

# 日本情報

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## JAPAN'S NETWORKED SOCIETY IMPLICATIONS FOR SCIENCE & TECHNOLOGY POLICY\*

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Discourse on Japan is cyclical. Just as French fashion favors short skirts for one season and long skirts for another, observations about Japan also seem to fluctuate between trends. Japan's current economic downturn has promoted many to now discount Japan. This contrasts with the recent past where Japan was "Number One" with an economic model to fear and emulate. One can already predict the discussion on "the return of the phoenix."

These alternating views of Japan have to stop. Japan is too important to be continually overestimated and then underestimated. Most analyses of Japan have ignored how the role and organization of knowledge and science in an advanced industrial society affects its economic and political development. If you observe Japan through its R&D networks and policies, a more consistent view of Japan emerges. Such a perspective presents a dynamic, albeit evolutionary, picture of an inherently resilient Japan.

### **Institution Building**

Since the early 1980s, the Japanese "iron triangle" (bureaucracy, industry, politics) has organized the transformation of the Japan's social-industrial system through the development of large-scale research programs. These massive projects, however, have generally neither succeeded at their initial goals nor produced any significant scientific breakthroughs. This view of these projects as "failures" of industrial policy, nevertheless, is deceiving.

How Japan defines the "success" of these projects has been largely misunderstood in the West. Research in Japan cannot be separated from its institutional environment. The institution created from the scientific research is as important, maybe more so than its result. The institutions created becomes completely embedded into its research results and can be understood only from this point of view. Thus, a scientific failure can be an organizational success. And an organizational success can produce future scientific successes. This also means that institutional failures or hindrances are all the more important for Japanese development.

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It is the institutional environment that produces and distributes R&D knowledge. In the U.S., the overarching institutional environment is one of competition among individuals. There is a web of relations and interactions between firms, public institutions and nongovernmental actors that work and compete as distinct entities in the policy “market.” Relaxing regulations to allow the market to work is a fundamental concern in the U.S. This is not the case in Japan which perceives its strength as building and maintaining close cooperative relations among competing interests. Regulations exist to maintain the socio-economic status quo.

Thus, the Japanese reaction to their economic and scientific shortfalls is to restructure institutions, not to reduce regulations. Japan’s political and economic elites have maintained this tact for the country’s current development path. Indeed, the policies pursued since the early 1980s to focus on the management and promotion of R&D through the creation of new organizations and human networks have greater saliency.

Since the early 1990s, Japan’s government budget devoted to science and technology, which has been low compared to other industrialized countries, has increased significantly. The increases have averaged 6 percent per year, reaching ¥2.7 trillion (US\$25 billion) in 1996. These increases were institutionalized in the Science and Technology Basic Law enacted in November 1995 with a Science and Technology Basic Plan initiated by the Cabinet in July 1996. The “Basic Plan” places an emphasis on the promotion of basic research as well as on technology development. The goal is to increase S&T budgets by 60 percent over a five-year period to place Japan on par with and, in some cases, go beyond the level of its Western counterparts. The effort is to upgrade the nation’s infrastructure for scientific research.

For example, in 1995, Mombusho expressed the government’s priority for basic research when it nearly doubled the budget of the Japan Society for the Promotion of Science (JSPS). In the government’s JFY1999 draft budget passed by the Diet on March 17, 1999, the funding allocation for JSPS was ¥130.0 billion. This figure constitutes an augmentation of approximately ¥87.8 billion, or triple the amount of the previous fiscal year’s budget. This increase was due mainly to the transfer to JSPS of one of the principal organizations promoting scientific research in Japan of a part of the Mombusho’s Grants-in-Aid for Scientific Research, which until now had been administered by Mombusho itself.

Even if the Ministry of Finance (MOF) has yet to find the means to pay for all the desired funding, the decisions expand budgets and create new institutional infrastructures, express a collective strategy. This expansion also generates unforeseen and difficult institutional problems. When knowledge is involved, power is always in question. In this case, it is national security power that concerns the relationship between the governing elites and the people it purports to represent as well as the relationship between a nation and its neighbors and partners. These relationships infused with crisis and technological changes lead to intense conflicts and uncertainties.

### **New Socio-economic System**

Japan’s elites are clearly trying to create the basis for a new socio-economic system. This process was initiated long before today’s present economic crisis and before Japan was seen as “number one.” The weaknesses of Japan’s lack of inventiveness and dependency upon foreign scientific know-how are

viewed as weaknesses in Japan's socio-economic system. The current economic crisis, therefore, was not a surprise. The elite's surprise has been the depth of the crisis and the extreme difficulty in implementing needed reforms. This is a striking contrast to other periods of crisis in Japan such as the oil crisis of the mid-1970s where the elites were able to identify the problem and move swiftly.

It is a difficult and intensive task to change a national development trajectory. It touches the core of a society, its most entrenched habits. Japan is always given as a typical example of a state-controlled society. Interestingly, if there is one sector of Japanese society where this was not the case, it is in science and technology. Here is one of the few examples where institutional arrangements created by the U.S. Occupation government remained. From 1945 till the early 1980s, the financial participation of the government ministries in R&D has been weak. This had not been the case before.

Since the opening of Japan, the government created the national scientific institutions. The objective was to import foreign knowledge and to introduce it into every sector of the national economy. Chalmers Johnson (1982) has explained how from the 1930s on, the defense-related ministries became the main source for investment in scientific research. Created in 1925, the Ministry of Commerce and Industry (MCI), an ancestor of today's Ministry of International Trade and Industry (MITI), was redirected in 1937 to support the war industry. It was finally merged in 1943 with other agencies into the Ministry of Munitions that was abolished in 1945. The MITI itself was created in 1949 with the mission of rebuilding the economy. Since 1945 and because of its pacifist Constitution, defense could no longer play a major role in the financing and orientation of research. Research became a task of the industrial firms within their own means, needs and strategies, albeit under the guidance of MITI.

This was a catch-up strategy of borrowing and learning from the world's best practices. The first goal was not to develop fundamental nor basic research, but to gather from abroad scientific and technical information and knowledge to adapt to Japanese firms. The second goal was to train Japanese scientists who would participate in fundamental research project abroad, mainly in the U.S. and return to Japan to contribute their experience to firms or universities. This strategy reached its peak in the late 1970s and early 1980s.

This catch-up strategy proved quite effective. Japanese firms conquered world markets and dominated certain technologies. The consequence was that these firms resented more and more the guidance of MITI. The firms began to perceive their insertion in the MITI-dominated institutional environment as a hindrance to their own development. Their very successes were emancipating them from MITI's control. Sony and Honda are typical cases. Sony sometimes paid heavily for its independence when it adopted standards, such as the Betamax, that were rejected by its competitors. This does not mean that these firms had become independent entities answering to the market. Instead, they were simply transforming their role in their institutional environment. Their relationships with their competitors, with their ministries but also, implicitly, with the Japanese society at large were changing.

### **Institutional Determinism**

The view from the MITI during the 1980s, was that it had slowly lost its control over the major firms and critical industries. Thus, MITI planners knew that they had to adapt to the new independence of Japanese firms if they were to justify their bureaucratic preeminence. The result was that MITI began to disassociate itself from its traditional vision image as the guardian of the Japanese nation-state. This

role for MITI is over. Instead, MITI sees the nation as a system, as a complex socio-economic entity whose coherence has to be sustained. Japan is seen merely as a territory to be developed, adapted, and reorganized. MITI is the facilitator not the leader.

If the key word needed to understand the U.S. is the “market,” then the key word needed to understand Japan is the “system.” To be sure, in both cases, this is a gross simplification. MITI’s basic assumptions are that firms cannot be trusted to develop a coherent view of the nation and that an advanced nation is a system of functions, activities, groups and territories. Firm strategies are not short-sighted, but they are based on their own interests and geared toward their own growth and survival. A nation is not merely made up of discreet firms and their employees, it is a system of interrelated social behaviors that need to be moderated or directed for the whole to prosper.

MITI believes that the criticism it received during the 1980s was the price it had to pay for its own success. The rise of energy and raw materials prices from 1973-78 had put the Japanese economy at risk, exposing its weak points. From the point of view of a bureaucracy managing the nation as a global entity, this was as threatening for national sovereignty as colonization had been in the 19<sup>th</sup> century. With a consensus emerged from the administrative and business communities that MITI’s response had to be aggressive and firm. The dominant industries in Japan were to shift from labor-intensive to technology-intensive activities.

Taking the cue from America’s information technology boom, high-tech Japan was born. The buzzword of the 1970s through the mid-1980s was the “Information Society” (Rieu 1997a). Seen from the U.S. or Western Europe, MITI’s response was successful. Seen from Japan’s administrative and business elite in charge of the nation’s present and future, however, the situation was quite different. Japan’s economic independence and freedom remained insecure.

Another conclusion was being drawn in Tokyo. Japan had saved its socio-economic system by adopting and adapting America’s latest technologies. The result was that the country had also become as dependent on foreign technology as it was on foreign natural resources. Thus, MITI planners wondered where would the next technological wave come from? The answer was obvious: Japan itself had to develop its own next wave, the “next generation technology,” or at least contribute to its development. By the end of the 1980s, when Japan was thought to be at its industrial peak, it became clear that to control intellectual resources was an even stronger power than to control natural ones. Information, technical know-how, could always be bought or gathered. But knowledge, with its scientific and technological potentials, was different.

### **The Age of “large scale programs” and Internationalization**

The insecurity of Japan in face of its technological future was defined by two reports. The first was a 1982 report by the Agency for Industrial Science and Technology (AIST), entitled *Toward a New Phase of R&D*. Another report, *Visions for the 1980s*, was the result of MITI’s main *shingikai* (consultative body) of key business leaders, the Industrial Structure Council. AIST was created in 1977 under the auspices of MITI to conceive “a long term plan for the development of an industrial technology” for the year 2000 (Dore 1983).

These two studies gave impetus to the Next Generation Base Technologies Development Program (1981-1991): A Program For a Nation That Lives by Its Technical Expertise. Throughout the 1980s,

this program with ample modifications developed a number of large-scale cooperative research projects such as the Very Large Scale Integration Consortium (VLSI), Fifth Generation Computer Consortium, and The Real Time Operating Nucleus (TRON). The paradox of these programs was that they reinforced the role of government administration while giving the firms the means to become more autonomous and to resist further administrative guidance. In effect, the firms were paying and MITI was “guiding.”

In retrospect, the 1980s can be viewed as a period of a profound and long transition in Japan. The present economic crisis is a result of this transition. The postwar age of industrial policy was the age of reconstruction and consolidation. This period transformed into the age of science and technology policy. This is best described by Martin Fransman in his book, *The Market and Beyond: Cooperation and Competition in Information Technology Development in the Japanese System*. His thesis was that it was possible and necessary to have regulation while there was successful competition. The bureaucracy could work in a competitive economic environment.

Observers have reflected upon the 1980s in Japan as a period of conflict and error. The decade is viewed as the unraveling and discrediting of Japan’s industrial policy. The conflicts between ministries for a bigger share of the technological pie, between firms and ministries for dominance undermined all efforts at bureaucratic control of the economy. MITI is viewed as being at the center of all of these disputes and is painted as an incompetent meddler in the market. Industrial policy was to blame for all Japan’s shortcomings. The Japanese model of development was an empty promise.

This view gave way to a period of self-criticism in the late-1980s and to an alternate view for understanding the production and distribution of knowledge within and between firms. The role of MITI in setting private firm’s strategy was changing. By freeing the firms from MITI, new management methods could be designed and implemented. In 1990, ground-breaking work by scholars Aoki Masahiko and Kodama Fumio set out a strategy to oppose national (MITI)-led development. Their alternative was a purely economic approach, with the firms leading the way and knowing what is good for them. This perspective remains very influential. The expression of these theories was seen in the West as a potential opening of Japan. A firm-guided Japan had the potential for market liberalization, for a greater role of the market in the economy, and a new management philosophy for firms.

### **R&D in “The Lost Decade”**

In this environment, the financial crisis erupted in 1991 followed by a sustained economic downturn. Both linger on. To Japan’s elites the diagnosis and the cure were clear: Japan lacked innovation and the need was to invest in basic research. This conclusion is best outlined by Watanabe Chihiro (1992): who compared international investment in R&D from 1987 (the first rise of the yen) to 1992. He found that the percentage of public investment in R&D was 21.5 percent in Japan as opposed to 49 percent in the U.S., 37.7 percent in Germany, 45.4 percent in France, and 38.5 percent in England. Excluding defense budgets, the percentage was even lower: 2 percent for Japan, 35 percent for the United States, 25 percent for England, 23 percent for France, and 15 percent for Germany.

This commitment to public science remained the case throughout Europe and North America even though all were trying to reduce their budget deficits and produce knowledge more effectively.

Watanabe found that this was not the situation in Japan and that it needed to be corrected, fast. In further research, he showed that since 1992, Japanese firms have been slowly reducing their R&D budgets. Therefore the government had to compensate for these reductions and increase its share in research.

These simple budget observations set a new stage for Japanese officials to tackle the country's economic downturn. It created an intellectual and empirical foundation for change. It opened up a new role for MITI (Watanabe 1994) to organize a framework for cooperation with other ministries and with firms to introduce new management methods (evaluation). A 1994 newspaper article perfectly states how Japan understood its present situation: "The three main factors responsible for economic growth are labor, capital and technology. Japan is likely to have problems with the first two factors in the near future. Technology is Japan's only resource and now is the time to develop it" (Matsumoto, 1994).

The first two negative factors concern the aging of the population, the financial crisis and the public budget deficits. Apparently the third one was considered the easiest to solve. The choice had already been made. The present crisis provided the impetus to confirm and enforce the decision to support S&T research with proper, public financial means. In 1993, MITI proceeded to restructure its all its national R&D programs into two sectors, the Industrial Science and Technology Frontier Program and the New Sunshine Program, to prepare for increased funding. In 1995 and 1996, the government made the legislative and financial decisions to confirm its commitment to emphasize scientific research.

Thus, 1995 Science and Technology Basic Plan is not new at all. On the contrary, it is the outcome of an evolutionary process started in the early-1980s. What really is new, is the level of investment in S&T. Japan has moved from an "information society" to a "knowledge-based economy". There is a grand strategy to rebuild Japan's entire social and economic fabric with scientific knowledge at its core. R&D Billions of yen in every governmental agency are being spent to reach this goal. Budgets have been regularly raised all through the 1990s and will continue to increase into the next century.

### **How to Overcome "The Lost Decade."**

"The lost decade" is the Japanese expression to describe not only the continuing state of crisis since 1991, but also the paradoxical situation of the country, What is wrong with Japan is well-known and commonly admitted. Still Japan seems unable to reform. The evaluation of the Basic Plan made in 1998 and early-1999 clearly showed that results are not what was expected (STA 1999).

There is a deeper problem interfering with reform and technology progress in Japan. It is all the more worrisome to Japan's leaders that the diagnosis of Japan's difficulties was the right one and that the solution rests with a change of scale in the nation's R&D activities. The problem can not be reduced to the need of "liberalization," of an opening of the Japanese market, society or mind. In Japanese, the phrase used for liberalization and deregulation, *kisei kanwa*, only means a "loosening of the system." There is no reference to nor assumption of working toward a market economy.

Seen from Japan, the conflict is not between the role of the state and the role of the market nor between a nation-based economy and a globalized economy. For example, Watanabe Chihiro does not consider himself a "nationalist" but an "internationalist." He advocates collaborative research in every field. But he also advocates internal reforms to develop a new socio-economic system. In 1998,

Kodama Fumio was clearly advocating that Japan has to design a new socio-economic structure. The situation is paradoxical in that although he and others criticize the role of the bureaucracy, it is assumed that in a transitional period there is a strong proclivity to maintain the bureaucratic status quo.

It is also necessary to face the social consequences of change. Deep and genuine reform is extraordinarily difficult in Japan. Most of all, the transfer of power to research (to knowledge in general) presents a genuine threat to the established power equilibrium. Scientific knowledge is an intermediary power between the bureaucracy and industry. It can be controlled by neither institution. Science produces its own loyalties and solutions. Neither corporate nor ministerial administrators cannot pretend to control the research activities they have financed. Thus, it is difficult for a bureaucracy to recognize its limits and to organize around its own overcoming.

The problem Japan is facing is deeper than usual. It concerns the institutional environment of research. This cannot be reduced to the relations between the public and the private sectors as commonly understood. The situation needs to be understood within the relations and interactions between the different “spheres” or “functions” that make up a society. Social interactions and human networks are what is changing.

As a result, multiple reforms are necessary. These reforms will affect the firms, the general public, the bureaucracies, the political system, the researchers in their labs, and the designers in their offices. This is a new deal, a different type of power-sharing destined to change Japan’s techno-structure and society. Without change, the crisis will linger. Even if the economy does pick up, R&D will not.

A new socio-economy will not rise without the political will to resolve new problems of this society. The changes are touching the very structure of Japanese society at its institutional framework and collective behaviors. Every Japanese citizen is affected by the crisis, even if he or she does not suffer from it. All know that now something has to happen for the nation to find a new course of development.

This sense of crisis is not new for Japan. The country has already encountered such a situation several times in its history such as during the Meiji Restoration (1868-75) when Japan opened to the West and also during the American Occupation (1945-52). In both cases, true change was impossible, because it was imposed from above—Japanese elites or foreign conquerors. The average Japanese citizen did not determine his fate.

This time the context is quite different. Japan is on its own. For the first time in their history, the Japanese people, themselves, can decide what kind of society they want to become. These changes will open the development of R&D in Japan, open new collective needs, life styles, and standards of living. New products will be conceived. New businesses will supply them. This is what Japan is waiting for.

Instead of building research capacities, the Japanese will finally produce knowledge. Young people will again find an interest in science and technology instead of trying to escape the structured life prepared for them by firms. The intellectual debate is vivid but intellectuals do not want anymore to see society falling back to its status quo and show their impotence. Japan knows that its future lies in a new level of development and implementation of R&D. But it has by now also understood that the

future of R&D lies in society at large, its organization, and its level of individual and collective freedom.

### **Learning From Japan Today**

Defining a development trajectory produces only a mid-term perspective. These predictions change faster than nations, but much slower than markets. The future of a nation lies in its development path and in its capacity to act upon a potential based on the country's institutional organization. Institutions are more or less codified from nation to nation but they all express power relations.

In Japan, institutions are much more informal albeit important than in the U.S. They are much more dominated by power struggles and inner fights, to the point of resisting all change. The U.S. conceives of its society as adapting spontaneously to technological advances. It is the ideology of the market dominated by consumer behavior, life style choices, and distrust for bureaucracy.

There is a conflict between Japanese society and technology. Japan is still a bureaucratic and industrial power trying to make sense of its level of development. Japan has caught up with the rest of the industrialized world, but does not know what to do with its success. Yet, there is something deeply interesting in Japan's crises. Since the early 1980s, Japan did see its next step and understood the challenges to come. Until now, there was little content to resolving the new problems. The question is whether Japan is responding too late or if Japan has already advanced. An answer appears to be emerging. In June 1999, the ruling LDP published its report outlining its proposals to increase industrial competitiveness. It calls for adopting a "national industrial strategy." Thus the political consensus is crystallizing to remake Japanese society around the dynamic process of science.

Japan's current crisis can not be neatly defined as either financial or industrial. The Japanese seem to understand that it is organizational. The challenge is to make science the powerful mediator between government and industry. Scientific innovation creates its own path and demands that bureaucracies and corporate executives must heed. But beyond that, it is conjuncture as to how well the Japanese will succeed in overcoming their difficulties.

Knowledge is changing the basic rules of the game. The future lies in science and technology development but it is unclear how to design this future. Japan seems late in its technology development because it has not yet found an acceptable organizational solution. But it is also the first industrialized country so experienced and so successful with resolving its developmental crises. Japan clearly still has a lot to teach us.

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