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SOME OBSERVATIONS ON TECHNOLOGY TRANSFER IN JAPAN

Herbert S. Kleiman

Battelle Columbus Laboratories

Prepared for:

Defense Advanced Research Projects Agency

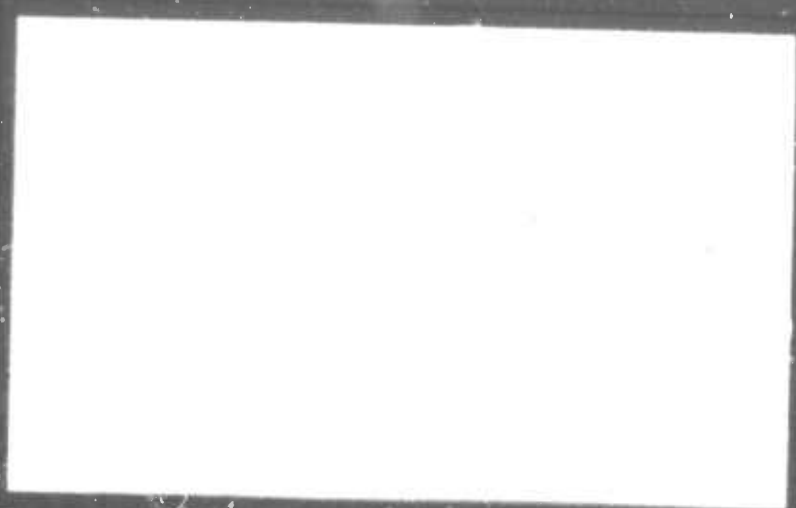
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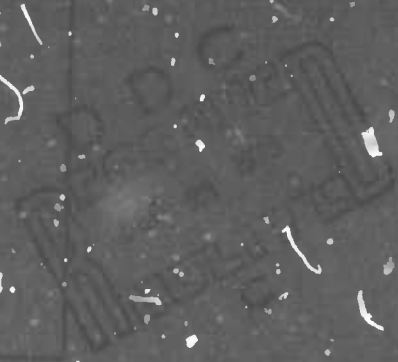
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WORKING PAPER

on

SOME OBSERVATIONS ON
TECHNOLOGY TRANSFER IN JAPAN

by

Herbert S. Kleiman

June 20, 1975

Prepared for

DEPARTMENT OF DEFENSE
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The rate of reaction between a "solid" and a liquid is measured
— a lot of it is measured in more than 100 reactions. It
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report draws upon existing literature from Japanese and non-Japanese authors to provide a brief overview of the Japanese technology transfer mechanism. It stresses the totality of that country's commitment to economic growth utilizing the T ² tool as a major contributor toward this end. The technical aspects are considered, along with the various secular factors-- financial, political, economic, social, cultural--that provide the support upon which the Japanese T ² success is based. To a limited extent, the uniqueness and universality of this Japanese experience are discussed.		

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PREFACE

A comprehensive research program to develop an analytical methodology for assessing technology transfer in the Soviet Union is underway. A necessary part of such a program is the need to insure that the technology transfer process, per se, is clearly understood. Hence, reviews and analyses of the extensive literature relating to technology transfer seek to identify both common threads and unique requirements for the technology transfer process in various national environments.

Technology transfer in Japan was examined not only because the Japanese culture differs from those in the West, but also because Japan has clearly benefited greatly from technology transfer, particularly since the end of World War II.

This Paper synthesizes, compresses, and analyzes the extensive literature, and will hopefully provide some insights into the technology transfer process in Japan. A related working paper, soon to be released, will offer a general overview of technology transfer.

PROLOGUE

Cultivate the ways of rectitude; foster nobility of spirit; and work with resolution so as ye may enhance the innate glory of the Imperial State and keep pace with the progress of the world.

The date, August 15, 1945; the speaker, Emperor Hirohito: the occasion, the capitulation of the Japanese government to the Allies to end World War II. With these words, the first his subjects ever heard from their Emperor (albeit from a record on radio), the war was over. A remarkable period followed as bitter former enemies learned to live together as victor and vanquished.

To this observer the essence of the Japanese resurrection can be discerned in the words of his deity-emperor and the subsequent national reaction. The commitment to war was transformed to an acceptance of defeat and a fatalistic realization that the Japanese must face up to this unpalatable reality and make do. Much of the later success derives from this philosophic attitude and the ability to turn their collective backs on the "mistaken" past and look to the present and future.

As we try to understand the particular subset of the Japanese economy concerned with technology transfer, we must keep broader "landscape" considerations well in mind since, without them, the more specific considerations cannot be evaluated correctly or, indeed, may be misinterpreted.

SUMMARY OBSERVATIONS

1. The phenomenon of Japanese technology transfer, successful as it has been, must be viewed in the context that such transfer evolved from a conscious and well-implemented supporting policy of the Japanese government sustained for over 25 years. As one of a number of supporting tactics for an overall growth strategy, the acquisition and adaptation of technology has been a basic underpinning of Japanese planning. In most countries, and especially the United States, technology transfer is either not consciously pursued or is dealt with superficially. For other than advances in agriculture and perhaps aerospace, probably no sector of U.S. technology has been characterized by a strong drive to transfer technology. In the past few years the U.S. government has initiated some efforts to modify this situation but these are feeble compared to the Japanese thrust. Without in any way demeaning their notable achievement, the Japanese pursue technology transfer with no holds barred. Their available resources--material and social--are and have been effectively focused to achieve this end.

2. Although technology transfer in postwar Japan is only one input to the much larger overall Japanese growth plan, government activities set up the necessary support to insure that such transfer would be effective. In other words, the government provided a totality rather than simply a splinter action. Among these actions are the following:

- Quotas on imports of non-Japanese products that might compete with the Japanese version, particularly of favored growth industry outputs
- Special subsidies in a variety of forms to companies licensing technology from the outside

- A variety of bureaucratic procedures, both overt and covert, to frustrate non-Japanese penetration of the Japanese market
- Numerous incentives for Japanese to export overseas to obtain needed currency, particularly dollars
- Policies to insure that the Japanese consumer buy Japanese products rather than those from overseas, thereby helping the balance of payments and insuring that the Japanese domestic market is well protected.

3. The borrowing and adaptation of others' creativity are recurring themes in Japanese history, with the major exception of their xenophobic period from about 1600 to 1850. From China, and to a lesser degree from other Asian and even European cultures, the Japanese have sought ideas from the outside world and then adapted them to the idiosyncrasies of the Japanese culture. Their postwar technology transfer phenomenon must be viewed in the broader context of a tradition that is naturally conducive to such transplantation. The NIH (not-invented-here) factor appears to carry little or no weight; most probably the Japanese would look down upon a Japanese company that hesitates to license from an outside source if it could do so to its own advantage.

This strong tradition provided the underpinning for Japanese technology transfer of the past 25 years. This foundation facilitated and accelerated the transfer activities, and reinforced the other activities and considerations described here and in the text.

4. Much of this success derives from those special traits of the Japanese which appear to be unique, or near unique. These societal and cultural characteristics draw from a history of isolation and inbreeding perhaps unlike

any other in the world. Anyone viewing their achievements, technology transfer and otherwise, must consider these secular factors. Although some aspects of the Japan success story to be discussed in this report can be duplicated by others given sufficient motivation, the cultural factors are not transferrable by government dictate. Perhaps other means can be invented to simulate them but this supposition introduces a whole new array of variables. These special Japanese traits provide the basis upon which everything else is structured.

5. The U.S. occupation through 1951 was a singular exercise by an enlightened victor imposing its will upon a thoroughly defeated enemy--particularly when one considers the bitterness of the war years. The United States provided Japan with inexpensive technology (particularly in hindsight), capital for industrial expansion, a willing customer base for numerous products, a military "umbrella" allowing Japan to concentrate its resources and industrial activities, a means to accelerate its industrial growth during the Korean War, and a generally supportive policy to raise Japan from its prostrate position rather than inflicting the more typical tributes demanded by a victorious power. Although obviously the United States has also gained from its "benign" policies, we certainly gave much.

6. Perhaps the Japanese ascent is ended or at least slowed down. Many of the factors that facilitated or even allowed this growth no longer exist:

- Whereas 30 years ago Japan was treated as the wartime defeated, today it is a major component in the free world economic arsenal.

- As a competitor to be reckoned with, no industrial nation will look upon Japan with indifference. Quite the contrary, many countries are specifically instituting policies and regulations that will constrain Japanese growth and penetration of their own national markets.
- Thirty years ago Japan's industrial base was destitute. Today it is huge, implying that similar percentage growth gains of, let's say 15 years ago, cannot be as easily duplicated. For instance, its participation and growth in the U.S. marketplace must be assiduously pursued against other strong industrial competitors and sometimes limiting government regulations.

SOME OBSERVATIONS ON TECHNOLOGY TRANSFER IN JAPAN

As with the "miracles" of biblical times, the Japanese economic emergence from the ashes of World War II has sometimes been associated with semi-mystical forces and unique characteristics by which Japan has achieved its ascendancy. The wealth of literature on this subject is super-abundant, ranging from lavish praise and sometimes reverence to somewhat more muted assessments. Authors are drawn from the ranks of native Japanese, Japanese-American, and non-Japanese observers from other industrial societies, as the United States, Great Britain, and West Germany. Perhaps the peak of this idolatry was reached with Herman Kahn's publication of The Emerging Japanese Superstate, which clearly raised Japan to premier position. But, even before the Japanese economic resurgence, the subject of Japan's special status has interested many observers. Perhaps the best known study addressing Japanese society, as pertinent now as when it was first published in 1946, is Ruth Benedict's The Chrysanthemum and the Sword, which has enjoyed about two dozen printings since its first paperback edition some 20 years ago.

No attempt will be made to exhaustively recite the list of impressive Japanese achievements accrued since the war. Few people are unfamiliar with the highlights: the second largest CNP in the free world; a dominance in selected world markets, sometimes achieved at the expense of more laggard international competitors; a more recently-gained reputation for high quality merchandise, often selling at a premium; a reputation for trading prowess; and admiration, sometimes grudgingly given, that when the Japanese choose to achieve superiority in a given industrial activity they are unsparing in their efforts.

Although not breaking new ground, this paper draws upon the reservoir of extant literature with a view to contributing to a much larger effort.

This latter program attempts to analyze technology transfer within the Soviet Union, where the technology transfer mechanisms of concern embrace both transfer within that country and between the Soviet Union and other countries. Therefore, the emphasis here will be on technology transfer within the Japanese context; ultimately the program will consider how such insights might apply to the Soviets but no effort to accomplish this end is attempted in this piece.

The discussion here essentially addresses one segment of the Japanese technology transfer, namely, the absorption of technology from external foreign sources (with little attention paid to the intra-Japan aspects). This choice derives from two factors:

- the available literature is rich in the former area but very skimpy in the latter
- soon after the war, the Japanese opted to borrow from the outside, and adapt as needed, to impel their economic growth, rather than depend on their very limited resources (then).

Obviously, the technology transfer contribution to the Japanese economy has been considerable. There is little need to reiterate Japanese excellence and aggressiveness in consumer electronics, steel making, ship building, cameras and optics, textiles, and many other technology-based industries and product lines. A segment of the Japanese growth, particularly in the earlier years immediately after World War II and perhaps extending through the early sixties, placed technical excellence per se in a secondary role relative to the abundant and low-priced Japanese labor supply, the doggedness to survive and adapt accordingly, and the strong support from government agencies. In the past decade or so, and especially as we look out to the future, it

is not a capricious nor random process--particularly if success is enjoyed on many fronts over a long time period. The elaboration of these factors, especially their confluence as a reinforcing whole, is discussed below. It is difficult to state which is most/least critical: the totality is crucial. The sequence moves from factors consciously planned and implemented to those that cannot be easily driven or shaped.

The Government-Industry Relationship

"Japan, Inc." exists. It is alive and well, a remarkably intertwined government-industry association. Accepting this closeness and realizing that such rapport is not unique to Japan but is found in many other industrialized societies, we should go beyond the obvious and probe what ingredients in this interrelationship forged such a potent economic weapon for the Japanese.

The following factors are suggested:

Planning is performed and carried out with unswerving singlemindedness. Periodically, after lengthy and widespread participation, the Economic Planning Agency offers its "master" plan for the Japanese economy. This is not fiat but it does represent a consensus of the major government agencies, mainly the Ministry of International Trade and Industry (MITI) and Ministry of Finance, and the large business organizations including the powerful Keidanren, the umbrella economic federation. When issued, presumably all key parties have agreed on the priorities implying that the resources available to drive the economy will be directed along the lines suggested in the plan. Appropriate incentives and disincentives are included, along with the many minutiae needed to implement the various programs.

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The plan is not burdened with strong conceptual and abstract overtones. It is pragmatic, with a view to achieving the possible without the adherence to any given ideology. This is a key point: the Japanese believe in Nihonism, a set of tenets which draws upon human experience rather than dogma or strong abstract beliefs. It suggests that actions are based on highly pragmatic motivations, including the preservation of harmonious human relations. The goal is tangible and finite, the "isms" are secondary or irrelevant.

The plan's issuance represents a "de facto" rather than a "de jure" position by government and industry. Among other things, it has traditionally suggested which industries should be specifically designated for their high growth potential thereby becoming recipients of favored treatment and, conversely, which industries are viewed as poor candidates for support and "set aside".

With such intentions it is clear to observers, both inside and outside Japan, that the favored designees will receive a diversity of special treatments. We recently see pointed examples of this type of activity as the Japanese government and industry have prepared themselves for the opening of the Japanese domestic market to computer manufacturers in the United States and elsewhere. In anticipation MITI allocated about \$65 million in FY-74 to strengthen the Japanese computer industry by, among other tactics, pairings of top electronics companies to specialize in various sectors of the computer market, such as mainframes and peripherals.

To illustrate a recent variation of the Agency's planning thrust, the February 1972 comprehensive national development plan noted that the following large scale development projects were to be supported:

- Construction of new nationwide networks for high-speed transportation and communication

- Development of large scale industrial projects for construction of bases for agriculture, industry, distribution, and tourism
- Development of projects to preserve the environment, both in urban and rural districts, including land conservation and water resources, etc.

The plan goes into further detail on these three major strategic thrusts. Obviously these programs are less concerned with economic growth per se, rather than the "quality of life" considerations which began to dominate Japanese thinking in the early seventies. Still, we see the sense of pointed direction by which the government chooses to allocate available resources.

In short, the Japanese planning practice is a variation of the outputs emanating from the Soviet GOSPLAN agency, utilizing a consensus technique that an authoritarian society would find difficult to emulate, and with significant differences in success levels. Above all, planning is coordinated and reinforced, perhaps to a unique degree in industrialized societies and distinctly different from the often adversary mode experienced in U.S. government and industry.

It is valuable to pause here to fully realize the potential implications of the influence of the strategic plan conceived and agreed-upon by the highest members of Japanese society. The Japanese social organism is now poised to respond in force, as noted by one prestigious Japanese observer Professor Chie Nakane:

The development of the highly efficient and complex Japanese administrative network, its influence seeping through every section of society, serves all the more successfully to further the effectiveness of the central authority, and by the same token the pre-eminence of authority implants in the Japanese a ready submissiveness alongside fear and hostility.

With the above-mentioned plan in hand, the government resorts to various techniques to ensure the plan's success. These include the following:

- Typically, licenses imported from non-Japanese sources have been closely controlled. All licenses originally had to be approved by the central government, and all were argued relative to their public and private merits. In the immediate postwar period, this control was total; subsequently, in 1959 and even more so in 1968, the stringency has eased. In the fifties, technological imports were growth-inducing, resulting in the phenomenal growth achieved in the next decade.
- Low government interest rates are enjoyed by the designated high growth industries. As will be discussed subsequently, this favoritism is essential in an economy where growth is accomplished via borrowing from commercial banks rather than resorting to the equity market, which is more typical in the United States. Since the Bank of Japan, similar to the U.S. Federal Reserve Banking System, can call upon the official Japanese resources and ultimately regulate the commercial banks that are the direct patrons of industry, the government essentially controls Japanese industry in a more severe life-and-death manner than seen here. When low growth industries are desirous of increased capital, the government can choose not to supply such support. Conversely, assistance can be obtained by the high growth companies to weather bumpy periods by further extension of credit or deferral of debt repayment.

The current example of Toyo Kogyo, the Japanese manufacturer of the rotary engine Mazda automobile, typifies this bias. The company is in serious straits due to the reduced market for its product. Apparently the government and industry, including the banks, are taking extreme steps to assist the company through this difficult and perhaps transitory period.

Top management from Japan's Chamber of Commerce and Industry and the company's financial partner, Sumitomo Bank, have joined with the company to develop a major strategy to help Toyo Kogyo ride out the storm. Indirectly the Sumitomo group has offered assistance on several fronts. For all involved the stakes are great. Of course, the banks are concerned with the payments of their loans, but the government is also influenced by social factors since the company is a major employer in the Hiroshima area and its demise would have serious impact on that community.

- Tax benefits, accelerated depreciation, special allocations of foreign exchange for importation of machinery, equipment, and raw materials have also been used by the Japanese government for its favored industries.
- Foreign investment has traditionally been tightly controlled, beginning with the Foreign Investment Law of 1950, which limited foreign investment to ensure no foreign domination of Japanese industry. This law also helped to ensure the availability of financial resources to carry on trade and industry via licensing agreements, joint ventures, and subsidiary operations. It achieved this end through a number of tactics all aimed at supporting the favorites.
- Besides the numerous open bureaucratic policies the Japanese government influences its industry via a number of more subtle internal ministerial rules and regulations--known as Naiki. The Naiki are internal, decided on case-by-case screening, not made public, communicated verbally

rather than in writing, and transacted on a personal basis. These more obscure rulings arm the government with another powerful tool for administrative guidance.

As contrasted with our more pluralistic system, the Japanese focus is achieved at the expense of segments of their society, such as the consumer and small business. Without placing any value judgments on such priority-setting, the thrust is total and unremitting, as Herman Kahn suggested in his The

Emerging Japanese Superstate:

And it was an almost total commitment to the most advanced and most prestigious areas, rather than straight business calculations of profit and loss, that drove the Japanese economy in the very successful directions it took.

Financing

Whatever other conditions existed to fuel the Japanese growth, certainly no single requisite was more indispensable than the Japanese capacity and simultaneous commitment to wholeheartedly focus their financial resources in the directions agreed upon via the planning process discussed above. The channeling of such resources, openly coupled with implementation on other fronts, systematically funneled the Japanese energies toward the designated opportunities. These facts should be considered:

- Japanese business traditionally depends upon commercial bank credits to obtain its financial resources for capital expansion. It is estimated that their debt-to-equity ratio is about 4:1, which is approximately the reverse of the U.S. situation. This implies that industry need not defer to its stockholder (equity) base, as we often see here. If a private company covers its interest payments, and eventually its principal repayment or reborrowing needs, then it is performing satisfactorily. Considerations of stock appreciation and dividend payment appear to play minimal roles.

- As noted, the Bank of Japan serves as central bank to the Japanese commercial banks exerting great power in the disposition of finances.

- This influence is particularly relevant with respect to the large Japanese business firms, rather than the smaller companies that serve the large industrial groups. Certainly, this tradition derives at least partially from the earlier Zaibatsu role, i.e., major industrial concentration in a close-knit group, that prevailed before and during the war. Although the Zaibatsu concentrations, which all pivoted on a central financial institution, no longer legally exist, the practices still persist even today via informal and personal relationships that tie top executives of banks and industry together. As one example of the bias toward larger firms, in 1967 only one of Japan's total 8,000 bankruptcies was listed on the Japanese stock market.

- The Japanese have traditionally been a frugal people, placing a high percentage of their earnings into savings. This trait is at least partially attributable to their need to accrue financial support after retirement when a low pension is received. This relatively high savings rate allows the banks to physically possess the large financial resources which can then be moved in the manner described above.

* * * * *

The financial configuration described above has accomplished the major goals defined by the series of economic plans generated over the years. Its singlemindedness, however, has succeeded at the sacrifice of the health of smaller companies and particularly those companies or industries not considered "favorites". Also, the high debt-to-equity ratio suggests that the stockholder exerts little leverage on the workings of the business entity. Without placing any value judgments on such priorities, there can be no doubt that the method basically achieved its objectives.

There can also be little doubt that the mechanism of technology transfer and eventual absorption could not have been achieved without the selective and ample funding allowed through this financing system. This scheme did funnel resources to potentially high growth, technology-based industries, allowing them to obtain licenses and equipment and create joint ventures, thereby generating the necessary products and ultimately marketing them. Although it is futile to engage in "what if" exercises, the Japanese technological advance, including its highly effective adaptation of others' technologies, would probably not have been as successful had the more pluralistic practices of our society been in force there--with ultimate divisive impact on financial activities.

Government as R&D Sponsor

The earlier discussion of the government-industry relationship described the closeness of the interaction, and its ultimate pervasive impact on industrial activity. As a key derivative of this relationship, the government is a major patron of R&D activities both by government agencies and by industry, or combinations thereof. Support to advance Japanese technology takes place on a number of fronts:

- Basic and applied R&D is performed by MITI's Agency of Science and Technology.
- A limited number of large programs receive substantial financial backing. The largest of its kind is the effort to produce a high performance computer line. This program began in FY-66 and has received emphasis in anticipation of two trade liberalizing events forthcoming during the following year: in December of 1975 all computers and related equipment will be free of import restrictions, and in April 1976 some liberalization of direct foreign investment will be enacted. To combat the onslaught of American computer companies,

MITI allocated about \$65 million in FY-74 alone to strengthen its domestic computer industry. To achieve this end three groupings of Japanese companies have been created--Hitachi/Fujitsu, Nippon Electric/Toshiba, and MELCO/Ok Electric--to specialize in various segments of computer equipment.

In a somewhat similar manner, MITI allotted about \$12 million in 1974 for eight Japanese companies to develop their integrated circuit capability to better compete with foreign companies.

- Beginning in 1950, important technology development received matching funds from MITI, i.e., MITI matched the private investment, leading to development periods of several years and ultimately a commercial product.

- Low interest rates were available to companies for commercializing Japanese-developed technology.

- Preferential taxation was allowed on a number of criteria.

* * * * *

The protectionist attitude of the Japanese government has chafed numerous U.S. industries. Japan has diligently pursued a policy of protecting its high growth, technology-based industries against the incursions of more highly developed countries, particularly the United States. Through the mid-sixties, this policy imposed only nuisance value to U.S. industry. Toward the late sixties and early seventies, however, our attitude hardened and pressure was exerted that Japan should liberalize its import policies--particularly as its trade surplus rose sharply.

Lifetime Employment

Perhaps this attribute has been more highly publicized than any other in the Japanese success story. It essentially consists of a lifetime mutual

commitment with a pay scale based on age, tenure, and education level. It is most pronounced in the larger firms with more bureaucratic structures. Although one sees some current erosion of this ethic, it undoubtedly still prevails in force with defections in the minority.

The lifetime employment attitude is deeply rooted in Japanese society, reinforced by the postwar reality that unemployment was synonymous with starvation or utter poverty. It was totally natural that the Japanese sense of "family" should dictate a social ethic to protect its populace under the trying conditions of the late forties and early fifties. In this sense there are analogies with the U.S. situation during the Depression.

Given this employment condition, the implications for technology transfer and adaptation within the industrial firms are many and significant:

- Of overriding concern, the employment level, and certainly its male population component, is basically governed by the growth of the company. Normal inter-firm mobility is about nil, with employment changes based on the hiring of new employees (particularly from the colleges by the larger firms), single female employees quitting after marriage (few married women work in industry), and the forced retirement at age 55 or 57 (except for a few top managers). This compulsory retirement policy allows two major benefits: continuing openings and advancement for younger staff, and a flexible labor base from the retirees which can be called upon as needed.

Over the past decade, until the past year or so when the economy encountered its well-publicized problems, total employment levels were increasing, with limitations imposed by the available labor supply and a resulting fear that economic growth might ultimately be restrained by labor shortages (which is a distinct change from the earlier years just after the Second World War). A growing, and even a static, work force suggests the following:

- The worker is willing to accept change, technological or otherwise, since one's job is not in jeopardy if new processes, procedures, or equipment are introduced. When Japanese top management articulate the need for technological change, the organization responds positively. (This general point of adherence to a superior's will is typical of the Japanese vertically-oriented society, as will be discussed in a subsequent section.) Therefore, the workers see technological innovation as an opportunity, not a threat. The environment for technological change is totally benign.
- With some variations, labor costs are fixed and high, implying a high break-even point arguing for high volume production, high productivity, and low unit costs (prices) to compete effectively in domestic and international markets. Under such conditions the best technology available is sought and accepted.
- The flexibility and mobility within a given company are great, particularly compared to a U.S. counterpart. Retraining at all levels is continual and often occurs before changes are effected. The parochialism often associated with craft and trade unions in the United States simply does not exist there. As technological needs change, the labor force is willing to make suitable modifications.

• As a corollary of the last comment, unions have been traditionally weak in Japanese industrial society, as compared to their U.S. counterparts and particularly to the socialistic countries of western Europe. Union issues appear to be totally preoccupied with salary, leaving other aspects of the work scene to the discretion of management. The type of dissension experienced in Vega's Lordstown, Ohio, plant is unknown there*. To complicate matters for the Japanese unions, they are poorly financed and their leaders work for the company. Therefore, it appears that in all respects the union is company-dominated and relatively impotent. (Admittedly, some changes appear to be in the making during the past year or two of rampant inflation, but the basic observation still holds.)

The union weakness is aggravated by its ties to its own company, rather than to peers in other companies. There are no counterparts to the traditional craft and trade unions of the United States and western Europe. Lifetime employment is supportive to technological change in all its ramifications, thereby obviating the difficulties we so often encounter within the U.S. context. The labor force is receptive to change and diligent in its subsequent implementation as advocated by top corporate management.

The "Borrowing" Ethic

Japan has often been depicted as a borrower and copier. Much of this characterization is true, especially as it relates to the years after WW II through the early sixties. The borrowing pace has not slackened: in 1973 Japanese corporations concluded nearly 2,000 contracts for import of foreign technologies and paid royalties amounting to \$725 million. This allocation was 25 percent higher than the comparable payments in the previous year.

* General Motors set up a highly automated production line, ultimately clashing with the union and its younger workers chafing at the high-efficiency demands imposed by GM management.

This ethic is deeply engrained in the Japanese culture, as they have a long tradition of borrowing and adapting from others, particularly the Chinese. When Japan entered its first industrialization stage from 1870 to 1885 at the beginning of the Meiji period, the MITI of that day--the Ministry of Industrial Affairs--spent up to 42 percent of its budget for hiring foreigners. Many Japanese were sent abroad to obtain ideas from others for domestic adaptation. This earlier activity is totally analogous to the visits made by the Japanese since the mid-fifties to seek export markets and learn productivity methods from the United States. These trips, sponsored by the Japanese Productivity Center formed in 1954, have since totalled over 10,000 to the United States alone. So the willingness to seek ideas from western cultures has long and deep roots.

Certainly two events have crystallized the westward orientation: the Japanese destruction in World War II and the opening of Japan when Commodore Perry sailed his "black ships" into Tokyo Bay in 1853. The World War II scene is well-known, but the impact of the Perry voyage is perhaps less apparent. At that time Japan had been totally isolationist for over 250 years under the continuing reign of the Tokugawa family. Toward the middle 1800s strains had developed in the hegemony of this rule, aggravated by imperialist and colonial world trade patterns then developing. Via a number of forces, Japan was being forced to open up its doors, and the Perry visit brought these pressures to a confrontation. The Japanese were confounded by steam-powered vessels which could move against the wind, and ultimately realized that their weapons would be useless against the American warships. Perhaps this recognition of technical inferiority, which eventually led to the decisive change in Japan's relationship with the rest of the world, did much to lay the groundwork for Japan's respect and envy of western technology.

Various Japanese factions took sides in trying to resolve their response to Perry's ultimatum to "open" Japan, concluding with the opening of Japan to the west, loss of power by the Tokugawa clan, and the assumption of major authority by the Emperor Meiji. This, then, began Japan's outward orientation, in contrast to the total inwardness which completely dominated its prior 2-1/2 centuries.

In short, for the past 100 years the west and especially its technology have been overtly viewed as a paragon to be emulated, except for the 1930 to 1945 period of Japanese militarism and attempted conquest.

- To characterize the Japanese as slavish borrowers and adaptors totally demeans their achievement. More precisely they have very selectively chosen those items they wish to borrow, implemented their decisions, and then adapted the borrowings to their particular interests considering what they can do well and what markets are available. Much of the technology obtained was research know-how, rather than product and production knowledge, therefore leaving the Japanese with the task of bridging the R&D to commercialization activities--where they have performed well. Several observers have noted that very often the Japanese have improved the original borrowing leading to a better end product. Certainly in selected areas of electronics, shipbuilding, steelmaking, and textiles, they cannot be slighted for their ingenuity in adapting others' creativity.

* * * * *

The Japanese desire to borrow U.S. technology was apparently matched by U.S. willingness to let them do so. Perhaps several reasons contributed to this attitude with respect to licenses, namely (a) the U.S. did not fear the loss of technical advantage since, typically, older and more mature

technologies were offered, (b) the U.S. was not compelled to set up marketing facilities in unfamiliar territory, particularly right after the war, and therefore the licensing arrangement offered a much simpler alternative, (c) a new market was opened to which the U.S. would normally have little or no access, (d) the Japanese succeeded with their licensing activities, thereby contributing income, often regarded as a bonus, to the American company, and (e) the U.S. did not foresee competitive threats from Japan.

Perhaps to place this brief discussion in better perspective, Americans should realize that much of our early industry was borrowed from others. It would be fair to classify the colonists as poor inventors (with a few exceptions such as Ben Franklin), better innovators, and superb exploiters. With time this balance has shifted but undoubtedly, even today, U.S. industry is still extremely facile at utilizing innovations, wherever generated, and applying them with creativity.

Perhaps the first instance of intercontinental technology transfer occurred in 1789. At that time Samuel Slater, an American colonist who had recently left England, duplicated from memory the innovative textile machinery of Richard Arkwright. Mercantilist England did not allow technicians to leave lest British industrial advances be copied by others. With Slater's diligence, the American textile industry took hold in Rhode Island to become eventually the prototype of the New England textile town.

Some Secular Factors

Whatever the Japanese achieved themselves, in 1945 they were confronted with several realities that forced them to either create or reinforce the characteristics noted above. These include the following considerations:

- After World War II Japan lost all its colonial sources of raw materials from countries it had dominated before and/or during the war. These

included, among others, Korea, Formosa, and Manchukuo. Therefore an already resource-poor country was no longer able to draw upon sources obtained via imperialist or military acquisition.

- Then and since, no Japanese government has been faced with the "guns and butter" decisions that typify the U.S. and Soviet economies, for instance. Industrial expansion was not directed toward military demand and production, the so-called "destructive" industries. This postwar orientation was totally counter to the basic thrust of the decade preceding Japan's military ventures.

Therefore this "no guns" option allowed the resource-poor country to be highly selective and concentrate its technology and trade activities. The less effective path of trade following military expansion/imperialism, as before the war, no longer held. Leaving out any obvious value judgments, this was a reality for the Japanese in the postwar era. From the technology standpoint any technology transfer would be directed along the narrow paths assigned to the designated high growth industries (as described earlier).

Perhaps a more subtle benefit of the "no guns" condition was the continuity in the labor force, particularly for male youth during a major productive period, afforded by the absence of a compulsory conscription national policy. The benefits are several: a larger work force, a more productive work force, less training costs due to turnover, and a hedge against civilian labor shortages.

- Even though the Japanese did not partake in defense manufacturing, they could adapt available outputs from the U.S. defense and space industries. Certainly much of their electronic borrowings from us drew from programs sponsored or accelerated by our own military/space establishment.

The Japanese Culture

Whatever the logic, the persuasiveness, or the force of the arguments presented above, the entire discussion must be weighed within the context of the peculiar nature of the Japanese people and their ambient culture. Much has been written on this subject by various writers, but perhaps the most incisive comments appeared in the recent book by a Japanese sociologist Chie Nakane, Japanese Society. Many of the following comments draw from her insights.

Vertical Relationships. Japanese societal associations are dominated by the vertical relationship which in turn is carried into their industrial world, particularly for the larger organizations:

- The junior/senior relationship is religiously adhered to. Competence defers to age or position with few exceptions. The posturing and detailed protocol, often so ludicrous to a westerner's eyes, is deeply imbued in the Japanese psyche. The tradition has long roots in Japanese history when a highly stratified society diligently observed these amenities.

Two years ago I gave a series of talks to the upper and middle management ranks of a major Japanese corporation. From the seating in the room one could easily tell the age and ranking of the audience: the most senior and prestigious in the front row, and the most junior in the back. Subsequent questioning and discussion were dominated by the senior men with no contribution from the younger staff.

- Implicitly horizontal relationships are few and weak. In most groups, junior men relate to each other only through the leader. Should the leader forfeit his role, for whatever the reason, the group's unity breaks down as the others cannot work in this void. The initiative and independence, so prized in the western and particularly the American culture, is basically nonexistent.

- The leader's role is to motivate those below him. Often leaders are bland and sometimes even incompetent in their specialties yet they may still fill the role if they can provide a wholeness and somehow supply the glue to pull the group together or, as one commentator noted, they "understand with the belly".

- The obedience and sometimes reverence to one's leader is perhaps best illustrated by the favorite literary theme in modern Japan.

The incident of the 47 ronin, which took place in the early 1700s during the Tokugawa period, depicts loyalty of the samurai to their master. A lord was unjustly accused of offending the Emperor and forced to commit suicide--harakiri--and his estate confiscated. His samurai were disenfranchised thereby becoming ronin, which is the term applied to a masterless samurai who no longer has his normal place in Japanese society. To avenge their master's death the ronin went their separate ways and bided their time but secretly planned to kill the highly-placed lord responsible for the injustice meted to their master. Eventually they succeeded in beheading the culprit. For their crime to the government they were permitted to die by harakiri. Today their 47 graves are revered in a quiet temple in Tokyo.

The implications of the vertical relationship are clear: directives received from the leadership position, as top management in industry, are followed without question except under extreme circumstances, and then any such discord is done at the risk of the nonfollower to himself and to the viability of the group. One can extrapolate such thinking from the small group to the company to a nation and, coupled with the unanimity of purpose already discussed, the mechanism for implementation from the top to bottom clearly exerts much leverage.

Consensus. Consensus and unanimity permeate the group relationship, regardless of how one describes a group. Most popular in the business literature is the mechanism of ringi (rin--proposal to superiors, gi--discussion).

Ideas often originate from middle ranks, are brought forward to superiors, and ultimately discussed exhaustively until all parties have a chance to air their opinions. This method is wholly participative, rather than the more typical unilateral dictates from top management downward that characterizes western cultures, particularly our own. As so well documented in the literature, the ringi mechanism is slow in decision and remarkably fast in implementation.

By its very nature it also forces the participants to worry about and decide on matters of great importance, since small decisions could not possibly be exercised by the consensus technique without bottling up the entire organization. Since ringi must involve many people over a relatively long period of time, the strategically meaningful decisions are confronted in this manner and ultimately implemented effectively. In contrast, the western decision ethic is not as selective in priority setting; the ringi mechanism does not allow the Japanese such luxury.

The group attempts, by whatever means possible, to minimize or negate any potential discord between its members. Here the leader's role is particularly critical, as he must be sensitive to the participants and allow them the semblance, if not the substantive participation, to voice minority views. Many Japanese meetings are held to walk through this ritual with little substantive content. As implied above, group identity dominates the individual. It is apparent to all participants that group fulfillment must be achieved at all costs; again, any rebel does so at his own peril.

Since groups relate to other groups in much the same way as the personal vertical relationships depicted above, the dominance of the leader is reinforced in the vertical mode. The system is geared to implementation of his wishes.

The Family. The concept of family far transcends the minimal grouping of father, mother, children, et al. For reasons already suggested the Japanese

nation sees itself as a family relative to other countries, therefore the sense of "national mission"; Japanese companies infuse the same closeness relative to their competition. At the corporate level the various paternalistic measures, such as company housing, company hotels, company hospitals, etc., reinforce this sense of corporate family. As Professor Nakane has noted:

The characteristics of Japanese enterprise as a social group are, first, that the group is itself family-like and, second, that it pervades even the private lives of its employees, for each family joins extensively in the enterprise. These characteristics have been cautiously encouraged by managers and administrators consistently from the Meiji period.

This loyalty and dependence on the family begins early in childhood. One observer has commented that in the United States babies "earn" love while their Japanese counterparts "demand" it. As any close observer of the Japanese culture easily senses, the Japanese baby is spoiled by doting parents and particularly grandparents to an extent rarely seen in western culture. Therefore, the involvement in a dependence upon a family relationship begins early and persists through schooling and then into the industrial environment.

Education. The Japanese are probably the best educated people in the world, with a literacy rate of about 99 percent. Until college, schooling is wholly democratic and the Japanese are diligent students and voracious readers. With the step to college, university education becomes more elitist, and the competition for entry into the top universities totally preoccupies the student. Graduation from top universities is the ticket to employment with the top industrial companies or government agencies.

The incestuous nature of the government-industry relationship, previously described, is reinforced by the clannishness of the top managers, both in government and industry, who seek their own and exclude others. This

undemocratic leaning contributes to the rapport which permeates the cooperation at the highest levels in government, industry, banking, and, to a lesser degree, academia.

One might question whether the events of the past 30 years have greatly impacted Japanese thinking. In early 1974 the Ministry of Education surveyed the population to discern changes in the Japanese attitudes toward life style, values, and the like. The following comments briefly note some of the highlights of that study:

- Basically the traditional sentiment and values of the Japanese, particularly those traits a foreigner associates with their society, have changed little since the war
- Over 80 percent of the respondents still want their superior to take an interest in the worker's personal life, to an extent far transcending the normal relationship we see in the United States
- The "corporate" family was still held in high esteem, with three-quarters of those polled
- The desire for harmony in group relations still persists.

* * * * *

The cultural traits described above do not of themselves argue one way or the other in the technology transfer context. History has shown that they have been perverted to the goals of a military clique, supported by its industrial base, thus unifying a nation in a highly destructive mode. It is only when one considers the other factors described earlier that the Japanese societal characteristics loom so potent in the technology transfer dimension. Given these other conditions, these traits are extremely supportive toward the

national intent and, if that intent is growth-oriented based on technology borrowing and adaptation, then the national cause is reinforced accordingly.

Observations on the Common Wisdom

Perhaps at this point, after viewing various aspects of the Japanese technology transfer phenomenon, it is valuable to deal with some of its "cliches", thereby providing a wrapup and limited summary:

- Japan, Inc.--The closeness, indeed the incestuous nature, of the government-industry relationship in Japan is sometimes compared to the workings of a multinational conglomerate, such as a General Electric, Nestlé, or Philips. This characterization suggests that government and industry work closely together to form commonly-agreed-upon plans that are ultimately implemented by all parties for the common good. Japan, Inc. is, so it is alleged, an all-embracing power that sets economic policy at the national level, provides capital to private industry, institutes and effects incentives and punishments, and generally works as a unifying omnipotent force.

There is much truth to this picture. But there also appears to be relatively little research that has compared the government-industry relationship in Japan relative to its counterparts in other societies. For instance, in countries with one-man rule, as experienced with Salazar of Portugal and Sukarno of Indonesia, their nations' fortunes were much more closely concentrated than in Japan. Within the totalitarian socialistic societies, especially the Soviet Union, party rule is all-powerful and the separation between government and industry is either vague or nonexistent. Even for free-world socialistic countries, such as France, Italy, England, and Denmark, the public and private sectors work closely together, and numerous examples delineate the means by

which a government may bend certain policies to accommodate its domestic industry. Certainly we could easily suggest that a Russia, Inc. or a France, Inc. might be an equally deserving appellation to the countries--and perhaps even more so--of this sometimes pejorative term. Government-industry closeness is not unique to the Japanese society; one can probably argue persuasively that several other industrial countries practice this interrelationship even more assiduously than the Japanese.

- Cheap Labor Supply--After the war, Japanese labor was both cheap and abundant. But after the war, labor all over the world, certainly relative to the United States, was cheap and abundant. In the past decade, the Japanese labor situation has shifted drastically: labor shortages have appeared and Japanese labor is no longer inexpensive--whatever the measuring criteria. Today, labor is much less expensive in India, Africa, Southeast Asia, and Latin America. And if abundance is the criterion, the Indian populace outnumbers the Japanese by a factor of about 6 to 1, and is very low-priced. Probably during the entire postwar period of the past 30 years, Indian labor, to take only one example, has always been considerably less dear than its Japanese counterpart.

Today, Japanese industry is being forced to shift much of its labor-intensive industry to other areas, typically Southeast Asia. It is no longer valid--even if it was previously, and that is most questionable--to suggest that the growth of Japanese industry has been fueled by the exploitation of an underpaid labor reservoir not available elsewhere. Certainly, one cannot single out that resource and cogently argue that Japanese economic gain is attributable to this factor.

- Japan, the Copier--Japan probably will never outlive its reputation as an imitator and adapter of innovations created by others. There is no doubt that Japan did capitalize on the license mechanism to more quickly set up its ruined industries. But that sort of borrowing is not unique:

Great Britain selectively capitalized on innovations from the European continent to help initiate its own industrial revolution, and the American colonies, later the United States, freely and sometimes illicitly "borrowed" others' ideas and adapted them to the peculiarities of the American culture. Such transfer has ample historical precedent.

Basically, the availability of licenses was open to all companies and countries willing and able to negotiate satisfactory contracts with the originators. Although the Japanese were certainly most diligent in pursuing this particular route, licensing was not a closed avenue to others. Indeed, perhaps one can argue that the licensing route, and its variations, could be more easily effected between the United States and west European partners. Certainly licensing has contributed significantly to the Japanese resurgence but it, too, was available to others.

- The "New Equipment" Rationalization--Although Japan's capital stock was devastated during the war, the subsequent magnanimity of the United States ultimately staked the Japanese to a partial industrial edge that persists to this day, and possibly into the future. In particular, we placed new equipment in damaged or totally new factories. Our own industry simultaneously did not enjoy such "luxury". It had to live with equipment which was only discarded after the normal sequence of decisions influenced by availability of new and better equipment, capital-to-labor efficiencies, competitive factors, tax regulations as imposed by the Internal Revenue Service (IRS), etc. Therefore, some argue, U.S. industry was put at a disadvantage--to be experienced much later--due to our winning the war.

This reasoning is, at best, self serving and, at worst, wrong. Its proponents have not confronted several issues, or have chosen to ignore them:

- An American company can discard any piece of equipment at any time in the equipment's life. Management is

under no compulsion to adhere to the depreciation life schedule suggested by the IRS tables. The equipment replacement decision is swayed by IRS regulations only when the allowable depreciation costs are deducted as part of the total costs of doing business in a given year. Obviously, such a consideration may enter into the equipment substitution decision, but it is not an absolute constraint, rather it is only one input into a typically complex overall decision.

- If a company is especially sensitive to its earnings record in deference to the stockholder community, it will attempt to maximize earnings and might be particularly concerned with allowable IRS depreciation costs. On the other hand, the stock market is not an omnipotent god, even in the United States, forcing management to make decisions only to placate stockholders' interests. When companies are doing very well, or even for that matter when they are doing very poorly, the influence of depreciation schedules is probably negligible. Whatever the circumstances, it is a moot point whether depreciation schedules significantly modify the behavior of managements in their equipment replacement policies. Perhaps in marginal situations, where the arguments for and against such substitution stack up about equally, IRS regulations may tilt the scale one way or the other. However, these are special circumstances.
- More likely the equipment replacement decision within the United States is viewed as a major perturbation in the

production sequence, particularly for conservative industries. For instance, it appears that many sectors of the U.S. electronics industry are motivated mainly by the availability of better equipment, rather than the depreciation schedule, in resolving their equipment purchase decisions.

Ultimately, the replacement of equipment involves the human element, where U.S. unions typically exert strong influence. When computers were first making their mark about 20 years ago, it was argued by some that more automation would lead to fewer jobs. Although that argument has been refuted, it did cast a shadow on associated decisions. This loss-of-job consideration, does not enter into Japanese thinking and may actually be a most potent factor on the Japanese scene.

The impact of Japan's newer equipment upon its ultimate commercial successes is, at best, moot. Certainly any simplistic one-to-one attribution is totally naive, since examples can be cited in other countries, such as the Soviet Union, where the purchase and installation of new equipments have not resulted in industrial superiority. This entire argument, and its more recent offshoot of more liberal depreciation policies now in effect in Japan, should be viewed most critically.

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