for telecommunications services and KDD *et al.* the national market (with the

⁹⁴ The argument in this section is adapted from Fransman, see *Fransman 1996*.

⁹⁵ *Fransman 1996, Ibid.*, esp. pp. 3-4.

assurance of interconnection at fair costs as elaborated above), Japanese consumers would benefit from the heightened domestic competition spurred by new entrants, and *possibly*, in time, telecommunications consumers in other countries would benefit from the new level of international competition fostered by the strong performance of a new viable contestant in global markets.⁹⁶

Conclusion

This paper has sought to describe and analyze Japanese government policies for the development of a national info-communications infrastructure. It began with a discussion of the importance of the subject, placing it within the context of three related debates concerning (i) Japan's competitive standing vis-a-vis the United States in info-communications sectors, (ii) the issue of the efficacy of Japanese technology development programs on the high-technology frontier, and (iii) the relevance of national technology policies in a global economy. The paper demonstrated that the conventional understanding of U.S. dominance and relative Japanese weakness in the technologies and sectors comprising the info-communications realm needs to be adjusted significantly to conform to the reality of Japanese strength in underlying high-value added hardware technologies, a number of which constitute the world's fastest growing info-communications markets. The paper also showed that the issue of the efficacy of Japanese policies to develop technologies on the high-frontier and the debate concerning the relevance of those policies in a global economy ultimately entail a fundamental challenge to the institutions and structures that comprise Japan's political economy. Thus, it was argued that how those institutions and structures adapt to the challenge of external

⁹⁶ I stress the word *possibly* because, as Fransman points out (*Fransman 1996, Ibid., p. 4*), it is by no means certain that NTT will automatically be a strong player on the international scene, especially in light of its experience as a domestic firm and in light of the difficulty of learning to excel in world markets.

forces will influence profoundly the nature of Japanese domestic political and economic life and the nation's relationship with Asia and the world in the years ahead.

The paper then turned to a description of the Japanese response to the articulation of the U.S. NII showing that the government of Japan launched a comprehensive and well-funded national info-communications program of its own in 1994 spearheaded by MITI and MPT, but involving a host of other agencies and ministries as well. Moreover, it was argued that while there is evidence that the long-standing political rivalry between these two ministries continues, a review of the ministries' ICI budgets shows there is little reason to believe that the rivalry is resulting in a zero-sum contest for funds or is otherwise slowing the advance of the national program. The paper also demonstrated that Japanese industry has followed the government's ICI lead by launching major reorganization and technology development projects designed to leverage the government's investments. This is especially the case in such areas as multimedia technology, but is also reflected in industry's shift of emphasis from mainframe computers to smaller computers, a shift which corresponds with that underway in government.

Analysis of MITI's and MPT's ICI programs showed that each ministry has launched efforts to address ICI needs and national weaknesses in the broad realms of infrastructure, technology development, applications development, and deregulation. Specifically, MITI's infrastructural projects were shown to address national needs and weaknesses in the areas of computer diffusion in education and research, information and network security, and the promotion of standards. MITI's technology development projects were shown to focus principally on the development of multimedia software, an acknowledged Japanese weakness, and it

was further demonstrated that Japanese industry is complementing the government's efforts with major software development initiatives of its own, especially in the area of packaged software. Two critical points were made regarding these complementary efforts. The first was that MITI seems to have learned from the errors of some of its recent software development project failures (e.g. the Fifth Generation Computer Project) and is accordingly emphasizing the development of technologies already proven and accepted by the market. The second point constituted a rebuttal to the argument that in spite of software initiatives launched by Japan, U.S. firms' dominance is so well-established as to be almost invincible to any challenge. The rebuttal centered on an elaboration of how the rapid rate of technological innovation is profoundly reshaping info-communications markets and expectations every day.

MPT's infrastructural effort principally emphasizes the development of a nationwide broadband fiber-optic network system, which MPT maintains will prove to be a generator of enormous numbers of new jobs and value-added industries by the year 2010. The paper showed that criticisms of MPT's early and almost singular emphasis on fiber-optics resulted in the ministry backing away and embracing the development of wireless and other improved transmission means. Just as with MITI's software projects, the paper demonstrated that MPT has committed itself to structuring its application and technology development projects in ways that will ensure that past practices that led to project failure are not repeated.

Finally, the paper turned to a discussion of the issue of regulatory reform of Japan's telecommunications and broadcasting sectors. The paper reviewed how the ultimate goals of regulatory reform, namely the introduction of competition into Japan's markets and the strengthening of Japan's telecommunications industry,

have been subordinated in the public discussion to the red herring issue of NTT's divestiture. That the public discussion would have been channeled in such a direction is unsurprising given the passion of the techno-nationalists, the telecommunications union and other anti-breakup forces on one side and the surface appeal of splitting up a monopoly on the other. With regard to the latter, it was shown that MPT's reasons for breaking up NTT may well extend beyond introducing competition where there was once only a monopoly to the recognition that its regulatory authority will actually increase with NTT's divestiture. The paper concluded with the argument that the goals of Japanese regulatory reform can proceed without a change in NTT's status by ensuring fair interconnection to Japan's local telecommunications networks and by abolishing the demarcation -- unique to Japan -- between the international and national telecommunications service markets. The proposed divestiture of NTT, by contrast, was shown to have little to no effect on the introduction of competition into Japan's domestic telecommunications market and a probably counterproductive effect on the ability of Japanese telecommunications to hold its own in global competition.

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—— "Panel Officially Calls for NTT Breakup," March 4, 1996.

—— "Global Firms Tone Up for Telecom Free-for-All," April 1, 1996.

—— "NTT Breakup Put on Hold Again," April 1, 1996.

—— "MITI Aims to Catch U.S. in Network Commerce," April, 18, 1996.

—— "Fight Over NTT Putting Drag on Competitiveness," May 6, 1996.

The Nikkei Weekly is an English language edition featuring the major articles that appeared in the past week's Nikkei lineup of newspapers (much like the *International Herald Tribune* is a compilation of some of the major articles from the *New York Times* and the *Washington Post*). A highly

useful and affordable resource for policy analysts and those wishing to stay abreast of major news stories in Japan.

Tsuchiyama, Ray K. "Will Venture Businesses Ever Flourish in Japan?," *The Nikkei Weekly*, February 26, 1996.

Tsuchiyama advances the argument that the weakness of Japan's venture capital community is holding back high-technology-based economic growth in Japan.

Vogel, Steven K. "Deregulation Japanese-Style: A Contradiction in Terms?," Paper presented at the 1995 Annual Meeting of the American Political Science Association, Chicago, August 31-September 3, 1995.

——— *Freer Markets, More Rules: Regulatory Reform in the Advanced Industrial Countries*, Ithaca, NY: Cornell University Press, forthcoming 1996.

Vogel argues that liberalization often requires reregulation, which is a positive action that can easily come in a wide variety of forms, as opposed to deregulation, which is a negative action. He shows that in advanced industrial countries, liberalization of markets, as in the proposed break up of NTT, government regulatory bodies like MPT often gain increased authority and power.