

**BACK TO THE FUTURE:  
JAPAN'S NII PLANS**

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# Back to the Future: Japan's NII Plans

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In 1993, Japan began debating plans for a nationwide digital communications network (often referred to as a national information infrastructure (NII) or “information superhighway”<sup>1</sup>). Because such an infrastructure is potentially the largest public works project since the construction of the *shinkansen* (bullet trains) of the 1960s, the debate was entered by the leading industrial companies, corporate think tanks, academia and several government ministries.

Despite the inherently new opportunities and challenges of such a network, the “visions” and other elements of the debate fell back on old intellectual concepts of a Japanese information society. The plans reverted to familiar top-down policies that favor producers over consumers, with actual implementation hamstrung by established patterns of bureaucratic infighting. Allied with government bureaucrats were Japan's large electronics firms, which remain focused on hardware production and, at the same time, continue to crowd out smaller, more innovative firms that develop software and information content.

Some concerned Japanese advocated more radical policy changes, notably centered on telecommunications deregulation. But these changes seem unlikely in the near term due to structural impediments in the national political system.

This overview summarizes the policymaking processes at work in the recent Japanese NII debate. Because much of the debate is an explicit reaction to U.S. NII plans, it also highlights a few of the similarities and differences between those plans, as well as those issues universal to most countries planning to build an NII.

## **BACKGROUND: ECONOMIC AND POLITICAL INSTITUTIONS**

The postwar Japanese “miracle” was one of rapid economic and technological development, although the economic benefits accrued more to large industrial firms than individual consumers.<sup>2</sup> These firms worked closely with the national ministries, including, in the case of computer and electronics technologies, participation in government-sponsored R&D projects.

### **National Ministries**

The formal structure of the current Japanese government is set by the Constitution of 1947, which was imposed by the U.S. Occupation. Although politics exist at the prefectural and municipal levels, essentially all significant regulatory and spending authority is concentrated at the national level; the prefectures lack the authority of Canadian provinces or German *Länder*, let alone an American state. The national political authority is vested in the two-chamber Diet, headed by the Prime Minister, and

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<sup>1</sup> In English, the term “information superhighway” has been most popular, as used by Gore (1991), but is often shortened to “info highway;” its equivalent in Japanese (*joho haiue*) has also been used. The term “national information infrastructure” seems to have first been used in Singapore, as in (NCB 1992); the Japanese equivalent is *joho infura*, which is now preferred, at least in policymaking circles. Other variants on the NII theme include “Asian information infrastructure,” “global information infrastructure” (GII), etc.

<sup>2</sup> As a leading Japanese political reformer wrote: “Japan raised itself from the ashes of war to become an economic superpower boasting one of the world's highest incomes. Nonetheless, the people living in this supposed economic giant do not feel as though they are living rich lives.” (Ozawa 1994: 153).

from 1956-1993 was ruled by a single party, the Liberal Democratic Party (LDP). Despite this political continuity, career bureaucratic officials held considerable power and influence, particularly during the period 1950-1973.<sup>3</sup>

For NII policy-making, the two most significant government ministries are the Ministry of International Trade and Industry (MITI) and the Ministry of Posts and Telecommunications (MPT).<sup>4</sup> MITI traces its background to the prewar Ministry of Commerce and Industry and the wartime Ministry of Munitions, but is best known as the architect of the growth of export-oriented heavy industries and electronics in the three decades following the war (Johnson 1982). The ministry holds central technology incubation and other policy-making functions, both directly and through the AIST (Agency of Industrial Science and Technology).

MPT at one time had the configuration of a traditional government PTT, but in 1953 the Nippon Telegraph and Telephone (NTT) Company was spun off as a government corporation, leaving MPT with postal functions — including the key national postal savings system — and telecommunications and broadcasting regulatory responsibilities.<sup>5</sup> Unlike other some other Japanese ministries, MPT does not take a clientelist view on behalf of NTT, but instead has been attempting to re-assert its authority through proposals of an AT&T-style divestiture (Vogel 1996).

For most other firms, however, the ministries have strongly identified with the interests of their associated firms (and vice versa), ties that are strengthened by the retirement of ministry bureaucrats in their mid-50's into senior executive, board member and "advisor" positions with leading Japanese firms; this process is known as *amakudari*, or "descent from heaven" (Johnson 1974).

### **Industrial Structure and Development of the Electronics Industry**

As part of its postwar economic development, fledgeling electronics firms were supported in the 1950's and 1960's with now-familiar tools of infant industry protection, both by discouraging foreign competition through tariffs and investment restrictions, subsidies and export promotion (Johnson 1982; Okimoto 1989; Mason 1992).

In the 1960's and 1970's, such industry promotion efforts focused on the production of mainframe computers by these same electronics firms. Both MITI and NTT promoted leading electronics firms by funding joint public-private R&D projects. When MITI gave subsidies of ¥70 billion for its New Series Project—joint R&D at Japanese firms to develop mainframe computers to

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<sup>3</sup> A discussion of the relative power of political and bureaucratic officials is the most controversial issue in the discussion of Japanese policy and well beyond the scope of this paper.

<sup>4</sup> It is well beyond the scope of this chapter to summarize Japan's postwar industrial policy and the central role played by government ministries, even if limited to just high technology industries. The standard discussion of the role of MITI is given by Johnson (1982), while the interpretation of Okimoto (1989) emphasizes the role of private firms; Johnson, et al., (1989) offers views of Japan's developmental policies in several industries. The best account of the incubation of Japan's mainframe computer industry is given by Anchoroguy (1989), while it, along with Fransman (1990) and Flamm (1987, pp. 125-153), outline Japan's computer industrial policy. Other relevant discussions would include Japanese incubation of the semi-conductor industry (Anchoroguy 1989, pp. 138-147; Mason 1992, pp. 174-187; and Okimoto *et al.* 1984, pp. 95-115). See Callon (1995), however, for a skeptical view of more recent technology policy efforts.

<sup>5</sup> Although the official English title is "Ministry of Posts and Telecommunications", the ministry is still known in Japanese by its original title, *yûseishô*, which means "Government Postal Ministry."

**Table 1: Top Japanese Electronics Companies**

Fiscal Year 1994<sup>7</sup>

Company	Year Founde d	Ind. Group	New Series	Den- den	R&D %	Sales (¥ billion)	Rank*		
							Consume r Electron c	PC	Semi- cond
Matsushita Electric	1935	Sumitomo†			8.5%	4,441	2	6	
Hitachi	1920	DKB,Fuyo,S anwa	•	•	10.2%	3,742	6	4	3
Toshiba	1904	Mitsui	•		8.3%	3,325	3	3	2
NEC	1899	Sumitomo	•	•	9.6%	3,007		1	1
Mitsubishi Electric	1921	Mitsubishi	•		6.6%	2,488	5	5	5
Fujitsu	1935	DKB	•	•	12.2%	2,260		2	4
Sony	1946	Mitsui†			12.7%	1,882	1	8	
Sharp	1935	Sanwa			8.9%	1,262	8	7	
Sanyo Electric	1950	Sumitomo†			7.7%	1,065			
Fuji Electric	1923	Fuyo			5.5%	561			
Victor Co. of Japan	1927	Sumitomo†			6.7%	541	4		
Oki Electric	1949	Fuyo	•	•	6.2%	536			

† Not a member of the presidents' council for the industrial group

\* Ranking among Japanese firms based upon total sales (domestic sales for PC's). Semiconductor sales for calendar 1994

Sources: Toyo Keizai (1995), Miyashita & Russell (1994), Dodwell (1988)

Yano Keizai (1995), Dataquest (1996), Anchordoguy (1989)

catch up with IBM's 370 series—NTT funded its four *den-den*<sup>6</sup> (NEC,Fujitsu, Hitachi, Oki) companies to produce computers that would be used in its telephone switching systems (Anchordoguy 1989). MITI's funding also helped establish the Japanese semiconductor industry, spending ¥200 billion on the VLSI project targeting mainframe semiconductors that helped Japanese firms develop Dynamic Random-Access Memories (DRAM's).

This R&D funding was concentrated in the overlapping oligopolies of the Japanese computer and telecommunications industries that some scholars argue act as *de facto* cartels. As shown in Table 1, these leading computer and telecommunications firms also overlap the prominent Japanese consumer electronics producers, with most having pre-war origins.

These firms have, in turn, been part of larger organizations of inter-connected firms that dominate Japanese industry. These industrial groupings are normally classified into two types 1) horizontally diversified cross-shareholdings known as *kigyô shudan* and 2) vertically integrated production and distribution systems known as *keiretsu*. (Kikkawa 1995). The better known are the horizontal industrial

<sup>6</sup> The term *den den* comes from NTT's nickname. Nippon Telephone and Telegraph is a translation of *nippon denshin denwa*, which was abbreviated *den den kosha* during the period (1953-1985) NTT was a government corporation.

<sup>7</sup> The Japanese government fiscal year extends from April 1 to March 31, and is used by the government, listed corporations and trade associations for reporting most financial results and other statistics.

groupings formed, in part, to prevent hostile takeovers, which—though lacking the centralized authority of the prewar *zaibatsu* holding companies—have established preferential capital and buyer relationships that enable coordinated action and risk sharing (Fruin 1992; Gerlach 1992). Many of the leading electronics firms play an active role in their group’s governance through participation in the presidents’ council that coordinates intra-group cooperation (Miyashita and Russell 1994). A few large firms lack strong group ties, but many head their own vertical *keiretsu*. There also exist a tier of smaller electronics firms—including Alps, Casio, Kyocera, Kenwood, Pioneer, TEC—which act as suppliers to the large firms or sell a narrower range of end-user products.

## **MOTIVATIONS: THE ORIGINS OF JAPAN’S NII PLANS**

Plans for an NII are based on the prediction that developed nations will shift from an industrial society, in which tangible objects are manufactured, to an information-based society, in which knowledge is gathered and sold. In Japan, Masuda predicted that a combination of computer and communications technology would bring “the increasing emancipation of man from labor for subsistence” (1980, p. 62). More recently, the Telecommunications Council (*denshi tsûshin shingikai*, an advisory group to the Ministry of Posts and Telecommunications) said the NII could address Japan’s problems of an aging population and over-dependence on Tokyo, and shift Japan to an “intellectually creative society” (Telecommunications Council 1994a). Not coincidentally, the creation of an information society would create new economic opportunities in software, services, entertainment and information content, all of which are presently areas of weakness in the Japanese economy.

Of course, anywhere NII plans are being discussed—whether the United States, Japan, Singapore, Korea or Europe—there is an implicit or explicit subtheme of technological competitiveness in computer and communications industries. In Japan, this subtheme is an especially powerful motivator in the 1990s, as Japan’s electronics giants have suffered through a decline in revenues and a collapse in profitability. An additional powerful force behind the recent surge of interest in the NII in Japan has been fear of falling behind the United States in an important economic arena—a concern which became acute with the Clinton administration’s 1993 announcement of its NII strategy. Finally, the emergence of the NII issue in Japan has coincided with the quest for a new mission on the part of key economic ministries, particularly the Ministry of International Trade and Industry (MITI) and the Ministry of Posts and Telecommunications (MPT).

These four issues—creating an information economy, bolstering the electronics industry, reacting to the U.S. challenge, and redefining bureaucratic missions—are the key factors motivating Japan’s drive to develop an NII strategy. The following discussion looks more closely at each of these issues.

### **Jôhō-Ka: Creating the Information Society**

The phrase *jôhō-ka*—usually translated by the quasi-English word “informatization” and denoting change to an information-oriented society—has been a slogan of Japanese government policy for more than two decades, even though the actual effect of the slogan has been minimal. It is generally associated with two threads—the abstract concept of Japan as an information society, and a shift in government industrial policy away from heavy industries in the late 1960s and early 1970s.

In the early 1960s, the phrase “information industry” was popularized by Tadao Umesao, while *jôhō-ka* is credited to Yujiro Hayashi of the Economic Planning Agency in 1967.<sup>8</sup> In 1971, a report of the Industrial Structure Council advocated a transformation of the Japanese economy from traditional heavy industries to “knowledge intensive” ones (Morris-Suzuki 1988, p. 27). The “oil shock” of 1973-

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<sup>8</sup> Ito (1991), referring to Umesao (1963), Hayashi (1969).

74 made salient home the country's vulnerability as a resource-poor industrial nation, and Johnson places MITI's first detailed vision of a "knowledge-intensive industrial structure" at November 1974 (1982, p. 301).

Hiromatsu and Ohira (1991) argue that though this first "information society boom" had little impact in Japan, it was exported to Europe, from which it inspired a similar boom in North America and started a second boom in Japan in the late 1970s and early 1980s. Certainly from the 1980s onward, the shift to an information society was repeatedly cited as a national goal, as in Prime Minister Nakasone's speech opening the Diet in February 1984, and became the subject of various books, articles and television programs (Morris-Suzuki 1988, p. 28).

Since the initial conception of information technologies, the Japanese government has spawned many research and demonstration projects in software and related technologies, including the Fifth Generation Computing Project, Pattern Information Processing System, Sigma (Anchordoguy 1989; Fransman 1990) and the more recent Real World Computing project. But despite the desirability to shift from producing tangible ("hard") to intangible ("soft") goods, Japan has not become a major worldwide supplier of software and other intangible information technology products.

Thus far, Japan's role in the global computer industry has remained primarily in electronic components and peripherals, with a limited role in complete computer systems and a negligible role in software; by one calculation, the size of the information industry increased only from 3.1% to 4.0% of gross domestic product (GDP) in the period 1975-1985 (Hiromatsu and Ohira 1991). Public policy debates on information technology are still dominated by considerations of manufacturing and selling hardware—perhaps because the major electronics *keiretsu* still have far more political influence than smaller software-only firms.

### **Catching up with the United States**

Although elements of what is now considered NII have been discussed in Japan for many years, the rhetoric in the period 1993-1995 seems driven by a "catch up" mentality—the view that Japan is behind in both plans for an information infrastructure, and key technologies such as networking and software.<sup>9</sup>

Such a mentality became one of the periodic fads of the Japanese popular press. A visit to a Tokyo bookstore during this period would turn up several magazines and dozens of popular books devoted exclusively to multimedia, NII and the coming revolution in the information industries. Many examined technological issues, while others examined U.S. policies or explicitly paint an imminent economic rivalry with the United States. Representative is the book cited by Glen Fukushima (1995) entitled *Jôhô Superhighway no Kyôri: Nihon Jôhô Sangyô Kaimetsu no Kiki* ("The Threat of the Superhighway: The Crisis of the Annihilation of the Japanese Information Industry").

In the words of Teruyasu Murakami, a prominent Japanese multimedia expert at the Nomura Research Institute:

Last year [1993], we had a new social infrastructure boom. The argument suddenly erupted around March. The point was [made] that in the Japanese budgeting system, only hardware investments such as construction of bridges or highways or airports are

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<sup>9</sup> This is consistent with Calder's conception of Japan's postwar economic policy as that of a "Reactive State": see (Calder 1988). For a more detailed discussion of catch-up rhetoric in Japan's NII plans and links to Japan's postwar technological development, see West (1996).

the subject of construction bonds. [It was argued] that bonds should be able to fund software development, including communication development.<sup>10</sup>

This argument was made by [those in] politics and industries from mid-1992. Throughout the year 1992 there wasn't any enthusiasm [for it], but in February-March of 1993, suddenly this argument came to the surface in mass communications, TV, newspapers....

Gore's superhighway idea triggered the whole argument about a national information infrastructure in Japan . . . It's a sort of artificial social phenomenon, not driven by Japanese society's national indigenous needs (Interview, August 29, 1994).

Murakami said Japanese politicians and businessmen were very concerned about U.S. NII plans, because policy recommendations from the President's Commission on Industrial Competitiveness (President's Commission 1985) in the U.S. had, in his words, "dramatically changed" U.S. science and technology policy toward Japan. The May 1993 report of a similarly-named industry group (Council on Competitiveness 1993a) raised concerns that this pattern would be repeated, although the latter report received little notice in the U.S. (West 1996).

Similarly, Japanese policymakers intently studying the United States government can recite Vice-President Gore's "Five Points" for any future U.S. NII: 1. encourage private investment; 2. promote competition; 3. quick regulatory response; 4. network access for all information providers; and 5. universal service. These points have gone generally unnoticed in the U.S. popular media or in the high-tech community, and given the complexity of the U.S. policymaking process, were likely to face major revisions even before the 1994 elections brought Republican control of the Congress.

There are three possible explanations for such a Japanese fixation on United States' policy proposals far beyond their actual importance in U.S. policy:

- *Confusion of the External Perspective.* The United States is unusually diverse in both its social composition and the range of opinions that enter the public discourse. It is difficult for an outsider to distinguish between the president's nominal and actual power, the actual influence of industry, or between legislative proposals that are seminal and those that are "dead on arrival."
- *Greater Perceptivity from an External Perspective.* Japan's industry has been credited with taking a longer view than that in the United States, while its press is considered more international in focus. The Japanese may be recognizing merit in U.S. ideas that go unremarked here: so when Kumon (1994) cited Gore's five points, he could be anticipating that they would play a role in policy outside the United States—as happened when they were later proposed as a global goal for the February 1995 meeting on the global information infrastructure held by the Group of Seven (G-7) industrialized countries. (NTIA 1994).
- *External Threat as an Internal Weapon.* It is also possible that the competitive threat of U.S. plans is being used in Japan as a consensus-building tool. It is well understood within Japan that government and industry do better when competing with an external economic rival, because it provides the external pressure necessary to speed up the decision-making process and force things to a conclusion. A crisis of competitiveness—real or imagined—has moved the Japanese closer to an information revolution in the last two years than anything in the preceding twenty.

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<sup>10</sup> It should be noted that construction bonds do not count against the national government's requirement to balance the budget, i.e., they can be used to pay for deficit spending (Lincoln 1988, p. 74), thus overcoming one potential objection from the powerful Ministry of Finance.

Samuels (1994) notes that such Japanese desires to catch up to Western technology have driven national policy for the past 150 years, while West (1996) argues that since the 1980's, such "competitiveness" concerns have provided a positive-feedback loop between technology policies of Japan and the United States.

A few (mainly in the United States) have suggested that Japan lacks the creativity or other elements necessary for technological leadership, and thus needs to have a model to emulate. According to John Stern, then Vice-President for Asian Affairs of the American Electronics Association, "The Japanese catch up better than they lead. . . . This is a nation that got rich following the tailights of America" (Interview, September 1, 1994).<sup>11</sup> But despite the "catch-up" rhetoric, there is little sense among Japan's business and government leaders that the country is irretrievably behind. They face a number of problem areas in their NII plans, but, according to telecommunications executive Teiichi Aruga, "If these issues are resolved, playing rapid catch-up is Japan's forte." One of these issues, Aruga notes (1994), is the emphasis in existing NII tests and discussions on producer rather than, user motivations.

Since that time, Japanese strengths and American weaknesses have been more openly voiced. For example, a Kobe University professor (Seki 1995) published a lengthy (if often inaccurate) critique, entitled "Piecemeal nature putting potholes in the U.S. info highway," criticizing competition between cable TV and regional telephone companies in the United States and questioning the value of PC-savvy executives. Such outward criticism may be intended to rebuild Japanese self-confidence after excesses of catch-up rhetoric, or it may be intended to focus Japanese energies on building within the country, rather than constantly watching outside.

### **Producer Motivations: Reviving Japan's Electronics Industry**

Much of the debate about the Japanese NII has been framed around the potential revenues and jobs it would generate for many of Japan's electronics industries by incubating a domestic market base for future exports. Such a concept is not new, of course, but instead has been the underlying rationale for Japanese high-tech industrial policy throughout the past 35 years.

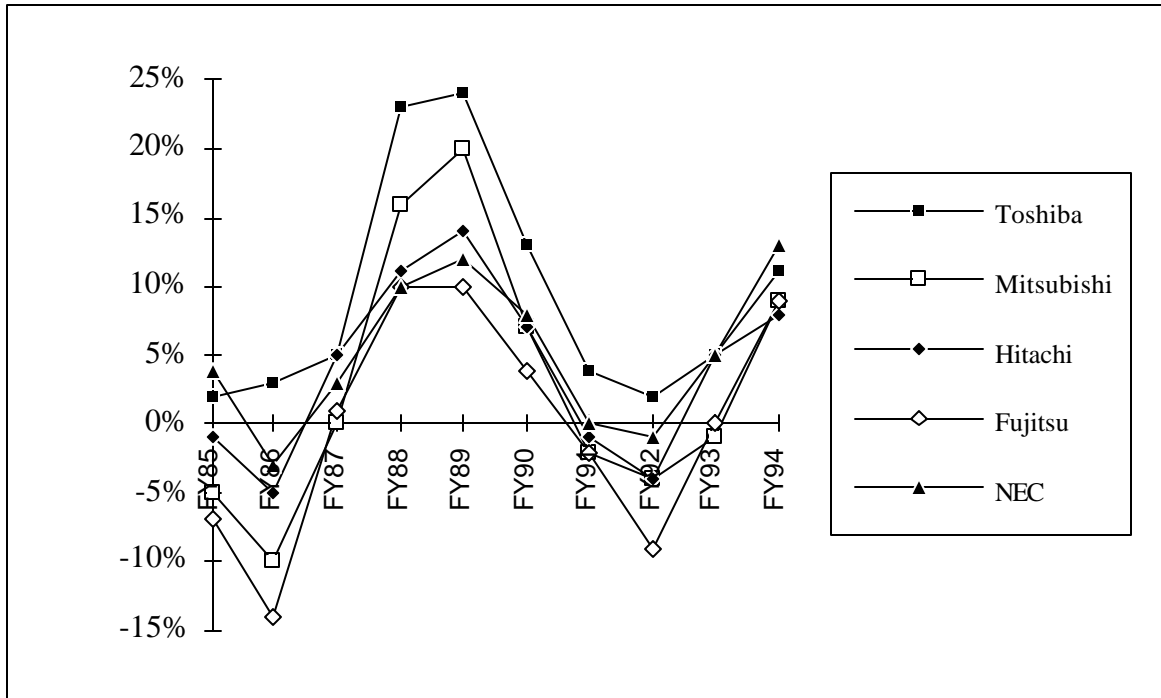
What was new during the 1993-1994 period was the unaccustomed difficulties faced by various Japanese industries, which were pinched since the bursting of the "bubble economy" led to recession and an end to four decades of almost uninterrupted economic growth. Adding to weak domestic demand, exports of Japanese-made goods were threatened by continuing *endaka*, or the strong yen. This meant that large Japanese electronics firms were cutting back production in the home islands, moving manufacturing to China and Southeast Asia and searching desperately for new products to manufacture in Japan to sustain both the health of their companies and, by providing jobs, their standing in Japanese political debates.

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<sup>11</sup> The view that Japanese are not innovative is not universally shared, even among Americans. The work of two Hitotsubashi University professors (Nonaka and Takeuchi 1995) became a successful business book in the U.S. by purporting to offer the secrets of Japanese innovation.



**Figure 1. Profits of Japan's Top Five Electronics Companies**



Source: Nomura Research Institute

It is no coincidence that the “catch up” panic came in 1993, in the middle of a 10% two-year decline in Japan’s industrial production and a slump in the profits of major electronics firms (Figure 1). Advocates of NII investment have used job creation as a justification: take the oft-cited report by the MPT’s Telecommunications Council, which includes a table that explicitly equates NII with jobs [emphasis in the original]:

<b>Multimedia Markets</b>	
(annual revenues in 2010)	
New markets related to the fiber-optic network	¥56 trillion
Existing multimedia markets	¥67 trillion
<b>Total</b>	<b>¥123 trillion</b>
<b>Jobs created through the construction of the fiber-optic network</b>	
Approximately <b>2.43 million</b>	

Source: Telecommunications Council 1994c, p. 14

As Stern (1994) noted, however, this employment figure would constitute a greater percentage of the labor force than the present-day auto and consumer electronics industries—combined.

Such an emphasis on domestic job creation is consistent with Japan’s postwar economic policies, but sustaining this attitude into the 1990s could potentially cause two sources of trade friction. For advanced electronics products, Japanese industries are at par with U.S. rivals in several key technologies: Anderson (1995) notes that NTT considers Japanese industry ahead of the U.S. in several hardware technologies such as Asynchronous Transfer Mode (ATM) telecommunications switches, but lagging in other areas such as software. The implication that all the jobs created by Japan’s NII will be

Japanese suggests a continuing policy of favoring Japanese products over imports—which would, in turn, would create new sources of potential trade friction with the United States.

At the low end, both Japan and the United States are at an economic disadvantage compared to low-cost producers in the rest of East Asia, so it is natural to assume that (absent explicit governmental policy) many of the jobs involved in manufacturing mass-market consumer electronics products will be created in other East Asian nations, and not in Japan. As the wealthiest country in East Asia, Japan's potential for political leadership in the region lies in using that wealth to promote regional economic growth. Some Asian specialists believe to continue economic growth in the region, Japan must act as a consumer market for manufactured exports from other Asian countries, the way the United States has for decades. Such a step would also improve the quality of life of Japanese consumers. But the tone of the NII debate shows that any shift from a producer-driven economy to a consumer-driven economy has yet to begin.

### **THE VISION: AN INFORMATION/COMMUNICATIONS-BASED ECONOMY**

Japan's vision of the NII was continuously evolving during the period 1993, with different versions coming from various players such as MPT, NTT and MITI. The most influential government document in starting the debate was MPT's 1994 document "Reforms Toward the Intellectually Creative Society of the 21st Century." NTT's NII vision is spelled out in the 1994 publication "NTT's Basic Concept and Current Activities for the Coming Multimedia Age." In addition the Management Coordination Agency of the Prime Minister's office has published a plan for government computerization (MCA 1994), and think tanks such as the Nomura Research Institute have developed their own visions of Japan's NII (see Murakami 1993).

The term *jōhō tsūshin* ("information/communications") is the focal point of both MPT's and NTT's NII visions. MPT (Telecommunications Council 1994b) speaks of a transition from the existing socioeconomic system to a different system founded on a new paradigm. That new paradigm is defined as an "intellectually creative society based on info-communications." Likewise, NTT (1994) argues that "the information communications industry contributes to the enrichment of people's lives and the activation of industry activities." Each of the visions emphasizes the role of the NII in promoting future economic growth and enriching the lives of citizens.

While the notions of realizing a comfortable lifestyle and promoting mutual understanding are emphasized in MPT's vision, those goals have been reiterated in various government visions for two decades. Why then has NII suddenly taken on such urgency in the past few years? Al Gore might be a proximate cause, but a more fundamental issue is revealed in the MPT report.

The international competitive environment is changing in step with the progress of yen appreciation and the growth of the newly industrializing countries, and Japan is increasingly shifting its production facilities overseas, especially in the manufacturing industries where competitiveness has been declining... (T)he shift of production overseas is continuing at a fast pace, giving rise to fears of a hollowing-out of industry. For this reason, too, it is imperative that Japan switch to a new highly productive framework for industry and employment, a framework centered on areas with high intellectual added value (Telecommunications Council 1994b, p. 2).

As this paragraph illustrates, NII in Japan is primarily a response to the declining competitiveness of Japanese industry. Building the NII would respond to the challenges of *endaka* and hollowing-out in two critical ways. First, it would create new economic activities to replace activities that will inevitably continue to move offshore in response to *endaka*. The new activities would include production of intellectual property, such as software, information content, entertainment and information services.

They would also include production of new multimedia and telecommunications equipment in which Japan could leverage its existing strengths in hardware technology to create a competitive advantage.

Second, the creation of an advanced national information infrastructure would help make existing industries more productive and competitive through the application of network technologies within and among corporations. A specific concern expressed in Japan is that the U.S. NII will give American companies a competitive advantage, and it is clearly expected that Japanese companies need access to a comparable infrastructure to compete.

The elements of Japan's NII visions focused on creating an information/communications-based economy, and the benefits expected to spring from such an effort. They include: producing new multimedia products and services; installing a nationwide broadband, fiber-optic telecommunications infrastructure; creating hardware products that can be manufactured domestically; developing software capabilities; and improving productivity of the economy through application of information and communications technologies.

## **Multimedia**

Multimedia—the anticipated convergence of audio, video and computing technologies—has been the great anticipated growth market for Japan's electronics companies for many years. They have developed both new products, such as Sony's handheld Data Discman and Fujitsu's home PC series FM Towns, and promoted existing products such as CD-ROMs and even *karaoke* as part of an anticipated "multimedia revolution."

While touting multimedia as a potentially huge industry, the Telecommunications Council report remains vague on its definition of multimedia. New multimedia markets are defined as those "newly created by program distribution, production of terminal devices, network operations and others related to the development of the fiber-optic network." Existing markets expected to expand by 67 trillion yen include "video equipment, telecommunications equipment, computers and video software." In effect, the report is including the entire electronics and telecommunications industry under the term "multimedia." There is no estimate of the growth of those industries in the absence of a universal fiber-optic network, hence no true estimation of the additional value to be produced by building such a network, just the assertion that building the network will create 123 trillion yen in economic activity and more than 2 million new jobs.

Regardless of how vaguely the term "multimedia" is defined (and those hyping multimedia in the United States and elsewhere are not much more precise), it is clear that the NII vision in Japan is based on the belief that multimedia will be a tremendous driver of economic growth in coming years. Multimedia is expected to revive the stagnant consumer electronics industry by linking it to computing and telecommunications and giving Japan's electronics companies a new edge over their Asian competitors. It is also expected to enable Japan to make inroads in the entertainment and software industries, where Japanese companies have been unable to challenge the dominance of Hollywood, Silicon Valley and Redmond.

## **Broadband, Fiber-Optic Communications Infrastructure**

The link from multimedia to an information infrastructure is straightforward. Only multimedia content—home movies (video on demand), interactive video games, interactive education, business videoconferencing, and so on—requires the bandwidth to justify a nationwide digital telecommunications network supplanting the existing telephone network. Such a network is the cornerstone of the plans of Japan (and other nations) for an "information society" in which information is conveyed digitally between citizens, business and government, rather than via mail, fax, telephone or television.

Japan's NII plans stated that this multimedia system will be delivered via a fiber-optic network. In the United States, corresponding plans called for a hybrid of fiber optics, coaxial cable, enhanced copper wire and wireless. Coaxial cable TV lines serve the vast majority of U.S. homes and have the capacity to provide high-bandwidth transmission. In Japan, expensive, tightly-regulated cable TV has not caught on, available to only 22% of all TV households and subscribed to by a mere 5% (Yamazaki 1994). So Japan's initial NII visions called for building a pure fiber-optic network.

In 1994, NTT announced plans to wire every Japanese household with fiber optics by 2015. But then MPT announced a target date of 2010, so NTT changed its projections to 2010 as well. Today, many officials and observers privately say fiber-to-the-home will not happen by 2010, both because of cost and because there is no clear demand on the part of users for such high-speed service to the home.<sup>12</sup> However, there is still a clear emphasis on building the infrastructure as a means of stimulating demand, rather than waiting for demand to drive investment in the infrastructure.

### **New Hardware Opportunities**

The NII is seen as a means to stimulate domestic demand for computer hardware, consumer electronics and communications equipment. Some of the major categories of hardware include PCs and peripherals, set-top boxes, semiconductors, high-definition TV (HDTV), handheld personal digital assistants (PDAs), video servers, fiber-optic cable and digital switching equipment. Some of this demand, particularly for telecommunications equipment, will come from the actual construction of the NII. Demand for products such as computers, HDTV, video servers, PDAs and various consumer devices would be driven by the availability of multimedia content over the NII.

In addition, the creation of domestic markets for such products is expected to support exports. Japan's large, sophisticated domestic market for consumer electronics is credited with supporting exports of TVs, VCRs, video games, Walkman radios and numerous other devices. By contrast, Japan's slow adoption of PCs is one reason for the lack of export success in that industry. By stimulating domestic demand for multimedia hardware, it is hoped that new products will be developed for export and profits from the domestic market will support an export drive. Such a strategy is based on the earlier successes of Japan's automobile and consumer electronics industries, but also reflects the pattern followed by the U.S. PC industry. This aspect of the NII is not discussed as directly in the various NII visions, but given the strong concern over *endaka* and hollowing-out, there is no doubt as to the perceived need to develop new export opportunities for Japan's manufacturers.

### **Developing Software and Services Capabilities**

Software and services are the fastest growing segments of the information technology industry worldwide and still offer better profit opportunities than most of the brutally competitive hardware industry. Japan has tried for decades to catch up in software, through a number of government R&D programs as well as corporate efforts, but if anything, has continued to fall further behind the U.S. industry.

Japan's software industry lags far behind that of the United States in almost every key dimension. In applications software, eight of the ten largest firms are American, while only one is Japanese. For systems software, seven are U.S. firms and none are Japanese (Office of Industries, U.S. International

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<sup>12</sup> Of course, if enhanced copper wiring technologies such as ADSL (Asynchronous Digital Subscriber Line) are successful, this would solve the problems faced by both Japan and the U.S. regarding increased bandwidth at a reasonable cost. It would also obviate the need for Japan to build fiber-to-the-home and also its disadvantage due to low cable penetration.

Trade Commission 1995). Japanese software companies have almost no presence outside their domestic market. They continue to focus on custom programming, while the global market is shifting rapidly to packaged applications. Most importantly, virtually every key software architecture is controlled by U.S. companies.<sup>13</sup> The only important exception is video game software, which runs on architectures controlled by Nintendo and Sega. Even the Japanese domestic market for packaged software is dominated by U.S. applications, and IBM's DOS-V and Microsoft Windows are unifying the formerly fragmented PC applications market.<sup>14</sup> The Japanese market is still relatively small for information services, such as systems integration, outsourcing, online services and network services. Japanese companies have failed to compete outside the domestic market for such services, and are beginning to face foreign competition in their home market.

The other essential "soft" component of a multimedia future is content. Such an imperative motivated the purchase of Hollywood properties (MCA, Columbia Pictures, Columbia Records) by Japanese electronics companies, since Japanese-produced entertainment exports are largely confined to video games, karaoke and animation. The anticipated synergies between "hard" and "soft" goods have not been realized, and one of the major acquisitions, MCA, has since been sold by Matsushita to a Canadian owner. Meanwhile, Japanese firms such as Sony have experimented with U.S.-based new media subsidiaries and joint ventures, but, in the end, the predominant share of the world's entertainment content still comes from the United States

The NII offers new opportunities for Japan in software and services. Multimedia and interactive markets are still in their infancy, and new kinds of content and entertainment are sure to be developed. As new markets develop, it is believed that opportunities will be created for Japanese companies to develop their capabilities in software, services and content and challenge the present U.S. dominance in those areas. Even if U.S. firms set the standards, such standards provide a well-defined target that will play to Japan's forte: manufacturing high-quality complex products that conform to those standards (West 1995).

### **NII as a Productivity Tool for Government and Industry**

One possible role for the NII is as a tool for increasing productivity in government and industry. For the post-"bubble" industries, economists and other analysts have pointed to the poor productivity of Japan's white collar work force (compared to other industrialized nations) as one of the problems that needs to be addressed to aid in economic recovery (Yamakoshi 1995). Greater use of information technologies, such as PCs, e-mail and groupware are among the technological fixes that have been proposed to increase such productivity.

Government information systems have also lagged behind those of other leading industrial powers. Murakami (1993) argues that the Japanese bureaucrats have computerized each ministry separately, rather than coordinating and integrating work between ministries. He proposed an interministerial network based on a system of common document interchange formats that would also be connected to local governments and private users. Such a system could be expected to reduce and rationalize administrative tasks, reduce the use of paper (and thus office space), improve information sharing between various levels of government, and improve decision-making. Also, by computerizing this

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<sup>13</sup> This includes DOS-Windows (Microsoft), Macintosh (Apple), UNIX (various versions from IBM, Hewlett-Packard, Sun and DEC), Netware (Novell) and IBM's mainframe operating system.

<sup>14</sup> For more detailed analysis of the troubles of the Japanese software industry, see Cottrell (1994), Baba, et al. (1995), Nakahara (1993), and Dedrick and Kraemer (1995).

information, the government's information could be more readily accessible as an information asset for all of Japanese society.

## **NII PLANS AND INITIATIVES**

Japan's bureaucratic elites, particularly at MITI, have been credited with engineering the postwar economic miracle that turned Japan into a manufacturing powerhouse and the world's second largest economy. However, the 1990s found MITI a victim of its own success: Japan's manufacturers no longer needed MITI's protection and increasingly ignored its guidance, while few of the later technology development projects (e.g., Sigma, Fifth Generation Computing Systems Project) had produced any commercially successful technologies.

So it is not surprising that MITI was ready to jump at an opportunity such as the NII, which promises to remake Japan's industrial structure. But NII is largely a telecommunications issue, and as such falls within the purview of the previously second-tier MPT. MPT sees the NII as an opportunity to further expand its influence and achieve the status of an economic pilot agency, comparable to the Ministry of Finance (MOF) and MITI.

The jockeying for influence was not limited to MITI and MPT. The NII is seen by many in the bureaucracy as an opportunity to expand their influence and create a new, attractive mission for their ministry or agency. This creates bureaucratic rivalries that have slowed the development of a coherent NII strategy, manifested by various competing ministerial plans. Participants in NII conferences are treated to a parade of representatives from Japanese ministries, always including MITI and MPT but often featuring the Science and Technology Agency and other groups; even the national broadcaster NHK offered its own vision (Latzer 1995). Each speaker presents a "Vision of a Multimedia Society" that differs more in who is presenting it in than in the details of how the vision would be implemented.

### **MPT**

Like other national ministries, MPT develops its policies with the help of various permanent and *ad hoc* advisory groups known as *shingikai*, which consist largely of business and academic leaders. Such groups examine ministerial proposals and develop plans that reflect the desires of the constituencies represented on the panel, and that will also be supported by those constituencies once their report is released (Fukunga 1995).

So the influential Telecommunications Council (1994a) report in May 1994 came from a 21-member panel that included the chairman of both Hitachi and Nikkei (Japan's leading financial publisher), as well as four professors and a vice president of *Rengô*, the leading labor union; its communications policy committee was headed by the chairman of Daiwa Bank's affiliated research institute. The origins of the report, its distribution,<sup>15</sup> and its content all contributed to it being the most often quoted of the competing "visions" developed at this time.

The report emphasizes Japan's economic challenges for the 21st century, and argues that information communications can both facilitate the nation's decentralization and help develop Japan's creativity. The latter goal would be obtained through the informatization of education, medical care and government services, achieved through development of application databases and applications.

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<sup>15</sup> The report was printed in both Japanese and English, as well as in a widely-distributed ten-page summary. The rapid availability of the English summary contributed to its heavy use outside Japan, as did its publication (in both languages) on the World Wide Web once MPT established a web site later in 1994.

The two most-often quoted figures from the report are the aforementioned estimated annual size of multimedia-related markets (¥123 trillion) and the new jobs created (2.43 million). Less often quoted are the estimated implementation costs that range from ¥33 to ¥53 trillion, plus ¥42 trillion for underground wiring.

The fiber-optic network would be rolled out in three five year phases culminating in 2010. The first phase would emphasize the center city of prefectural capitals, the second would include all cities with a population of at least 100,000, and the final phase would extend to cover 100% of the nation. The first phase would also connect schools, hospital libraries and other public institutions, with the development of public applications. Since such application development is essential to take advantage of the hardware infrastructure, the MPT vision argues that the public sector must lead the development and trial deployment of such applications so that they can be put to practical use by the year 2000.

The report recommends interest-free loans and tax incentives to fund private development of the fiber-optic network. Local governments should also encourage replacing overhead cables with underground ones, as well as facilitating right-of-way for both underground and above-ground lines.<sup>16</sup> To implement the necessary services, regulatory reforms should encourage the expected convergence of broadcasting and telecommunications, while considering a fiber-optic version of universal service.

Finally, the report anticipates the development of systems and standards as the basis for the Japanese NII, arguing for new standards from Japanese trade associations as well as cooperation on international networks with the International Telecommunications Union (ITU).

## **MITI**

MITI's (1994) proposal for an "advanced information infrastructure" has similar goals to the MPT report. Noting the limited use of information technologies by public agencies, it emphasizes five priority areas: education, research, medical/social services, government administration and libraries. It outlines specific plans in each of these areas for linking government agencies, private homes and creating online databases to support these goals.

As with the MPT report, it notes the need for new standards for the information infrastructure, and also measures to facilitate the use of copyrighted material in new multimedia software. Such software is a major priority of the MITI report, which advocates the creation of various multimedia information centers (for creating content) and various programs and reforms to improve the software development capabilities of Japanese industries.

MITI is focusing on applications for the NII, not on creating the communications infrastructure itself, which is clearly MPT's turf. MITI sought the support of other ministries for its NII plan by including them as partners who would receive funding for their own NII applications. MITI's role was to be catalyst, coordinator and project manager. This was an attempt to carve out its own niche and enlist other parts of the government bureaucracy in support of its plan (Interviews with MITI officials, October 1995).

## **NTT**

The quasi-private Nippon Telegraph and Telephone is active in the NII debate in Japan, and its views are taken very seriously for two reasons. First, even if it should lose its national monopoly on local service, NTT will be the central player in the implementation of a Japanese NII. Second, NTT has a large telecom R&D budget: for fiscal 1993, this amounted to ¥288 billion as compared to ¥35 billion

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<sup>16</sup> The net effect of such right-of-way policies would assist the development of rivals to NTT's network, since NTT already has a national right-of-way network.

for MPT (MPT data). NTT's R&D and procurement have historically played major roles in the competitiveness of Japanese industry, not only in telecommunications, but also in computers and semiconductors (Anchordoguy 1989, pp. 39-42, 138-140).

Continuing such research is a major part of NTT's own vision, which would include digital packet-switching, high-speed transmission, low-priced optics, image encoding and voice/character recognition and translation technologies (NTT 1994).

The NTT plan outlines the various services the firm intends to offer, but at the same time advocates government assistance as essential for the development of the information infrastructure. As with the other reports, it lists software and content as areas where Japan lags the United States, using comparisons between the two countries such as the number of online databases and even dubious comparisons such as the number of universities offering degrees in TV/motion picture production.

## **THE REALITY: NII IN THE JAPANESE CONTEXT**

### **Government vs. Private Roles**

Despite the perceived importance of such networks, the up-front costs are such that few consumer-oriented systems will be self-supporting in the foreseeable future. As Egan (1991) explains:

Broadband telecommunication poses a very difficult "chicken and egg" problem for society...First there are the "high-tech" supply-side economists, who claim that we should immediately adopt and deploy new digital fiber-optic and radio technologies, based on the assumption that consumers will find new applications for them. Then there are demand-side economists, who claim that until there is a demand driver, we should not spend money on new technology for fear that we may create an expensive solution for which there is no corresponding problem (p. ix).

But under Egan's bifurcation, few examples of pure demand-side approaches can be found among early adopters of NII technology: the current approach in many technologically advanced nations (including Japan, Singapore and the United States) is supply-side. For our purposes, a more useful distinction may be drawn over the center of policy leadership, corresponding to Zysman's (1983) distinction between government (state) and business leadership of industrial development.

How much of a government role is appropriate (or necessary) in developing an NII? As the "info highway" metaphor suggests, an NII fits the classical definition of a public good—something whose benefit is spread throughout society. This would imply a government-dominant model of encouraging telecommunications development. Dutton, et al., note that an assumption that "telecommunications are a public utility rather than a private commodity" (1987, p. 22) is common to "wired cities" plans dating back to the 1960s. To emphasize the importance of the public nature of telecommunications, U.S. Vice President Gore (1993) cited the Titanic disaster as an example where the profit-making nature of radio communications caused messages to go unreceived which could have prevented the collision or speeded up rescue operations.

On the other hand, every developed or developing nation has one or more telecommunications companies, with heavy investment in wiring, right-of-way, switching facilities and staff. These companies must either play a key role in a digital communications network or eventually go out of business, obviously an option few telecom executives are considering. Similarly, many countries have cable television companies delivering broadcast (one-to-many) video service that would also be supplanted by interactive (two-way) video carried on an NII.

Such communications service companies see both an opportunity and a threat in plans for an NII. Most are working hard to earn a role in the government's plans. At the same time, many companies are



also working to preempt government leadership, by launching pilot projects to demonstrate that an NII can be built without state intervention.

One key issue is the risk (for either government or industry) in building a national system before the technology and its uses are well-defined. As a U.S. industry group noted, “it is impossible to predict accurately the future path of the market for technology” (Council on Competitiveness 1993b, p. iv).

Even government-led systems assume a role for private funding, since few governments have the billions of dollars required to wire geographically remote locations door-to-door. In these cases, government funding may be limited to seed projects, with regulatory powers used to direct private funding through incentives (increased rate of return) or coercion (mandated universal service). Of course, where the telecom or cable companies are completely or partially nationalized, the distinction between government and industry leadership becomes one of national budgeting and intra-governmental power struggles, as can be seen in Japan.

At this point, it seems that the Japanese government has decided to concentrate on the twin roles of regulator and promoter, while allowing the private sector to build the infrastructure and develop commercial products. This division of labor is not so different from that in the United States, although the form it takes is different. The Japanese ministries play a larger role as both regulator (MPT) and promoter (MPT, MITI and others), while the U.S. system is more diffuse, with important roles played by Congress, the bureaucracy, the courts, and state and local governments.

### **Supply-driven vs. Demand-driven**

The consumer has been noticeably absent from the NII debate in Japan. The assumption seems to be “if we build it, they (the consumers) will come,” and the talk is almost exclusively of the economic benefits accruing to the producers, the influence gained by Japanese ministries and so on, rather than of any demonstrable consumer demand. This is far from the standard view of the “marketing concept” which focuses on customer needs (for a comprehensive review, see Kohli and Jaworski 1990).

Of course, nominal consumer desires are postulated, with video-on-demand and long-distance medical imaging being the ubiquitous examples. But these are prototypical needs, placeholders used to advance the discussion of the technology until a real reason can be found. Market tests—both in the 1980s and more recently—have been failures (Kageki 1994), but plans are proceeding ahead anyway, despite a notable lack of consumer enthusiasm (Sato 1994).

This problem is not unique to the Japanese debate. In the United States, Iacono and Kling (1995) argue that “technological utopianism” has been used to sell the NII concept, and Kling adds that the same Information Infrastructure Task Force reports closely studied by the Japanese were seriously flawed:

They were superficial in particular points, particularly in failing to examine why some of these experiments had not expanded and why some of them were not widely adopted.

It was simply assumed that new information technologies would be the catalyst for expansion (Interview, May 24, 1995).<sup>17</sup>

Instead of consumer uses, King and Kraemer (1995) predict near-term market demand will center on businesses even though public rhetoric has centered on servicing individual consumers. Moreover, they argue that firms will be merely taking away each others markets rather than creating new markets.

Such an approach is symptomatic of technology-driven rather than market-driven thinking. The sharing of chest X-rays with specialists 200 kilometers away could be done by extending existing high-

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<sup>17</sup> West (1996) argues that such utopianism could also be seen in plans for picturephones, personal digital assistants, wired cities and telecommuting.

speed trunk lines to a few hundred hospitals, without the expense of building the information superhighway to the front door of more than 60 million households and firms.<sup>18</sup> And postulating an interest in video-on-demand ignores the ready availability of an established, much lower-tech alternative: the corner video store. (The presumed advantages of video-on-demand over the corner video store include availability but not price: forecasts all assume consumers will pay significantly more for the marginal convenience.) Such an absence of market-driven thinking does not bode well for the huge unanswered question of the NII: the cost of wiring each of those 60 million sites by the target date of 2010.

Beyond the technological impacts, a few Japanese have also considered the potential social impact of an NII. Kumon, the executive director of the Tokyo-based Center for Global Communications, predicted that in addition to spawning a “third industrial revolution” (a phrase he attributes to George Gilder), the developing information infrastructure will also spawn a social revolution, creating a new class of network-aware citizens, or “netizens”:<sup>19</sup>

Just as during the 17th, 18th, and 19th centuries bourgeois citizens wanted to take part in their societies, [netizens] will demand something different from mass democracy in the 20th century. They will demand a freedom of informational activities—just as the original bourgeoisie demanded freedom of business activities as against the chartered monopolies of their time. . . .

The netizens want to have much greater freedom in terms of sending out information and having access to information. . . . Today, broadcasting is monopolized, chartered to a chosen few of society. Netizens are demanding that anyone should have access (Interview, August 30, 1994).

Meanwhile, Sawa (1994) of Kyoto University argues that “the multimedia-oriented information society will succeed only when individualism is respected” and predicted failure for MPT plans unless education and other social reforms are made.

While precursors to today’s NII have been discussed since *jôhō-ka* came into fashion in the early 1970s, such social revolutions do not appear to be among the stated goals of big business and the bureaucracy, which have been leading the NII debate. And few participating in the NII debate (including Kumon) expect the outcome of NII will be the transformation of Japan into a “consumer economy,” as is so often postulated by American economists.

### **Bureaucratic Rivalry**

Given the central role of the Japanese bureaucracy in the nation’s economic miracle over the past 50 years, it is not surprising that business and the media eagerly await each new glimpse into the plans of the unelected officialdom. But despite its spectacular successes with Japan’s auto and electronics industries, and efforts to assert leadership (see MITI 1994), MITI seems consigned to play a consultative—if not subordinate—role in developing Japan’s digital communications industries.

MITI’s problem is, in fact, summed up by two words, “digital” and “communications.” Regulation of industries in digital technology (i.e., computers) is under MITI’s authority—except when they involve communications, which are governed by MPT. As Murakami put it “In the past, industrial policy was masterminded by MITI. Now you have to think about the Ministry of Post and Telecommunications”

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<sup>18</sup> The Telecommunications Council Report (1994c: 27) projects 54 million households and 7 businesses in the year 2010.

<sup>19</sup> The “netizen” term has already been expropriated in the United States by *Wired* magazine for its series on the 1996 campaign.

(Interview, August 29, 1994). MITI's emphasis on developing "multimedia software" (software being a traditional MITI purview) is one way to assure a continuing role in the debate.

In addition to MITI and MPT, other ministries and agencies have offered their "visions" of an information society, each competing for support from public and private opinion leaders<sup>20</sup>. Similarly, various ministries have demonstration projects for the city of the future: MITI calls them "new media communities," whereas MPT sponsors "teletopias," and the Ministry of Agriculture has its own "greentopias".<sup>21</sup>

Various ministries also sponsor competing private or quasi-private nationwide fiber-optic communications networks. As noted earlier, MPT has mixed relations with the one-time government agency NTT. Among the three new common carriers (NCC's) that are NTT's long-distance competitors, MPT favors DDI (Daini Denden Inc., or "second phone company"), co-founded by a former NTT executive,<sup>22</sup> the Ministry of Construction favors Teleway, whose lines are buried alongside of the ministry's national highways, and the Ministry of Transportation has backed Japan Telecom, a spin-off of Japan Railways, which built its fiber-optic lines along JR tracks—much as Sprint used the track of the Southern Pacific Railroad in the United States. Meanwhile, MITI favors various regional carriers tied to MITI-regulated electric power companies, such as Tokyo Electric Power (TEPCO) affiliate TNet.<sup>23</sup> Even the Ministry of Health got into the picture with a three-year pilot project to lay fiber-optic cables through water pipes ("Optical-Fiber Study" 1995).

Such diffusion of interests has its price. As several authors (see for example Watanabe 1994; Yamanashi 1995) have noted, many Japanese feel that these turf wars jeopardize the nation's multimedia future. Nonetheless, the jockeying for influence—primarily the rivalry between MITI and MPT—permeates the NII debate. The recent clash between these two ministries has reopened the "VAN wars" of the early 1980s, in which they fought for jurisdiction over Value-Added-Networks that provide online information and digital communication services, the forerunner of today's content providers and commercial Internet service providers.

In 1981, MPT proposed tough regulations for the new VAN providers, which, Johnson (1989) argues, was successfully opposed by MITI on grounds that it regulated both computer-based communications and also international trade. In 1982, regulation of many small and medium-sized VANs was liberalized, but MPT's revised 1983 proposal sought to tightly regulate large service providers, banning foreign ownership of both telecommunications systems owners (such as long-distance carriers) and those VAN companies that provided international service. Aided by the *Keidanren*, Japan's most powerful business association, MPT won Diet approval in 1984 for digital telecom regulation—but with less control over foreign entrants—and the net result was a liberalization of

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<sup>20</sup> For a generalized typology of bureaucratic rivalry in the Japanese government, see Campbell (1984).

<sup>21</sup> So, for example, the MPT vision makes a priority of wiring "teletopia cities" by 2000, but no mention is made of MITI's "new media communities" (Telecommunications Council 1994a, p. 49).

<sup>22</sup> Unlike Teleway and Japan Telecom, DDI lacked a development partner to provide a ready-made right-of-way for fiber-optic cables, so DDI is more dependent than NTT and the other NCC's on microwave relay transmissions—which proved to be an advantage in the January 1995 Hanshin earthquake (Kageki 1995).

<sup>23</sup> In May 1996, three of these companies announced plans to link their regional networks to form, in effect, a fourth NCC rival to NTT's long-distance service, although the initial emphasis would be on providing leased-lines to business customers.

the VANs to permit competition for NTT (Yamada 1992). However, several scholars (Johnson 1989; Vogel 1996) argue that it also led to a net increase in the regulatory power of MPT.

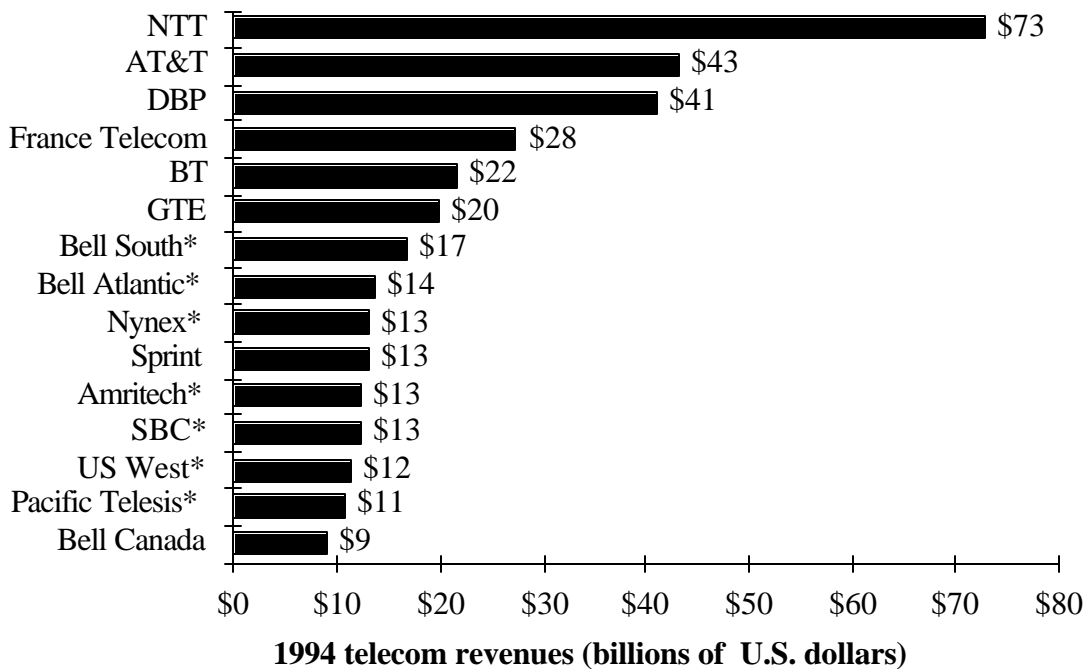
As in the earlier turf battle, MPT is again holding the high cards. In the final analysis, it is hard to see how a national information infrastructure that replaces analog voice circuits to each home with digital data circuits could be considered anything but a telecommunications, and thus MPT, affair. If it wins major control, MPT will guide both the nature of the network itself, as well as the specifications for the equipment to be manufactured for use in homes, offices and switching stations throughout the nation. For this reason, reports from MPT and its allies, such as the Telecommunications Council, offer the clearest glimpse into the future of Japan's NII.

Despite liberalization, MPT's continuing bias toward regulation will continue to impede the diffusion of network services. For example, as a legacy of the 1981-1984 VAN wars, MPT requires a Special Type II license for those VAN resellers who provide international service, but an easier Type II license for domestic-only VANs. This meant that, according to NTT figures, only about 70% of the Internet sites in Japan in May 1994 were licensed for international e-mail (Goto 1994); since one e-mail addressing system is used worldwide, the distinction is primarily a regulatory one rather than a technical one. A VAN provider can apply for a domestic license and provide international service (as happened in 1993), but that firm risks losing access to all circuits from an MPT-regulated carrier if MPT discovers the subterfuge. By contrast, no state or federal permits are required to provide worldwide e-mail services in the United States, and by mid-1993, service providers began to sprout up weekly.

### **NTT's Central Role and Disputed Future**

NTT is the world's largest telecommunications company (Figure 2) and is central to any Japanese plans for an NII: as noted earlier, all early NII plans assumed that NTT will be building the information infrastructure to the consumer's door. NTT was a government corporation until 1985, when it lost its monopoly on long-distance service, was officially spun off as a "private" company and MPT acquired responsibility for regulating it. Even after stock sales from 1986 to 1989, the Ministry of Finance still holds about two-thirds of the shares of NTT; with ongoing MPT influence, NTT has become at best a quasi-private corporation.

**Figure 2: Telecommunications Carriers in Japan, United States, Germany, France, United Kingdom and Canada**



\* Regional Bell Operating Company, i.e., U.S. “Baby Bell”

Source: MPT (1995)

After this 1985 “privatization,” the question of encouraging further competition for NTT—by breaking it up à la AT&T’s 1982 spin-off of the “Baby Bells”—was postponed. Complete privatization has also been on hold since the collapse of the stock market, because MOF has not wanted to sell shares in the face of declining prices. The NTT privatization law scheduled a first review of NTT’s status for 1990, when MPT hoped it could win support for breakup; those hopes went unrealized (Vogel 1996). However, with the prospect of an expanded information infrastructure, and ongoing market power of NTT to crowd out smaller rivals, MPT and the NCCs renewed their push to break up NTT; the first salvo in the new battle came with an MPT (1995) report documenting NTT’s market concentration (Table 2).

**Table 2: NTT's share of domestic telecommunications segments**

<u>Market</u>	<u>Share</u>	<u>Revenues</u>
Telephone service	93.3%	¥ 4,865 billion
Leased circuits	82.8%	574
Cellular phone†	60.7	873
Paging†	61.8	273

† Service by NTT DoCoMo affiliate

All revenues for fiscal year ending March 31, 1994

Source: MPT (1995)

This battle over NTT's future has been waged in the court of public opinion, gaining strength in 1995. MPT argued that breaking up NTT would create a dynamic telecommunications market, with competition leading to lower prices and new services. NTT responded that competition is now international, and that it should be allowed to stay intact to compete in international markets. NTT also argues that a breakup would damage network coherence. Finally, NTT argued that its R&D labs are a national resource that should be preserved, noting decreased R&D spending after the 1982 breakup of AT&T.

NTT took two preemptive strikes against divestiture in late 1995. First, it announced that it would increase potential competition by allowing rivals in local service to connect to its switched network. It also announced that it would eliminate 50,000 of its current 200,000 workers to reduce its operating costs, in return for keeping the company intact. At the time, NTT President said, "We present this restructuring on the assumption that the breakup will not go forward" (Timmermans 1995). One industry analyst argued that NTT's pricing structure for interconnection made the offer for network access "a fake," intended to win political points rather than create true competition. Potential local competitors are mostly small carriers, cable TV companies and other utility companies that have their own fiber-optic networks within cities. None have the capital or technology to compete nationwide with NTT in local service.

NTT's plan to cut labor costs will be difficult to implement, given the political clout of NTT's *Zendentsu* union. The average salary at NTT is estimated at between 8 million and 10 million yen (US\$80,000-100,000) per year, and NTT has a higher worker/customer ratio than its international competitors. *Zendentsu* has not agreed to job or salary cuts, and past efforts to spin off units such as NTT's Software Center were successfully thwarted by the union.<sup>24</sup>

At the same time, each side's true motivations have been questioned. NTT supporters charged that MPT's break-up efforts are mainly an attempt to create more regulatory jobs and *amakudari* retirement slots for MPT bureaucrats. Meanwhile, a former NTT executive conceded that the real purpose of NTT's 1995 announcements was to widen the debate from NTT breakup to a complete rewrite of telecommunications policy—giving NTT more opportunity to stall the effort in the Diet.

The battle lines were drawn (Table 3) and the Diet is, in fact, where the issue is likely to be resolved. The February 1996 report by MPT's advisory council delivered the predictable recommendation that NTT be split into three firms: a national long-distance company, and local telephone companies for Eastern and Western Japan (Choy 1996). The equally predictable opposition

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<sup>24</sup> Despite such opposition, NTT Data and NTT DoCoMo were successfully spun off.

by NTT and its allies prevented MPT from adopting the plan (as it originally hoped) before FY 1995 ended in March 1996.

**Table 3: Alliances Competing Over NTT's Future**

Pro-breakup:	MPT, NCCs, cable television companies, other potential competitors
Anti-breakup:	NTT, NTT's <i>den-den</i> equipment suppliers, <i>Zendentsu</i> union
Uncertain:	Political leaders, MITI, Ministry of Finance

The near-term prospects for a breakup are slim, due to severe political instability. The weak three-party coalition led by prime minister Ryûtarô Hashimoto includes the Socialist party, which opposed the breakup because *Zendentsu* is a major source of grassroots political organization and campaign funds. Meanwhile, all parties are focused on the next election, due by June 1997, which will re-align electoral power between urban and rural constituencies and is also likely to lead to major changes in the relative strengths of these parties.

An election that produces a single-party Cabinet—controlled either by the LDP or the *Shinshintô* opposition party—could conceivably result in more decisive action taken on NTT's future. But the LDP has many reasons to oppose a breakup, which Hashimoto personally opposed in 1990. One reason is the vocal public opposition coming from the NTT-aligned *den-den* electronics firms like NEC that have been major LDP contributors (Choy 1996). And as Keio University's Margarethe Estevez noted, "Even LDP members—unless they have a strong incentive in favoring the breakup—would rather not touch this issue. It's better not to make enemies." (Interview, May 14, 1996). NTT's future would certainly be dragged out if it means a rewrite of the Telecommunications Basic Law, which would require resolving the demarcation between long-distance service, domestic and international service, Type I and Type II service, and broadcast and cable TV.

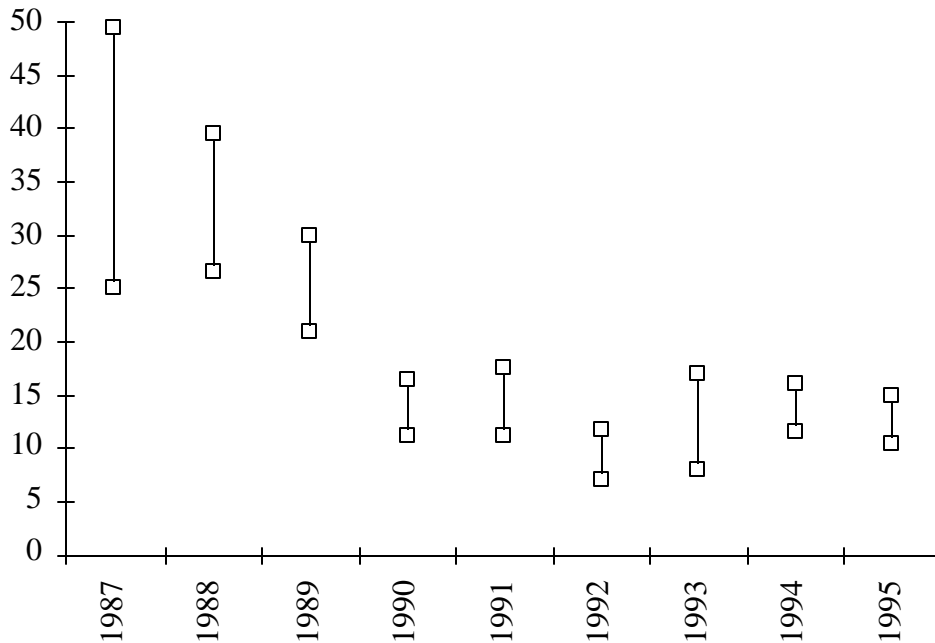
A key factor in the eventual success of any breakup campaign will be the positions taken by MITI and MOF, both of which had strongly opposed breakup in 1990 but did not openly advocate those positions in the 1996 debate. For MOF, the key issue is maximizing the value of the government's shares in NTT. The value of each share has dropped by 2/3rds since the company was first privatized in 1987 (Figure 3), although in mid-1996 the government's 65.5% share was still worth ¥8 trillion (about \$80 billion).

In the past it was assumed that MOF would oppose a breakup on the assumption that it would decrease NTT's share prices. However, in 1995, the Nomura Research Institute produced a report stating that NTT would actually be worth more in parts than as a whole, as the smaller units could pursue profitable alliances to enter new markets and cut costs. Morgan Stanley came to a similar conclusion (Interview with Tadao Saito, October 23, 1995). This perspective has been encouraged by the increase in AT&T's share prices after its second, self-imposed breakup of 1996.

Absent strong leadership from the Diet or intervention by MOF, the question of NTT's future is likely to drag out. The short-term prospects are for increased competition through reduced telecommunications regulations and liberalization of the terms enjoyed by NTT's competitors.<sup>25</sup> Anticipating a delay in the NTT breakup, MPT proposed a series of liberalizations in January 1996, including deregulation of wireless communications rates and decreased regulation of Type II carriers (Choy 1996). It did not include one change sought by NTT, a deregulation of Type II (value-added) services. By opening its local lines to competitors, NTT hopes to compete in value-added services free

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<sup>25</sup> For a discussion of the contradictions between deregulation and liberalization, see Vogel (1996).



**Figure 3: Total Market Capitalization of NTT**

Source: *Japan Company Handbook*

of MPT's regulation—risking its monopoly profits in local service to pursue future growth markets in value-added services.

Both MPT and NTT expect that NTT will eventually compete directly with KDD.<sup>26</sup> Since the spin-off of both companies from MPT in 1953, both have been restricted to their respective domestic and international markets; even their corresponding competitors are restricted to these same markets. The MPT advisory report called for KDD to be allowed to enter the Japanese domestic market, while NTT has long sought the ability to expand into international markets—which MPT would only agree to (if ever) as the last step in any series of reforms.

Meanwhile, MPT's short-term reforms call for loosening restrictions on foreign shareholdings of NTT and KDD stock (currently less than 2% each, vs. 14% for DDI). This would allow the firms to join one of global telecommunications alliances being formed around cross-investments between foreign partners.

But such marginal tinkering does not address the inflexibility of the current regulatory regime, which maintains artificial market barriers between different categories of service and hamstringing NTT and its competitors alike. Nor are the near-term changes likely to markedly increase the efficiency of NTT or decrease the high cost of telecommunications. Both the continuance of such problems—and the uncertainty surrounding NTT's future—are major obstacles to the development of Japan's NII, either by NTT or its competitors.

### **An Artificial Schedule Without Financing**

The minimum cost for extending fiber-optic lines to every business and individual neighborhood is put at ¥33 trillion; with associated switching systems, extending a line to every home and

<sup>26</sup> *Kokusai Denshin Denwa* or International Telegraph and Telephone.



undergrounding the entire system, the total could be as high as ¥95 trillion (Telecommunications Council 1994c, p. 5). Most of this cost will have to be advanced ahead of actual revenues, because the development model is not based on pay-as-you-go market-driven development, and because of an ambitious deadline of 2010; not coincidentally, 2010 is five years ahead of the Clinton administration's target date for the United States

To prime the pump, MPT in January 1995 announced an FY 1995 ¥32.3 billion loan program for building fiber-optic networks, with the money offered to NTT, other Type I carriers, and cable TV operators. Of that, ¥30 billion will be loaned through the Japan Development Bank, and ¥2.3 billion will come from the MPT general account; an unspecified additional amount will be provided by local governments from existing regional development loan programs. Further financing proposals were expected from MPT, the Ministry of Finance and the Ministry of Home Affairs ("MPT Establishes" 1995).

MPT and MITI both launched spending sprees to develop NII projects. Each has budgeted close to US\$1 billion for in FY 1995 for a variety of projects, including video-on-demand, education, telemedicine and local government networks. MPT's projects focus more on communications infrastructure, while MITI concentrates on applications development. The two ministries are operating independently rather than cooperating, as each competes to encompass NII and multimedia under its jurisdiction. In addition, NTT is running its own testbed projects as it implements its own NII vision.

But where will the other trillions come from? One possibility is raising rates for existing NTT subscribers, another is government financing: both face potentially crippling political and practical obstacles. NTT customers already pay more for their services than consumers in many industrialized countries, so the impracticality of raising rates was clearly acknowledged by NTT President Masashi Kojima when he said "Financing is the real challenge. Here, the 'if we build it they will come' model may no longer work. Most customers are satisfied with conventional telephony; they don't want advanced services to be funded by their telephone bill" (Aizu 1994, p. 164).

Much of the pressure for financing stems from the artificial schedule. Given that the financing mechanism (and basic consumer demand) is completely unresolved, the dates announced for completion of the NII reflect more the pride, power ambitions, and national competitiveness of the sponsors than realistic projections of Japan's information future. As an example, at a June 1994 conference in Tokyo, the NTT representative anticipated completion of the national network by 2015, but the MPT representative used the deadline of 2010 contained in its report (Telecommunications Council 1994a); thus, subsequent NTT presentations used the 2010 date. While Japan's "catching up" mentality is second to none, until the details become more concrete, such announced dates must be considered goals rather than predictions.

Also unknown are the long-term impacts of the January 1995 Hanshin Earthquake, which killed 5,502, destroyed nearly 200,000 homes and caused an estimated ¥6 trillion in damage. (Nikkei 1996a). In addition to rebuilding costs projected to cost national and local budgets more than ¥10 trillion, the painful vulnerability of Japan's urban areas to inevitable quakes has rekindled talk of decentralization, which would be greatly aided by an NII—as demonstrated by temporary telecommuting during Kobe's reconstruction. At the same time, the Internet showed a small fraction of its potential, with real-time eyewitness reports, photographs and casualty lists posted online at Kobe University and elsewhere for readers throughout Japan and the world.

### **Limited User Experience**

Japan faces even more serious problems than the United States in gaining end-user acceptance for the NII: Japanese homes and businesses have relatively limited experience with public networks in

particular (e.g., the Internet) and computers in general. In 1994, Japan ranked only 17th worldwide in per capita computer installations (Stern 1994), although it moved up in the rankings after annual PC sales increased by 130% between 1993 and 1995 (IDC 1996). Even though visionaries in Japanese industry, government and academia may be able to look beyond their immediate experience, such limited experience will make both accurate market research and demonstration projects far more difficult to implement.

According to MPT (Telecommunications Council 1994b, p. 31), in 1994 Japan had a third the rate of PC penetration and one-sixth the rate of Local Area Network connectivity of the United States; similar measures of Japan's perceived disadvantage were circulated by a MITI-affiliated non-governmental organization (See Table 4). A major reason for this was the long delay in developing usable computer representations of the complex Japanese language, in terms of both the input and display of more than 6,000 characters in common use (Choy 1989; Snellen 1991; Cottrell 1994).

Mechanical or electromechanical solutions made typewriters prohibitively expensive, so the lack of a solution prior to the refinement of personal word processors in the 1980s means that relatively few men over the age of 30 have the keyboard skills necessary to type Japanese for e-mail messages, while the huge popularity of faxes has made the adoption of e-mail more difficult (Negroponte 1994). Many Japanese are concerned because electronic mail was rarely used ("Industry leaders" 1994), even in the most beneficial applications such as submitting documents for typesetting (Noguchi 1994); again, this shows signs of changing in the wake of the exploding popularity of PCs and the Internet. In the long run, the availability of graphical user interfaces and the development of voice and character recognition software are likely to minimize the difficulties imposed by the Japanese language.

**Table 4: Japanese comparison to United States on PC and telecommunications measures**

<u>Description</u>	<u>United States</u>	<u>Japan</u>
PCs shipped (1994)	18.6 million	3.0 million
PCs per 100 employees (1994)	55.1	14.7
Computer use by managers (1994)	64%	8%
Systems on Internet (Jan. 1995)	3.2 million	97 thousand
Charge for leased lines (1994)	¥0.4 million	¥2.7 million
CATV households (1993)	61.5%	4.7%

Source: JIPDEC (1995), p. 10

While the United States may have an advantage in starting its infrastructure, early in this century Veblen (1915) pointed out that such advantages may not only be temporary, but that first-moving countries may actually be at a disadvantage by going first and letting others learn from their mistakes.<sup>27</sup> Though Veblen was talking about English railroads rather than U.S. information highways, Florida and Keeney (1990) specifically argue that the United States has a habit of breakthrough innovation while failing to commercialize those innovations, and that Japan in particular benefits from more consistent product development follow-through in a wide range of industries.

In the meantime, one approach is for Japanese firms to place significant marketing and R&D resources in a market which has a more experienced user base—i.e., the United States. Such an

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<sup>27</sup> Golder and Tellis (1993) make the same point about "first-mover" companies that pioneer new types of products.

approach has already begun, with the three largest *den-den* firms selling ATM telecommunications switches to U.S. NII demonstration projects and telephone companies, and plans to establish ATM manufacturing plants in the United States because they “want to get closer to their large customers” (Valigra 1994).

### **Competing Paradigms: Interactive TV or the Internet?**

The original Japanese visions of NII were based on the notion of a single unified network serving as a pipeline for providing information and entertainment in a mostly one-way direction. The technology of choice is broadband ISDN linking content providers to households, who will choose from a menu of content choices determined by the providers. This notion is now being challenged by the rapid expansion of the Internet in Japan. The Internet was slow to catch on in Japan, in part because of the high cost of telecommunications, MPT’s licensing power over Internet access providers, and government efforts to enforce Open Systems Interconnection (OSI) standards while the world was embracing TCP/IP.

Another reason was the interest by many players in an Interactive TV model, an updated version of MITI’s and MPT’s earlier teletext experiments (West 1996). Kumon distinguishes between the Internet model of NII, which is user controlled and allows users to send as well as receive information, and the interactive TV model which is controlled by industry and allows limited interactivity (Interview, October 24, 1995). He argues that most major players in Japan’s NII debate, including MPT and the NCCs had paid almost no attention to the Internet and have no understanding of its significance. They are more interested in how to weaken NTT rather than consider the more fundamental issues of what the nature of NII should be.

Kumon argues that NTT’s July 1995 announcement of an Open Computer Network (now due to be rolled out in 1997) was generally ignored by the media, but is a significant decision, as it means that B-ISDN will be almost discarded and replaced by separate networks for telephony and computers.<sup>28</sup> The notion is that the computer network will be based on economically self-supporting demand, rather than universal service, meaning that businesses in particular will have access to the high-speed digital communications that they need without having to wait for, or subsidize, universal service.

Whatever the debate between Interactive TV and the Internet among those crafting telecommunications policy, among businesses and consumers the issue was quickly settled. In 1995 “Internet” replaced “multimedia” as the catchword in Japan. One reason was on the content side: businesses were immediately able to use the Internet to advertise and put information online, rather than waiting for new infrastructure to be developed. The large firms quickly staked out their turf in this new virtual market. The leading financial publisher, Nikkei, published a Japanese Internet yellow pages in book form (Nikkei 1996b), an online directory of Japanese companies, a weekly table of new URL listings and took a 10% defensive stake in a new online service joint venture with American Online and the Mitsui trading company. Apparently unconcerned about short-term revenues, the five national newspapers (including Nikkei’s flagship *Nihon Keizai Shimbun*) and even local newspapers have been publishing free online editions since 1995 that put some of their U.S. counterparts to shame.

Both the availability and business promotion of Internet content, in turn, fueled both a consumer Internet mania and also an estimated 65% one-year increase in PC sales (IDC Japan 1996). Internet

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<sup>28</sup> NTT’s decision to offer OCN is probably influenced by the fact that its existing narrow-band ISDN network is underused and is a big money loser. But the decision was not without its controversy, as something akin to a religious war was waged within NTT’s ranks between rival camps favoring the interactive TV and Internet models (Interview with Izumi Aizu, Glocom, October 23, 1995).

service providers continued to sprout up while providers such as Niftyserve (like their U.S. counterparts) added Internet services: total Internet users in Japan exceeded 2 million in 1995. While Internet e-mail addresses—other than the occasional Niftyserve address—were rare for employees of large Japanese firms in 1994, by March 1996 E-mail addresses had become commonplace as 40% of large firms had internal E-mailsystems (“Over 40%” 1996).

But there are reasons to suspect that the diffusion of Internet computing in Japan is a kilometer wide and a centimeter deep. The use of URL’s in ads parallels the long-standing use of English in advertising and packaging to give products a more “international” feel. The average Japanese may recognize individual words, but extended usages are clearly intended more for effect than content.<sup>29</sup> This is best understood as part of the long-standing *kokusai-ka* (internationalization) fad that has left Japan still very inward-looking.<sup>30</sup>

So while Interactive TV proponents continued to plan for the future, the Internet seized the contemporary Japanese imagination and seems unlikely to let go. This paralleled the shift in the U.S. during the same period, in which visions of fortunes to be made making “set-top boxes” for interactive TV slipped away as 1995’s trials showed the same disappointing results as earlier teletext experiments. The idea that key applications would be primarily one-way services (such as video-on-demand) has been replaced by network services such as the Internet. The rapid development of technologies such as web browsers like Netscape and Sun’s Java technology suggests the Internet model is winning in the United States. If Japan makes the wrong choice, it could invest billions in an NII model that actually reinforces its position as an information backwater rather than tapping into the global information revolution.

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<sup>29</sup> Few Japanese know enough English to read the the 35-word quality explanation on the best-selling can of beer; other English usages strike native speakers as bizarre, such as the cream-substitute powder named “Creap”.

<sup>30</sup> To make the link even more explicit, in May 1996 the Ministry of Foreign Affairs offered subway posters promoting its home pages, which provided Japanese citizens with information about other countries in the “World Jump” section.”

## CONCLUSIONS

The development of Japan's plans for a future information infrastructure harken back to its past patterns of successful postwar economic development, involving many of the same actors involved in the creation and growth of the domestic consumer electronics, computer and semiconductor industries.

Some of these patterns relate to early part of the postwar period,<sup>31</sup> with its emphasis on following and catching up to technologies developed in the United States and the use of government-funded R&D projects to develop new technologies. Others correspond to the economically and technologically mature Japan of the more recent past, such as the disputes between government ministries vying for policy leadership.

Unfortunately, some the problems of the past remain unsolved. Despite many successes, not all of the past government "visions" were on target: the 1994 vision of fiber to the home by the year 2010 is no more realistic than the many failed teletext demonstration projects of the 1980's. Despite multi-billion yen government support for improved software development dating back at least to 1976 (Okimoto 1989:80), well-founded concerns remain for the ability of Japanese firms to produce world-class software. Consortia of the major Japanese electronics firms (e.g. Pollack 1995) continue to be formed to address the problem, even as Japan's only net exporters of software remain the innovative small- and medium-sized game software makers that must compete with these large firms for scarce engineering talent (JEIDA 1995).

Also unaddressed are fundamental problems in telecommunications services. The "informatization" of Japan increased dramatically in 1995, when PC sales increased by two-third and businesses raced to provide content on the World Wide Web. But the most serious obstacle to Internet usage remains: the high cost of telecommunications faced by individuals, firms and Internet service providers. Just as consumers did not adopt PC's until prices dropped below ¥200,000 (\$2,000) in response to increased competition, without drastically improved efficiency or competition for NTT, users will see little more than the pattern of modest price reductions over the past 20 years, stifling usage indefinitely. Such telecommunications reform seems unlikely in the near term due to fierce domestic opposition and weak political leadership.

Meanwhile, as Callon (1996: 2) notes, the environment for the development of Japan's high-technology industries has changed in three ways. A "catch up" strategy following the global leader doesn't work for a nation that itself has become a technological leader, and skills required for leading rather than following are very different.<sup>32</sup> Second, government ministries face a relative loss of power compared to Japanese firms that have grown up to be rich and powerful global competitors. Finally, many of the industry promotion tools used when Japan was a developing country are no longer applicable now that Japan has the highest per capita income of the G-7 nations and maintains persistent surpluses with leading trading partners.

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<sup>31</sup> The dividing point could be taken as the end of the "era of high-speed growth" (1973 when Japan faced its initial "oil shock"), although the major turning point in U.S.-Japan relations marked by the so-called "Nixon shocks" (1973) might also be used.

<sup>32</sup> So after trailing the United States and Europe in first-generation cellular wireless telecommunications, MPT and Japanese producers sought to gain an advantage in export markets by rushing the completion of the lower-cost next-generation technology, called PHS (personal handyphone system) in Japan. Some early indications (e.g., Takezaki 1996) suggest these efforts were premature, although Funk (1996) argues the cost advantages of PHS will enable it to gain market share against cellular once coverage is extended to a larger area.

At the same time, currency appreciation and other pressures are moving the manufacturing base of Japanese firms to elsewhere in Asia, increasing the pressures to develop new competencies in software and multimedia content. Despite such pressures, the large Japanese electronics firms are focusing on near-term hardware opportunities, both in low-risk areas such as ATM switches and more speculative areas such as Internet-oriented PDAs (Ohta 1996; Funk 1996).

Even if Japan cannot fulfill its ambitions to be *the* world leader in digital telecommunications, the outcome of current NII strategies is likely to be completion of a high-quality digital infrastructure. If, as elsewhere, fiber optics are too expensive, then the network may be completed using a combination of accelerated copper wiring, coaxial cable, wireless or satellite technologies. But the end result is given—some form of digital communications infrastructure will exist in Japan—even if the technology, use, financing, ownership and schedule are not.

Failing to understand such use runs the risk that the network will be grossly underutilized: Japan's widely available but little-used ISDN infrastructure offers a cautionary precedent.<sup>33</sup> Within the classification of an NII as computers, conduit and content (Kahin 1996), Japan's problem will be the pricing of the conduit, i.e., the telecommunications services that transmit content to the computers. Computers are not a problem: Japanese firms have proven themselves more than capable of producing affordable, high-quality electronics hardware, and the recent surge in domestic PC shipments suggest that their PC successes may soon match earlier ones in consumer electronics, components and large computers. The country can certainly afford to widely adopt such PC's, which can then be used to access the wide range of content (both domestic and imported) available in the Japanese media. But as long as the telecommunications sector remains a tightly regulated near-monopoly, telecommunications services will remain expensive: this increases the cost and decreases the amount of content available to Japanese consumers, while limiting the target audience available to fledgling domestic content and software producers.

Thus Japan is *en route* to building an information highway without really understanding where that highway leads to in the end. Despite three decades of discussing a shift to an information society, many of the accompanying social and economic changes remain unexamined and unimplemented. Some changes have begun with the end of the bubble economy, but in predicting Japan's information future, it would be a mistake to ignore the tremendous structural inertia that continues the policies and attitudes of the past.

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<sup>33</sup> The superhighway metaphor is useful here. Some countries have built sparkling new expressways to relieve traffic congestion on established highways, then charged high tolls to drive on the new highways. As a result, the new highways are relatively untravelled with hardly a motel or restaurant to be seen.

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