

Japan's Role in Technology Transfer in Indonesia*

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INTRODUCTION

It is gradually recognized that a country's capacity to compete in international markets is increasingly determined by the level of its technological development. The development of technological capabilities requires conscious and sustained efforts by both firms and government in that country. Firms contribute to technological development through their choices in products and production techniques, through their R & D activities, through the training of their workers, and through their linkages with other firms. Government contribution is primarily by her efforts to establish a strong science and technology infrastructure (educational/engineering and research institutes), through her technology policies, education policies, investment policies and trade policies.

Technological capabilities refer to the whole range of skills needed to operate industry, and any gain in these skills is regarded as technological progress (Lall, 1990: 19). In general there are two sources for this capabilities: first, domestic sources through R & D efforts, education and training,

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second, foreign sources through import (technology transfer). This paper concentrates on the second source, which is becoming more important due to its impact in strengthening domestic technological capabilities or weakening it in a sense that imported technology increases the country's dependence on foreign sources. Thus, the question of technology transfer, i.e. how it is transferred, terms of transfer and effects of the transfer become increasingly critical to economic development.

The international transfer of technology takes place when knowledge in one country is communicated to people in another country, for use there. Since technology is a body of knowledge transferred by a learning process, then the successful transfer is determined both by the complexity of the knowledge involved and the initial capabilities of the recipient. If these two aspects matched each other, then the transfer becomes easier, quicker and smoother; but if there is a gap, certain efforts must be made, generally in the form of training and education. Thus, training and education are not just for promoting domestic technological efforts but they also served as an indicator of absorptive capacity.

The resumption of Indonesia - Japan relations after World War II was made possible by Japan's willingness to pay reparation payments ("pampasan perang"). During the last decades economic relations have included trade, investment and economic

cooperation. There are elements of technology transfer in these various aspects of economic relations.

The purpose of this paper is to describe the role of Japan in technology transfer in Indonesia. The characteristics of R&D being undertaken in Japan is oriented toward development of the technologies which would lead to commercial use and toward the dissemination of new technologies. The fact that Japan's trade balance in technology that is related only to new contracts has been in export surplus since 1971 may indicate that Japan's competitive position in technology trade has been improving (Tamura and Urata, 1988). Thus knowing the role of Japan in technology transfer in Southeast Asia becomes an interesting issue of concern to the host country.

This paper consists of two parts, the first part deals mainly with secondary data and focuses around both the unpackaged transfer and the packaged transfer of technology. The unpackaged transfer encompasses Japanese technical assistance to Indonesia and Indonesians studying in Japan with scholarships funded by the Japanese government. Students and trainees returning home after having completed their education and training can contribute to their country's capacity to absorb advanced technologies. Technologies are also transferred through technical licensing agreements from the Japanese licensor to the Indonesian licensee.

The packaged transfer of technology brought into Indonesia through Japanese foreign direct investment. Both the unpackaged

and the packaged transfer discussed in this paper serve as an indicator of the extent of the international transfer of technology from Japan to Indonesia. Technology embodied in capital goods are transferred into host country through import. Thus, Japan-Indonesia trade becomes an important source to look for.

The second part presents some illustrations of an intra-organizational transfer (through training programmes for the work force) as well as inter-organizational transfer (through subcontracting). This part is based on primary data i.e., interviews with the actual actors of the transfer process namely the Indonesian workers/managers and Japanese experts/managers. Both views and perceptions were considered as well as recent studies on the same or related topics.

In the last section, some conclusions are drawn regarding the Japanese role in technology transfer in Indonesia.

UNPACKAGED TRANSFER

In general, there are two channels for technology transfer: **unpackaged transfer**, which consists of a wide range of activities in which the various elements of technology can be acquired independently of control and ownership of the sources of suppliers. The second is the **packaged transfer** where foreign capital is combined with technology, management, marketing and financial skills in one package.

There are many forms of unpackaged transfers, such as through the published information, international seminars, technical services, research institutes, education & training, technology contract, turn-key arrangements and technical licensing agreements. Published information (journals, books, etc) and international seminars are increasing rapidly and are also becoming an important source of foreign technologies.

The limitation of Indonesian's absorptive capacity regarding published informations from Japan's sources is due to the language barrier and the access to that information itself. Since Japanese language is not taught in Indonesian's schools (such as English), only a limited number of people can benefited.

The purpose of education and training is to increase the skills and knowledge, which could be done by sending students/trainees to Japan or through technical assistance provided by Japanese experts. There is an increasing number of Indonesian students in Japan as well as trainees (Table-1).

Since the students are free to choose their field of study it is hard to recognize the specific branch of knowledge which is dominated by Japanese graduates. Trainees from Indonesia to Japan is almost 450 persons each year in the various fields such as agriculture, construction, transportation, telecommunication, nuclear power.

Table-1 Number of students & trainees to Japan and Japanese Experts in Indonesia

| Year | Number of students 1) | Number of trainees 2) | Number of Experts 2) |
|-------------|-----------------------|-----------------------|----------------------|
| 1964 - 1974 | 139 | | |
| 1975 - 1984 | 339 | 4828 ³ | 1784 ³ |
| 1985 | 53 | 573 | 192 |
| 1986 | 56 | 513 | 245 |
| 1987 | 87 | 539 | 297 |
| 1988 | 92 | 610 | 371 |
| 1989 | 166 | 674 | 316 |

1) Embassy source, only on government program

2) Japan International Cooperation Agency (JICA) source

3) Accumulated figure up to 1984

In regard to Japanese experts there are two types of them; one is the experts who are individually assigned in institutions of the recipient governments as technical or administrative advisors and the other type is experts who are assigned as a member of technical advisors to training centers or institutes established by the project-type technical cooperation in Japan. These experts are active in various fields such as agriculture, forestry, fisheries, medicine, civil engineering, transportation, telecommunication, mining, manufacturing, etc.

Since Indonesia is establishing cooperation with countries all over the world, unpackaged inflows of technologies come from

various sources. From the comparative figures in Table-2, it is clear that Japan plays an important role as a source of technology.

Table-2 Number of students, trainees, graduates, experts and others from various countries to Indonesia in 1989-1990

| Countries | Number of students 1) | Others 2) | Number of experts 3) | Number of Graduates |
|----------------|-----------------------|-----------|----------------------|---------------------|
| Asia | | | | |
| Japan | 166 | 37 | 103 | 34 |
| South Korea | 48 | 4 | 1 | - |
| Singapore | 17 | 29 | - | - |
| Malaysia | 37 | 31 | - | - |
| Philippines | 69 | 33 | - | - |
| Thailand | 16 | 16 | - | 1 |
| India | 2 | 2 | 1 | - |
| Others Asia | - | 21 | - | - |
| Africa | - | 7 | - | - |
| Australia | 339 | 70 | 66 | 30 |
| New Zealand | 4 | 2 | - | - |
| America | | | | |
| USA | 217 | 29 | 29 | 90 |
| Canada | 75 | 5 | 14 | 10 |
| Others America | - | - | 2 | - |
| Europe | | | | |
| United Kingdom | 194 | 13 | 101 | 5 |
| France | 116 | 10 | 6 | 11 |
| Netherlands | 116 | 30 | 48 | 7 |
| West Germany | 89 | 23 | 38 | 8 |
| Belgium | 12 | 1 | 8 | - |
| Others Europe | 8 | 19 | 24 | - |

Source : Ministry of Education, Bureau of Overseas Cooperation, Annual Report 1889-1990

- 1) Including trainees. Period of study ranging from 2 weeks until 4 years.
- 2) Conferences, Seminars, Workshops, Short visits.
- 3) Period of stay: 1 week - 2 years. This figures including language teachers.

For training and education, the four top countries are Australia, USA, United Kingdom and Japan. Majority of experts came from Japan, United Kingdom, Australia and Netherlands. As for short visits (seminars, conferences) the chosen countries are Australia, Japan, Philippines and Malaysia. Until 1990, the majority of graduates are coming from USA, Japan, Australia and France. The above informations indicated that Australia and Japan are the chosen countries fro studying, short visits and source of experts. Further investigation showed that many of the experts from the United Kingdom and Australia are English teachers, thus it leaves Japan as a dominant source of technical experts.

Another form of unpackaged transfer is technical licensing agreements which generally implies less control, as compared to equity investment. On the other side, licensing required greater absorptive capacity in the host country or the transfer is limited to simpler technology. It is estimated that at least 85%, if not 90% of all technology license transactions originate from just five countries: the United States, Japan, Germany, the United Kingdom and France (UNCTAD/Sarec Project, 1992).

Unfortunately, according to Jetro's (Japan External Trade Organizations) source there is no such figure on Indonesia. The study from the George Washington University (Institute for Sino-Soviet Studies) in 1986 on Technology Transfer and Human Factors in Indonesia and Thailand found that more technology licensing is done by Japanese than by American firms. Furthermore,

the study concluded that:

"Most licensees are affiliated firms, and it is not clear if they receive much technical assistance or human resource development which they would not have gotten in any case. The contribution to human resource development via licensing and associated assistance to independent licensees is not yet an important means of technology transfer by either nation".

This conclusion about affiliated firms as a licensee is still relevant to Indonesian case, particularly in automotive sector.

According to Hill, the licensing payments to Japanese manufacturing firms ranging from Yen 3.5 billion in 1978 to Yen 7.6 billion in 1980 (US\$ 17 million and US\$ 33 million respectively at the prevailing exchange rates), as compared to a realised cumulative Japanese equity investment in manufacturing of US\$ 225 million in 1977 (Hill, 1988).

Informations on education & training and licensing agreements showed an increase in Japanese assistances to strengthen the domestic source through unpackaged transfer, which in turn will improve the absorptive capacity of foreign technology.

DEVELOPMENT ASSISTANCE

The Official Development Assistance from Japan including grant, technical assistance and loans. The Japanese government's overseas assistance particularly emphasizes technology transfer (OECD, 1987) Technical Assistance covers the transfer of

technology and technical knowledge and is channelled through the Japanese International Cooperation Agency (JICA). Under this programmes, survey teams are sent for planning, resource surveys, feasibility studies and project design, which, incidentally give practical training for host country managers and professionals.

Specifically, for this purpose, JICA: 1) invites people from developing countries for technical training training in Japan; 2) dispatches Japanese experts and junior experts; 3) dispatches survey teams to help in formulating development plans and projects; 4) recruits and trains Japanese experts to be dispatched abroad; and 5) supplies necessary equipment for technical cooperation.

It seems that JICA focuses more on technology specific training and project related financing. The growing numbers of trainees and experts under this program is already presented in Table-1 above.

Official Economic Cooperation is channelled through the Overseas Economic Cooperation Fund (OECF), which engaged in providing the government or governmental agencies in developing countries with loans on concessional terms which are intended to be utilized for various types of development projects (OECF, 1989).

The loan to Indonesia extended by OECF since 1968 has been growing in amount with cumulative commitment of Yen 1,529 billion

in 1989 (including loan given through IGGI), comprises nearly one fifth of the total amount of OECF Loan to the developing countries of the world.

Table-3 OECF Loan 1968-1989 (Yen million)

| Year | On IGGI basis | Non-IGGI basis | Total |
|------|---------------|----------------|--------|
| 1968 | 14400 | | 14400 |
| 1969 | 19800 | | 19800 |
| 1970 | 18216 | | 18216 |
| 1971 | 23400 | | 23400 |
| 1972 | 27400 | | 27400 |
| 1973 | 29100 | 23000 | 52100 |
| 1974 | 41000 | 95000 | 136000 |
| 1975 | 41000 | | 41000 |
| 1976 | 41000 | 26250 | 67250 |
| 1977 | 49000 | 6500 | 55500 |
| 1978 | 54750 | 35300 | 90050 |
| 1979 | 55000 | 33000 | 88000 |
| 1980 | 58000 | 13230 | 71230 |
| 1982 | 63170 | | 63170 |
| 1983 | 67500 | | 67500 |
| 1984 | 71600 | | 71600 |
| 1985 | 75400 | | 75400 |
| 1986 | 80000 | | 80000 |
| 1987 | 88000 | | 88000 |
| 1988 | 176129 | 21500 | 197629 |
| 1989 | 159011 | 19396 | 178407 |

Source: The Overseas Economic Cooperation Fund, Japan's Contribution to Economic Development in Indonesia through OECF Loan, Dec., 1989.

Among the features of this loan that forwarded by OECF, is the great contribution it made to promote the technology transfer. Projects implementation and later on the maintenance of completed plants and facilities need adequate technology and for this purpose necessary training for local personnel is conducted by consultants and contractors in the form of on-the-job

training, overseas training, dispatch of guidance engineers, etc.

Types of loan provided by OECF covering project loan, sector loan, engineering service loan, financial intermediary loan, commodity loan and sector program loan. Table-3 presented the growth of OECF loan to Indonesia since 1968. Since this type of loan brings along the technology needed by the projects, the growth of OECF loan also indicates the growth of technology from Japan. According to OECF's source this kind of transfer is successful as measured by the decreasing man-months of foreign consultants. The average man-months now is 30:70 for foreign and local consultants, comparing with 60:40 for foreign and local consultants 15 years ago.

FOREIGN DIRECT INVESTMENT

Foreign Direct Investment by Transnational Corporations meant the transplanting of an industry from a country to another and brought together capital, management and technology in one package. Foreign Direct Investment is the major channel of technology imports, its pattern and composition reflected the country's technology flows.

Japan and the East Asian Newly Industrializing Economies (NIEs) generated the largest payment surpluses of the world economy which has facilitated an accelerated flow of investment from Japan and the NIEs in recent years, mostly to the East and Southeast Asian developing economies (U.N, 1991: 14). Japanese

investment overseas after 1985 showed the shift from the Asian NIEs, particularly Korea and Taiwan, to the ASEAN countries. At present most Japanese investment in the ASEAN countries are large capital and technology-intensive operations (Thee, 1992); but until 1989, labor intensive industries tended to be concentrated in the developing ASEAN countries (Table-4).

Table-4 Japanese Investment by Country and by Industry

| Country | Hongkong | Korea | Singapore | Taiwan | Indonesia | Malaysia | Philippines | Thailand |
|-----------------------------------|---|--|---|---|--|--|---------------------------------------|--|
| Top Five Industry | Wholesale (include electric) Trade Finance/Bank Storage | Electric Chemicals Machinery Textiles Automobile/Parts | Wholesale Electric Chemicals Finance/Bank Storage | Electric Wholesale Chemicals Machinery Automobile/Parts | Chemicals Finance/Bank Automobile/Parts Machinery Electric | Electric Wholesale Chemicals Service Trade | Trade Chemicals Electric Service Food | Wholesale Electric Food Chemicals Textiles |
| Japanese | 87: 1,072 | 647 | 494 | 367 | 545 | 163 | 72 | 250 |
| Direct Investment (US \$ million) | 88: 1,662 | 483 | 747 | 372 | 586 | 387 | 134 | 859 |
| | 89: 1,898 | 606 | 1,902 | 494 | 631 | 673 | 204 | 1,276 |

Source : Toyo Keizai Data Book, 1989; Ministry of Finance economic data, 1990
 Quoted from : Tachiki, Dennis S. Going Transnational, Japanese Subsidiaries in the Asia-Pacific Region, RIM, Mitsui Research Institute, Nov. 1990

Japan's overseas strategy is not only in the form of direct investment but also included technical tie-ups, production cooperation and OEM (Original Equipment Manufacturing (Tran, 1989); or classified into business tie-ups, technological tie-ups, production cooperation and local production (Nakakita, 1988). By local production meant setting up of overseas subsidiary for

the purpose of overseas production. Both studies concluded that for ASEAN (Indonesia) the dominant form is direct investment.

There are two particular reasons for Japanese foreign investment to Indonesia, first, the rapidly rising real wages in Japan rendered many labor-intensive industries uncompetitive, and foreign investment was seen as a means of utilizing accumulated managerial and technical expertise in these industries. Secondly, the Japanese government increasingly came to see foreign investment as an important means of fulfilling the country's supply security objectives, a factor which explains several large Japanese investments in resource base projects. (Hall Hill, 1988). The growth of Japanese Direct Investment in Indonesia is presented in Table-5.

Table-5 Japanese Direct Investment in Indonesia (US\$ million)

| Fiscal Year | New Projects | | Expansion | |
|-------------|--------------|------------|-----------|------------|
| | N.P | Investment | N.P | Investment |
| 1983/84 | 9 | 395.8 | 16 | 267.3 |
| 1984/85 | 5 | 51.6 | 16 | 88.9 |
| 1985/86 | 8 | 53.6 | 12 | 122.6 |
| 1986/87 | 8 | 248.9 | 16 | 87.6 |
| 1987/88 | 9 | 31.4 | 23 | 286.9 |
| 1988/89 | 23 | 244.6 | 19 | 120.8 |
| 1989/90 | 67 | 624.3 | 45 | 418.5 |
| 1990/91 | 83 | 1.316.4 | 55 | 808.5 |

Source: Capital Investment Coordination Board (BKPM), figures based on government's approved projects.

N.P = Number of Projects

The number of new projects as well as the amount of money invested showed an increase. If in fiscal year 1987/1988, the investment in new projects fall, but existing firms made an

expansion.

Table-6 presents a sectoral figure of Japanese Approved Investment. This accumulated figure shows that more than 70% of projects and more than 90% of the investment values are in manufacturing industries. The largest investment is in basic metals followed by metal goods, chemicals, and of textiles respectively.

Table-6 Japanese Direct Investment in Indonesia (1967 - 1991)

| Sector | Number of Projects | Investment Plan | | | | Realization | | |
|---------------------|--------------------|------------------|------------------|-------------------|-------------------|-----------------|------------------|------------------|
| | | Equity Cap. | | Foreign Loan | Total | Equity Capital* | Foreign Loan | Total |
| | | Ind. | Japan | | | | | |
| Agriculture | 8 | 2.306 | 4.674 | 18.364 | 25.344 | 1.822 | 3.597 | 5.419 |
| Forestry | 23 | 44.485 | 55.265 | 139.477 | 239.227 | 8.860 | 19.719 | 28.579 |
| Fishery | 60 | 31.243 | 76.531 | 127.405 | 235.179 | 10.449 | 15.387 | 25.836 |
| Mining | 1 | 1.020 | 980 | 600 | 2.600 | - | - | - |
| Food Industry | 34 | 49.139 | 162.823 | 272.375 | 484.337 | 28.355 | 41.668 | 70.023 |
| Textile Industry | 135 | 248.773 | 821.344 | 1.964.410 | 3.034.527 | 121.669 | 277.299 | 398.968 |
| Wood Industry | 39 | 23.362 | 30.429 | 131.545 | 185.336 | 4.830 | 8.029 | 12.859 |
| Paper Industry | 12 | 13.176 | 18.476 | 21.850 | 53.502 | 2.707 | 600 | 3.307 |
| Chemical Industry | 114 | 284.571 | 504.861 | 1.723.782 | 2.513.214 | 31.757 | 78.821 | 110.578 |
| Non Metal Industry | 40 | 173.640 | 214.561 | 1.428.444 | 1.816.645 | 37.955 | 200.496 | 238.451 |
| Basic Metal Ind. | 27 | 472.489 | 1.057.257 | 3.395.442 | 4.925.188 | 285.292 | 1.266.625 | 1.551.917 |
| Metal Good Industry | 217 | 558.764 | 677.848 | 2.096.482 | 3.333.094 | 79.541 | 166.705 | 246.246 |
| Other Industry | 7 | 3.316 | 21.409 | 9.758 | 34.483 | 825 | 1.000 | 12.267 |
| Construction | 38 | 13.495 | 25.671 | 11.166 | 50.332 | 8.367 | 3.900 | 8.044 |
| Trade | 12 | 7.940 | 12.047 | 31.650 | 51.637 | 1.044 | 7.000 | 29.537 |
| Hotel & Restaurant | 19 | 9.441 | 26.983 | 118.592 | 155.016 | 5.420 | 24.117 | 9.116 |
| Transportation | 18 | 12.760 | 12.840 | 42.000 | 67.600 | 1.176 | 7.940 | 67.296 |
| Real Estate | 38 | 84.808 | 84.156 | 462.800 | 631.764 | 17.796 | 49.500 | 2.960 |
| Services | 3 | 3.020 | 7.680 | 40.300 | 51.000 | 2.960 | - | - |
| Total | 845 | 2.037.748 | 3.815.835 | 17.890.025 | 17.890.025 | 650.825 | 2.172.403 | 2.823.228 |

* Not included Indonesia partner equity.

The extent of Japanese role in Indonesian foreign investment can be evaluated if we compare Japan's investment with investments from other countries. Comparative figure with other countries' investment are presented in recapitulation figures (Table 7) below :

Table-7 Recapitulation of foreign investment by country

| Country | Number of Projects | Investment Plan | | | Realization | | | |
|----------------|--------------------|-----------------|-----------|--------------|-------------|---------|-----------|-----------|
| | | Equity Cap. | | Foreign Loan | Total | Equity* | Loan | Total |
| | | Ind. | Japan | | | | | |
| Asia | 1848 | 3.279.781 | 6.205.391 | 19.988.914 | 29.474.086 | 915.325 | 2.870.213 | 3.785.538 |
| Japan | 845 | 2.037.748 | 3.815.835 | 12.036.442 | 17.890.025 | 650.825 | 2.172.403 | 2.823.228 |
| Hongkong | 349 | 525.298 | 1.026.555 | 3.221.958 | 4.773.811 | 183.570 | 402.821 | 586.391 |
| South Korea | 241 | 193.656 | 408.878 | 1.277.139 | 1.879.673 | 43.000 | 64.516 | 107.516 |
| Taiwan | 195 | 288.390 | 427.512 | 1.217.014 | 1.932.916 | 11.624 | 20.726 | 32.350 |
| Thailand | 23 | 22.888 | 47.712 | 51.864 | 122.464 | 4.074 | 200 | 4.274 |
| Singapur | 146 | 142.859 | 209.926 | 1.599.956 | 1.952.741 | 15.741 | 44.857 | 60.598 |
| Philippina | 7 | 3.485 | 12.792 | 232.081 | 248.358 | 1.605 | - | 1.605 |
| Malaysia | 24 | 18.063 | 41.765 | 64.290 | 124.118 | 4.560 | 7.000 | 11.560 |
| India | 16 | 40.827 | 90.760 | 287.393 | 418.980 | 326 | - | 326 |
| Others Asia | 2 | 6.567 | 123.656 | 777 | 131.000 | - | - | - |
| Africa | 11 | 7.494 | 29.472 | 151.521 | 188.487 | 4.112 | 14.519 | 18.631 |
| Australia | 208 | 107.651 | 321.541 | 3.452.548 | 3.881.740 | 22.354 | 143.171 | 165.525 |
| Others Oceania | 6 | 6.470 | 3.742 | 10.623 | 20.835 | 630 | - | 630 |
| America | | | | | | | | |
| USA | 264 | 705.523 | 864.336 | 3.297.343 | 4.867.202 | 93.566 | 161.607 | 255.173 |
| Canada | 18 | 3.764 | 63.248 | 232.378 | 299.390 | 1.308 | 4.644 | 5.952 |
| Others America | 39 | 25.151 | 75.668 | 306.201 | 407.020 | 8.167 | 20.660 | 28.827 |
| Europe | | | | | | | | |
| United Kingdom | 152 | 98.734 | 290.097 | 469.163 | 857.994 | 55.651 | 41.373 | 97.024 |
| Netherlands | 138 | 187.761 | 655.660 | 1.050.327 | 1.893.748 | 59.756 | 67.330 | 127.086 |
| France | 50 | 96.431 | 68.904 | 210.052 | 375.387 | 15.325 | 37.719 | 53.044 |
| West Germany | 101 | 295.207 | 450.228 | 1.568.575 | 2.314.010 | 46.881 | 46.614 | 93.495 |
| Belgium | 54 | 346.950 | 520.865 | 1.356.299 | 2.224.114 | 45.461 | 244.316 | 289.777 |
| Switzerland | 46 | 70.510 | 210.690 | 523.099 | 804.299 | 28.655 | 17.889 | 46.544 |
| Denmark | 25 | 26.928 | 29.960 | 113.161 | 170.049 | 2.338 | 4.050 | 6.388 |
| Norway | 14 | 25.740 | 39.147 | 187.386 | 252.273 | 3.825 | 13.656 | 17.481 |
| Others Europe | 23 | 31.577 | 42.911 | 127.906 | 202.394 | 3.151 | 3.465 | 6.616 |
| Various Area | 357 | 982.938 | 3.823.057 | 10.105.398 | 14.911.393 | 835.864 | 1.370.416 | 2.206.280 |

Source : Bank Indonesia, Foreign Investment, 1967 - March 31, 1991, 1991
 * Not included Indonesian partner's capital.

The table shows that Japan is the biggest investors in Indonesia, both by number of projects (25.2%), by investment plan (28.3%) and by the realized investment (40.1%).

JAPAN - INDONESIA TRADE

Trade between nations can be use as an indicator of the position of each nation toward each other. If one country imports most of its capital goods from another country, then it can be said that this country is technically dependent on the other. Table-8 below presents the Japan-Indonesia trade in 1990.

Indonesia's export to Japan is dominated by Mineral Fuels & Lubricants (72.3%), followed by manufactured goods (12.5%), then Food & Live Animals (6%). Thus, more than 70% of the total export to Japan contributed by raw materials. In regard to manufactured goods, most likely that the products of Japan's manufacturing subsidiaries in Indonesia were shipped back to Japanese market.

Import from Japan is dominated by machinery & transport equipment (64.7%), followed by manufactured goods (17.7%) and chemicals (11.3%). Although the trade balance as a whole showed surplus for Indonesia, the information indicated that Indonesia is dependent on Japanese technology (reflected in the amount of machinery & equipment imported), and on the other side, Japan's interest in Indonesia is raw materials.

Table-8 Japan-Indonesia Trade (in ton and US\$ 000)

| Item | Export | | Import | |
|---------------------------------|------------|------------|---------|-----------|
| | Weight | Value | Weight | Value |
| Food & Live Animals | 504.923 | 649.990 | 29.644 | 16.487 |
| Beverages & Tobacco | 5.342 | 3.743 | 66 | 152 |
| Crude Materials & Inedible | 1.988.099 | 602.686 | 97.873 | 82.420 |
| Mineral fuels, lubricants | 50.773.275 | 7.897.723 | 40.565 | 13.149 |
| Animal & Veg. oils & Fats | 9.715 | 6.828 | 9.032 | 4.574 |
| Chemicals | 92.391 | 41.648 | 435.995 | 599.081 |
| Manufactured Goods | 282.198 | 1.369.389 | 819.919 | 942.074 |
| Machinery & Transport Equipment | 13.151 | 34.092 | 528.109 | 3.432.680 |
| Misc. Manufactured Articles | 67.723 | 312.380 | 15.809 | 208.979 |
| Commodities & Transaction | 0,3 | 3.772 | 99 | 250 |
| Total (Value) | | 10.922.251 | | 5.299.846 |

Source: Central Bureau of Statistics, Export-Import Indonesia, 1990.

INTRA-ORGANIZATIONAL TRANSFER

Intra-organizational transfer means the transfer of technology within an organization. There are two models that can be used in this paper; first the model from Tachiki's study (Going Transnational, 1990), which stresses on the soft aspects

of technology (know-how of management practices and production methods). The framework he used provided by two dimensions, namely the production process-cycle (consists of four basic categories: R&D, design and engineering, manufacturing, marketing and sales) and the national capacity for technology innovation (grouped into management skills, macroeconomic policies, sociotechnical factors, science and technology policies). The latter dimension is more dependent on the recipients' capacity & capabilities, government policies and environment conditions.

Each functional division in the production process cycle contributes to the quality and quantity of technology transfers. By examining the interaction capacity for technological innovation, we can gain a better understanding of how managers make a choice whether to transfer technologies and what opportunities are foregone when they do not transfer it.

Thus, regarding the technology transfer, discussion must be expanded to include not only the manufacturing division, but the R & D, design & engineering and sales & marketing divisions as well. Put it in another way, the discussion must covered the horizontal differentiation of a core division of labor in a manufacturing organization.

Secondly is from the study of Tran Van Tho, which divided technology into three types (Tran, 1989):

- 1) Production technology which is the combination of equipments and operators. The transfer of this operator level technology requires the transfer of equipments as well as the knowledge and methods to operate them.
- 2) Administration technology which consists of knowhow in many forms of administration regarding the production process (inventories, quality control, schedule control, facility administration, etc). The transfer of this middle manager level technology involves the training and education of engineers and managers at middle management levels.
- 3) Management knowhow which is embodied in the headquarters involving the operations of a factory or a number of factories and conduct the strategies concerning planning, marketing, financial and other activities. The transfer of this top-management level technology requires the training of high-level managers by gradually allow them to replace the top class managerial posts initially held by staff from the TNC's home country.

Tran's hypothesized that production and administration technology are transferred easily due to most of the employee and staff at these stages should be recruited from domestic source. Transfer of management knowhow is more complicated due to the requirements and abilities the persons must possessed. In addition top management staff of the affiliates are usually members of the Board of Directors and the composition of this Board is proportional to the ownership structure.

To give an illustrations of this kind of transfer (within organization), two cases are presented, the first is of OECF project and the other is a joint venture company. Tachiki's model is quite applicable to the case of OECF project, while Tran's model is more appropriate to the joint venture's case.

Case-1: The Eastern Flood Control.

Before the loan is given to the institution who owns the project, there has to be a consultant's work covering the study stage, the detailed design stage and later on the supervision stage. This Consultant's work is followed by Construction work through an international competitive bidding. The transfer of technology is hopefully exist in both the Consultant's work as well as the Construction work. This case study focused only on the Consultant's work.

The Consultant for The Eastern Flood Control is a consortium of one Japanese consulting firm and two local ones. Each stage of the Consultant's work is done together. By working together knowledge of participants are shared with each other, thus by this method transferred of knowledge must be well done. The interviews with the Indonesian's managers reveals that :

- 1) The most important stage is the detailed design. At this stage the local managers felt that they learned something from their Japanese counterparts, particularly the systematic breakdown from the study stage. Preparing tender documents and tender evaluation are included in this stage.
- 2) The study stage is the next important stage because at this stage they work together intensively and getting to know each other better. Due to technical know-how, local managers perceived that in this stage, there's no knowledge-transfer,

but from this stage they learned their differences toward work from their Japanese counterparts.

- 3) Japanese counterparts is quite open when they are asked, but they are not giving lectures of formal trainings. It's up to the local managers to acquire knowledge from the Japanese whenever he feels he needs.
- 4) The supervision stage is the stage where the consultant's supervising the construction work. Actually there's not much work here, especially the contractor's accountability is toward the institution who owns the projects and not to the consultant. Regarding the hardware, for this projects the only imported hardware is the pumps.

From the Japanese side, critiques for local managers, mainly due to their behavior toward administrative work. Local managers are not doing this type of work properly, even the filing systems are not good enough. This view is in line with the OECF's finding of the socio-cultural aspect and the inadequate administrative and legal systems as the main factors determining project's failure.

Case 2: Joint Venture Company.

This company was established in 1988 as a third subsidiaries of a parent company in Japan. Total work force is 598 personnel plus 12 Japanese experts; President Director, General Manager, and one Director are from Japan, while the other

two Directors are local managers. Five experts are working at the headquarter in Jakarta, while the other seven work in plant outside Jakarta. The main raw material is aluminium, which before transformed into finished goods has to go through four production stages namely casting, extrusion, surface treatment and process & assembling. Production is under order-made system, the plant has no warehouse for finished goods, thus marketing activities are done prior to production.

Transfer of technology at the operative level and a part of middle level are mainly through on-the-job training whether in-house or in parent company (in Japan). In addition, recently this company engage in a training program for middle managers with a local management institute. For top-level management, numbers of local and foreign managers are in proportion to the share of capital.

At the operative level, the local work force can operate the machine and equipment by themselves, thus the transfer of technology prior to plant operation can be regarded success. Overseas training program to parent company are done on a regular basis, and until February 1992, this company already send 118 trainees to Japan. Trainees are recommended by their plant supervisor, usually they are persons recognized as best workers in their department. Japanese managers viewed this program as successful, and agreed to spend a considerable amount of money for funding this program. (Approximately US \$75.000/person).

There is a different perception of local employees in regard to this program. For them, this is just a simple work rotation, not a formal training program. They expected to learn something that they do not know before, but in Japan they are required to do exactly the same job as he was been doing in Indonesia. The only thing they gained is an experience working in the Japanese climate.

Transfer of technology is also done by giving the local managers an opportunity to hold managerial positions. This is done formally in this company, all the managers below Directors are Indonesian. Theoretically, managers are expected to make all decisions regarding his area of responsibilities. In this company, Japanese experts are assigned as "big brother" to these managerial positions; and in practice it is the big brother who made decisions through his suggestions. This attitude can be explained by the unaffordable loss, by the profit-seeking enterprise, if the local managers made an inappropriate decisions

It seems, from the Japanese view, training/learning through guidance is much better than learning by mistakes. Local managers accepted this attitude as the reluctance of Japanese to transfer the managerial skills at this level. If every decisions are interfered with suggestions, they afraid the local managers will never be able to make decisions at all in the future.

INTER-ORGANIZATIONAL TRANSFER

Inter-organizational transfer exists when technology spreads to other local productive units. In the case of Indonesia there is considerable amount of technology diffusion through training and other activities, but the spill-over benefits are limited by very low turnover of personnel in foreign firms and by the fact that the training received is often firm or even technique specific (Hill, 1988). Inter-organizational transfer is the same as what Hill called the spill-over benefits.

Transfer through inter-firm linkages can take place in a number of ways, for example, through active dissemination efforts of the initial recipient enterprises; sub-licensing agreements; demonstration effects; procurement of raw materials, parts, components, services and the related exchange of information with suppliers; sharing of marketing and distribution activities; sharing and joint development of product design and production technology.

In Indonesia, sub-contracting and sub-licensing agreements are encouraged by government in order to disperse technology. It is hoped that the large enterprise (e.g.: joint venture company or licensee) trains the small scale industry with technology to produce some of the components needed; on the other hand the small scale business becomes a supplier of the component parts for this large enterprise.

In automotive sector there is a deletion program which

encourage the linkages with sub-contracting firms. Indonesian automotive sector originated from sole agents of particular brands which grow into joint venture company with principal. In this regard product specification e.g., type and quality are determined by principal company; thus for establishing linkages with small industry, a large amount of money for training & supervision is needed. It is much more efficient to establish an affiliated firm and then su-contracting the needed components to this firm.

Sub-contracting to affiliated firm is not the only case in automotive sector but also common in other sectors. The main constraint is the capability of small scale industry to receive the technology followed by quality-consciousness.

CONCLUSION

The first part of this paper indicated that the technology transfer to Indonesia has been done and is still going. Unpackaged transfer increasing and so do the packaged transfer. This conclusion is taken from several indicators; number of students, trainees, experts, the growth of technical assistance and OECF loan, the growing of direct investment, and from the the Japan-Indonesia trade account.

There is a tendency of a shift in Japanese direct investment from the labour intensive technology to a more advanced technology, and to receive this technology, the

absorptive capacity of local work force should be increase.

The means for intra-organizational transfer of technology is training, either on the job, off the job or in parent company. This transfer is regard successful, although there is still certain barriers, namely language and different perception mostly due to cultural differences.

Inter-organizational transfer should promoted and encourage more intensively through sub-contracting or sub-licensing agreement.

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