III-4. Evaluation of the Investment Climate of Malaysia for the Electronics Industry

III-4-1. Overview of the Investment Environment for Electrical and Electronics Firms

(1) Reasons for Investment in Malaysia

As of the end of 1986, the electrical and electronics industry accounted for fully 5.0% of all foreign capital investment in Malaysia (based on paid-up/fixed assets). The investment boom has picked up increasing momentum since 1986, with the industry's share of investment on approved base growing from 10.0% in 1986 to 35.3% in 1987 and 35.8% in 1988. This is evidence of Malaysia's excellent reputation as a destination for investment among firms in the electrical and electronics industry.

Table III.4-1 shows the main reasons for selection of Malaysia as an investment site according to the questionnaire survey of electrical and electronics firms in Malaysia.

Since multiple responses were allowed, there was little variation between items. "Low labour costs," however, was noted by 20.2% of the responding firms. In a sense, reason for investment indicates a firm's expectations of overseas production, and it appears from these results that the greatest expectation of overseas production continues to be low labour costs. Expectations of labour quality itself were rather low, at 11.2%. The lowest-ranked item was "raw material supply," indicated as a reason for investment by only 3.6% of the responding firms.

A breakdown of the results by industry sector shows that component manufacturers considered low wages as a motive while ignoring the infrastructure. Expectations of the local market, while not as low as those of consumer products manufacturers, were also low. Manufacturers of industrial products, on the other hand, had high expectations of the domestic market and infrastructure. Manufacturers of consumer products had quite high expectations of labour quality.

When the results were analysed by capital structure, Japanese affiliates could be seen to emphasise "political and economic stability", while U.S. and European firms emphasised "labour quality." Investment incentives were also a major attraction for Japanese affiliates and other foreign affiliates.

Although this will be discussed in detail in Section 4-3 ("Comparison of Questionnaires in Japan and Malaysia"), electrical equipment and electronics firms, when considering the investment environment, gave the following ranking: 1) infrastructure, 2) tax incentives, 3) labour costs, and 4) labour quality. When the same four items were

considered as reasons for investment, the ranking was: 1) labour costs, 2) incentives, 3) infrastructure, and 4) labour quality.

Table III. 4-1 Reasons for Investment in Malaysia

Reasons for Investment	No. of Companies*	(%)
Low level of labour cost.	45	(20.2)
Availability of high quality labour force.	25	(11.2)
Good investment incentive systems.	41	(18.4)
Good infrastructure.	37	(16.6)
Political and economic stability.	44	(19.7)
Business of the procurement of raw material.	8	(3.6)
Expectation of the expansion of Malaysian domestic market.	21	(9.4)
Others.	2	(0.9)
Total	223	(100.0)

* Total exceeds the total number of respondents due to multiple answers

(2) Expected Markets

One of the survey questions asked whether the decision to begin production in Malaysia was the result of plans for increased production or whether a portion of existing production in the home country was simply being shifted to another production base. 49 of the 61 firms who responded to this item (80.3% of the total) indicated that the move was due to an expansion of total production. This trend was particularly strong at manufacturers of consumer products and Japanese affiliates, with figures for the two groups being 93.3% amd 82.9%, respectively. On the other hand, a majority of industrial product manufacturers (66.7%) and U.S. and European affiliates (70.6%) indicated that the move was simply a transfer of existing production.

Table III.4-2 shows the expected markets for products produced in Malaysia when firms invested in order to expand production. Asia (excluding Japan) was the most commonly noted market, with 62.5% of responding firms indicating they planned to sell to this region. This trend was particularly marked among manufacturers of consumer products. In general, these products are cheaper than industrial products, making transportation costs an important factor in cost competitiveness, and the marketability of each product is more clearly defined than in other sectors. As a result, there is a trend toward production in locations with proximity to the intended market.

The home country of the investing firm was the next most common destination, particularly among component manufacturers and U.S. and European affiliates, and particularly the U.S. semiconductor manufacturers, which export all production to the U.S. In contrast to the 58.3% of U.S. and European affiliates who envisioned sales to their home countries, only 37.9% of the Japanese affiliates planned sales to Japan. In the past, Japanese-affiliate firms had as their main objective for overseas production either the securing of overseas markets or roundabout exports to industrialised nations. Since the appreciation of the yen began in 1985, however, a trend toward shifting Japanese production of low-end items to developing nations, with Japanese demand to be supplied by imports, has become established. In the current survey, 41.4% of the Japanese affiliates included Europe among the export destinations for their products, while many among the 41.4% specifying other nations were aiming at the U.S. market, indicating a continuing emphasis on industrialized nations. Given this situation, the figure of 37.9% for sales to Japan actually seems rather high.

Table III. 4-2 Export Market to be Targeted by the Firms

Export Market	Malaysia	Home Country	Asia (except Japan)	Europe	Others	Total
No. of Answers	19	20	30	19	16	4
(%)	(39.6)	(41.7)	(62.5)	(39.6)	(33.3)	(100.0)

(3) Expansion Investment

Only 16 firms gave responses concerning expansion investment in the past, while 27 indicated investment amounts, leaving a large group of firms with no response. The results should be viewed in light of this.

According to the results of the questionnaire survey, the overall average for frequency of additional investment was 3.3, while the amount invested averaged M$41,350.

There were significant deviations according to industry sector. Manufacturers of consumer electronics products, for example, invested an average of 4.2 times and spent the considerable sum of M$111,960 each time, while the figures for industrial product manufacturers were only 1.0 and M$3,000, respectively. Semiconductor manufacturers constitute the bulk of component manufacturers in Malaysia, and while facility investment by such firms is generally thought to be significant, no such trend was discernible in the present survey.

A breakdown of the results by capital structure shows that Japanese affiliates invested an average of 2.8 times but spent M$58,950 each time, whereas U.S. and European affiliates invested an average of 8.5 times but spent only M$14,660 each time.

When results were viewed from the standpoint of the number of employees, larger firms were found to invest more money and do it more frequently, as would be expected.

III-4-2. Evaluation of the Malaysian Investment Climate by the Japanese Electronics Industry

In a survey distributed to the Japanese electronics industry, firms were asked to evaluate the Malaysian investment climate in comparison with those of Thailand, Singapore, and Korea. The results of this survey, based on their subjective evaluation, are summarised below and will be discussed in turn for each evaluation item.

(1) Government Policies

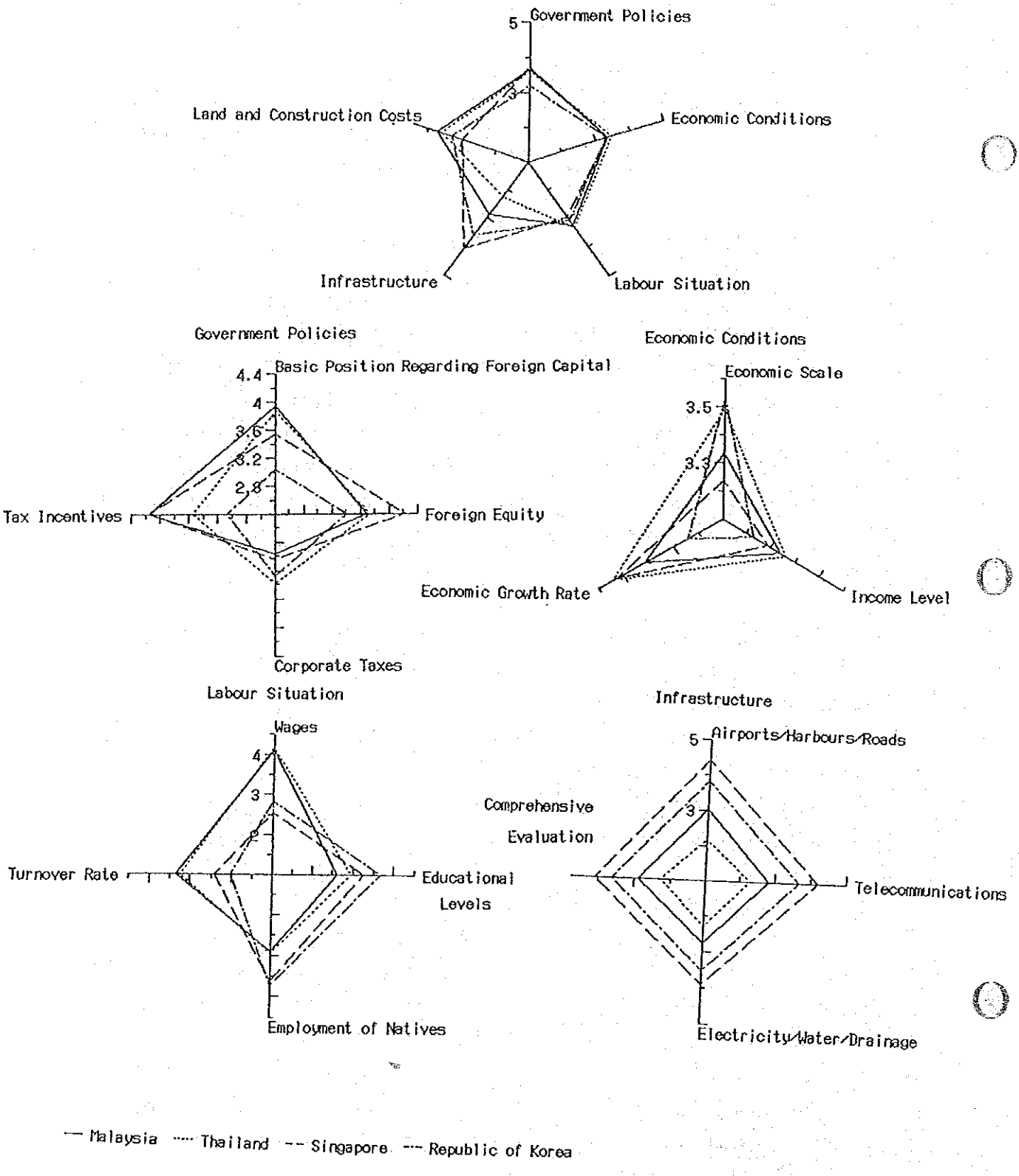
Concerning the government's "basic position regarding foreign capital investment," all of the nations appeared aggressive in their efforts to attract foreign capital. While the average scores for Malaysia and Thailand were 3.9., however, for what is virtually a positive factor, Korea's rating of 3.0 was neither positive nor negative. Singapore fell midway between these two figures. Although government policies in both Korea and Singapore aim at the introduction and promotion of leading-edge technologies and high-added-value industries, it appears that, in Korea at least, the government's position with respect to foreign capital is not acting as a positive factor for foreign investment.

Concerning "foreign equity restrictions," Singapore, with its complete lack of any such legal restrictions, was given a favorable average rating of 4.2. Both Malaysia and Thailand, which allow 100% foreign equity in the case of export industries, were given similarly high scores of 3.7. Although Korea's restrictions on foreign equity have been abolished in principle, it received a rating of 3.4, above average but lower than the other three nations. Those firms giving a negative or very negative response totaled 10.3% for Malaysia, second only to Korea's 13.2% and higher than Thailand's 8.1%.

Concerning "corporate taxes," evaluations directly reflected the corporate tax rates in each of the nations. Thailand and Korea, with rates of 30%, obtained average scores of 3.4 and 3.3, respectively. Singapore and Malaysia, with respective rates of 33% and 35%, both received ratings of 3.0. 19.9% of the firms gave Malaysia a negative or very negative response, 4.5% more than second-place Singapore's 15.4%.

Concerning "tax incentives," Singapore and Malaysia, offering maximum corporate tax deduction periods of 10 years, were both given high average ratings of 4.2,

Fig. III.4-1 Evaluation of the Malaysian Investment Climate by the Japanese Electronics Industry Based on the Results of the Questionnaire Survey Conducted in Japan



Note: The charts show average scores of graded from 1 (big negative factor) to 5 (big positive factor).

while Thailand ranked third with a score of 3.5. Korea, despite the existence of tax incentive programmes, was in fourth place with an average score of 3.1.

Comprehensive scores for Singapore, Malaysia and Thailand differed only slightly at 3.75, 3.69, and 3.63, and it appears that the government systems and policies in effect in these nations had a positive effect on Japanese firms considering the establishment of overseas plants. In the case of Korea, with a comprehensive rating of 3.21, these did not seem to have a particularly positive effect. It appears that: 1) firms considering investment in Korea emphasise other factors; and 2) the government's systems and policies with respect to foreign investment are not particularly attractive to the firms they target.

(2) Economic Conditions

Concerning "economic scale," which serves as a barometer of a nation's economic development and domestic market size, positive evaluations were given in the order of the size of each of the countries' economies. Average scores were: Korea, 3.5; Thailand, 3.49; Malaysia, 3.34; and Singapore, 3.24. Despite the fact that Korea's economy is more than twice the size of Thailand's, the ratings received by the two were virtually the same. When the responses for Korea were analysed, it was found that, while the percentage of firms giving a very positive response was, at 12.5%, far higher than for other nations, those firms giving a negative or very negative response were also numerous, at 13.2% of the total. Thus it appears that a significant gap exists in the perception of Korea's economic scale among firms in the Japanese electronics industry.

Concerning "income level," the results of the questionnaire did not correspond with actual figures. Thailand, despite having the lowest per-capita income of the four nations, achieved the highest rating, at 3.36. Malaysia, with a per-capita income three times that of Thailand, was rated second at 3.34. Singapore, at eight times the same, was third at 3.29, while Korea, with an income level three times that of Thailand, was rated fourth at 3.23. This question saw major discrepancies in responses concerning Singapore, with very favorable responses received from 14.7% of the firms, favorable responses, from 28.7%, ordinary, from 28.7%, unfavorable, from 25.0%, and very unfavorable, from 2.2%. There were also significant gaps in the perception of Thailand's income level, though not as large as for Singapore. These discrepancies appear to stem from different ways of evaluating income levels depending upon the objective of investment. In the case of Singapore, for example, while its unique characteristics as a

city-state economy and its high income level would suggest high purchasing power, responding firms may also have interpreted these as an indicator of high labour costs.

Concerning "economic growth rate," Korea, despite having the highest actual growth rate, received the lowest average score, at 3.24. Thailand was rated highest, at 3.36, while Malaysia, with the lowest economic growth rate, followed with a rating of 3.34. Singapore's average score was 3.29. Firms considering investment in Korea and Singapore, therefore, appeared to place less emphasis on economic growth rate than those considering investment in Thailand and Malaysia.

Thailand received the highest comprehensive evaluation of economic conditions at 3.47 and was followed by Malaysia, with 3.36, Singapore, with 3.35, and Korea, with 3.34. Concerning the evaluation of whether economic conditions were a positive or negative factor, therefore, no major differences could be seen among the four nations.

(3) Labour Situation

Evaluations of "wages" directly reflected wage levels in each of the nations, with Thailand and Malaysia receiving far higher average scores than Singapore and Hong Kong. Average scores were: Thailand, 4.14; Malaysia, 4.09; Korea, 2.83; and Singapore, 2.55. In the case of Thailand, 35.3% answered that wages constituted a major positive factor, and 51.5% that they were a positive factor. The two figures for Malaysia were 27.9% and 55.9%, respectively. In the case of Singapore, on the other hand, more than half of the responding firms gave negative evaluations, with 5.9% answering that wages constituted a major negative factor and 46.3% that they were a negative factor. In the case of Korea, wages constituted a major negative factor for 1.5% firms and a negative factor for 32.4%.

Concerning "educational levels," the results corresponded well with actual figures. In these evaluations, it appears that the percentage of students going on to secondary school was emphasised. Average scores were: Korea, 3.75; Singapore, 3.27; Thailand, 2.96; and Malaysia, 2.63.

Concerning the "possibility of employing natives according to position," in the case of direct operations, 75.0% of the responding firms answered affirmatively for Malaysia, 76.5% for Thailand, 67.6% for Singapore, and 69.9% for Korea. For supervisors, 61.0% responded affirmatively for Malaysia, 58.8% for Thailand, 67.6%

for Singapore, and 69.1% for Korea. In the case of office workers, the figures were 67.6% for Malaysia, 66.9% for Thailand, 72.1% for Singapore, and 71.3% for Korea. For engineers, the figures were 32.4% for Malaysia, 33.1% for Thailand, 61.0% for Singapore, and 68.4% for Korea. Concerning managers, the figures were 29.4% for Malaysia, 33.1% for Thailand, 62.5% for Singapore, and 69.1% for Korea. For directors, the figures were 7.4% for Malaysia, 8.1% for Thailand, 24.3% for Singapore, and 36.0% for Korea. Concerning higher-level posts for engineers, managers, and directors, therefore, it can be seen that Korea and Singapore received very favorable evaluations in contrast to Malaysia and Thailand. Korea received the highest overall evaluation among the four nations, followed by Singapore. Thailand received a slightly more favorable rating than Malaysia.

Evaluation under the heading "employment of natives" reflected the results of the "possibility of employing natives according to position" described above. Results concerning the possibility of hiring natives for upper-level positions as engineers, managers, and directors are particularly well reflected. Korea received the highest average score, with 3.75, followed by Singapore with 3.63, Thailand with 2.96, and Malaysia with 2.91. In this sense, the possibility of employing natives can be seen as a relatively positive factor for firms considering investment in Korea and Singapore, while for those considering investment in Malaysia and Thailand it was neither a positive nor a negative factor.

Concerning "turnover rate," evaluations reflected actual turnover rates in the four nations. Malaysia, with a turnover rate of 2%, had the highest average rating, at 3.34. Thailand, with the next-lowest turnover rate of 3%, followed at 3.24. Singapore and Korea were third and fourth with scores of 2.40 and 2.04, respectively. While the ratings given Malaysia and Thailand were rather typical, Korea's score indicates that the problem of job turnover in that nation is being interpreted as a negative factor. 20.6% of the responding firms answered that it constituted a major negative factor and 58.8% that it was a negative factor, so that nearly 80% of all companies considered it a problem. In the case of Malaysia, on the other hand, only 12.5% considered turnover a negative or major negative factor, while 7.4% thought it a very positive factor and 32.4% a positive factor.

When viewed comprehensively, average scores were 3.33 for Thailand, 3.24 for Malaysia, 3.34 for Korea, and 2.96 for Singapore, indicating that, overall, the labour situation in all of the countries is rather typical. Concerning wage levels and turnover rate, Malaysia and Thailand received better evaluations than Korea and Singapore, while

the latter two nations rated higher on education levels and the possibility of employing natives.

(4) Infrastructure

Concerning transportation infrastructure under the heading "airports/harbours/roads," Singapore topped the list with the extremely high average score of 4.41. 44.1% of the respondents answered that it was outstanding, with another 36.0% claiming it to be "very good." Korea also received the high score of 3.82, with more than 60% of the firms giving it an "outstanding" or "very good" rating. Malaysia's evaluation, at 3.03, was neither positive nor negative. Thailand received the worst evaluation with an average score of 2.18 and nearly 60% of the companies responding that it was either "poor" or "very poor."

Concerning "telecommunications," Singapore received by far the highest rating with an average score of 4.20. It was followed by Korea, at 3.69, Malaysia, at 2.81, and Thailand, at 2.27. Malaysia's evaluation was neither positive nor negative, while Thailand's shows to some disadvantage.

Concerning "electricity/water/drainage," Singapore again rated the highest with a score of 3.92, followed by Korea with 3.55, Malaysia with 2.58, and Thailand with 2.30. Overall evaluations in this area, therefore, were not as favorable as for the previous two items.

Comprehensive ratings were: 4.10 for Singapore, 3.64 for Korea, 2.89 for Malaysia, and 2.25 for Thailand. Differences in evaluation of infrastructures in the four countries stand out clearly, with the order for each item being Singapore, Korea, Malaysia, Thailand. Malaysia received neither positive nor negative evaluations from 47.8% of the responding firms, but 21.3% also answered that infrastructure was a negative factor.

(5) Land and Construction Costs

Concerning "land and construction costs," Malaysia received the highest evaluation with a score of 3.75. 10.3% of the firms answered that it was a very positive factor and another 52.9% that it was a positive factor. Thailand followed with an average score of 3.63, while Korea received a 3.32 and Singapore a 3.02. In the case of

Thailand, nearly 60% of the responding firms considered this item a positive or very positive factor. Thus, when considering investment in Malaysia and Thailand, Japanese firms find land and construction costs in these nations to be a positive factor. Singapore, despite receiving neither positive nor negative ratings from 47.8% of the respondents, also received negative or very negative evaluations from 25%, reflecting the high costs of land and construction in that nation.

(6) Comprehensive Evaluations

"Infrastructure" was the only item exhibiting major divisions of opinion concerning the four nations, although "land and construction costs" also outlined some definite contrasts. In other items, with the exception of "government systems and policies," for which Korea received lower evaluations than the other three countries, there was rough parity.

One discernible trend was the contrast between the two NIEs, Singapore and Korea, and the two nations struggling to overtake them economically, Malaysia and Thailand. The former pair earned favorable ratings for their infrastructures but rather low evaluations for land and construction costs and labor situation. Thailand and Malaysia, on the other hand, were less-than-favorably rated for their infrastructures but received high evaluations for land and construction costs and labor situation.

Malaysia received better evaluations than Thailand for its infrastructure and land and construction costs but lower ratings for labor situation and economic conditions.

III-4-3. Evaluation of the Malaysian Investment Climate by Resident Japanese Firms

The results of a survey to determine the evaluation of the Malaysian investment climate by the electrical and electronics firms with operations in that nation are as follows. Responding firms were divided into the following groups: Japanese affiliates, U.S. and European affiliates, other foreign firms, and Malaysian firms. Because there were few respondents from the last two categories, there exists the possibility that this questionnaire alone is insufficient to accurately reflect evaluations of the Malaysian investment climate by Malaysian firms and non-Japanese foreign affiliates. For reference, however, their evaluations will be compared here to those of Japanese firms.

1) Government Systems and Programmes

Concerning the government's "basic position regarding foreign investment," the nation received a high average score of 4.11. None of the Japanese affiliates gave scores of 1 or 2, and in general Japanese firms with operations in Malaysia gave favorable evaluations of the government's basic stance concerning foreign investment. The U.S. and European affiliates gave the nation an even higher rating of 4.20. Among Japanese firms, the responses of consumer electronics equipment manufacturers were slightly more favorable (at 4.33) than those of component manufacturers (at 4.00).

Concerning "restrictions," the scores given by Japanese, U.S. and European, and other foreign-affiliate firms were roughly the same, at 3.57, 3.67, and 3.80, respectively. In contrast, Malaysian firms indicated a rather low average rating of 2.60.

Concerning "tax rates," Japanese firms gave an average score of 2.78, the lowest rating given by this group for any of the items. The three other groups gave similar responses, and the overall average for this item was 2.83.

Concerning "tax incentives," Japanese firms gave an average rating of 3.63, slightly higher than the 3.53 indicated by U.S. and European firms. The Malaysian contingent gave a score of 2.80. In this item as well, therefore, foreign firms gave considerably higher evaluations than Malaysian companies.

2) Infrastructure

Considering "infrastructure," Japanese firms gave an average score of 3.67, higher than the 3.37 indicated by U.S. and European firms.

Table III. 4-3 Evaluation of the Malaysian Investment Climate by the Results of the Questionnaire Survey in Malaysia

Item	Japanese Affiliates Affiliates	U.S. and Europe Affiliates	Other Foreign	Local Firms	Total
Basic Position Regarding Foreign Investment	4.111	4.200	3.600	3.200	4.016
Foreign Equity Restrictions	3.571	3.667	3.800	2.600	3.533
Corporate Taxes	2.778	3.000	2.800	2.750	2.833
Tax Incentive	3.629	3.533	3.800	2.800	3.550
Infrastructure	3.667	3.400	3.000	3.500	3.533
Land and Construction Costs	3.694	3.333	3.000	3.400	3.533
Distribution	3.333	3.133	3.000	3.000	3.233
Wages	3.556	3.467	4.200	3.800	3.607
Educational Levels of Workers	3.417	3.667	3.200	3.400	3.459
Turnover Rate	2.972	3.200	3.200	3.600	3.098

(Note) The figures are average scores of the evaluations after being graded from 1 (Big Negative Factor) to 5 (Big Positive Factor).

3) Land and Construction Costs

Concerning "land and construction costs," Japanese firms gave an average rating of 3.69, again higher than the 3.33 indicated by U.S. and European firms.

4) Distribution

Concerning "distribution," the Japanese evaluation was at 3.33 somewhat lower than for other items but roughly on a par with the responses of other foreign firms and Malaysian firms as well.

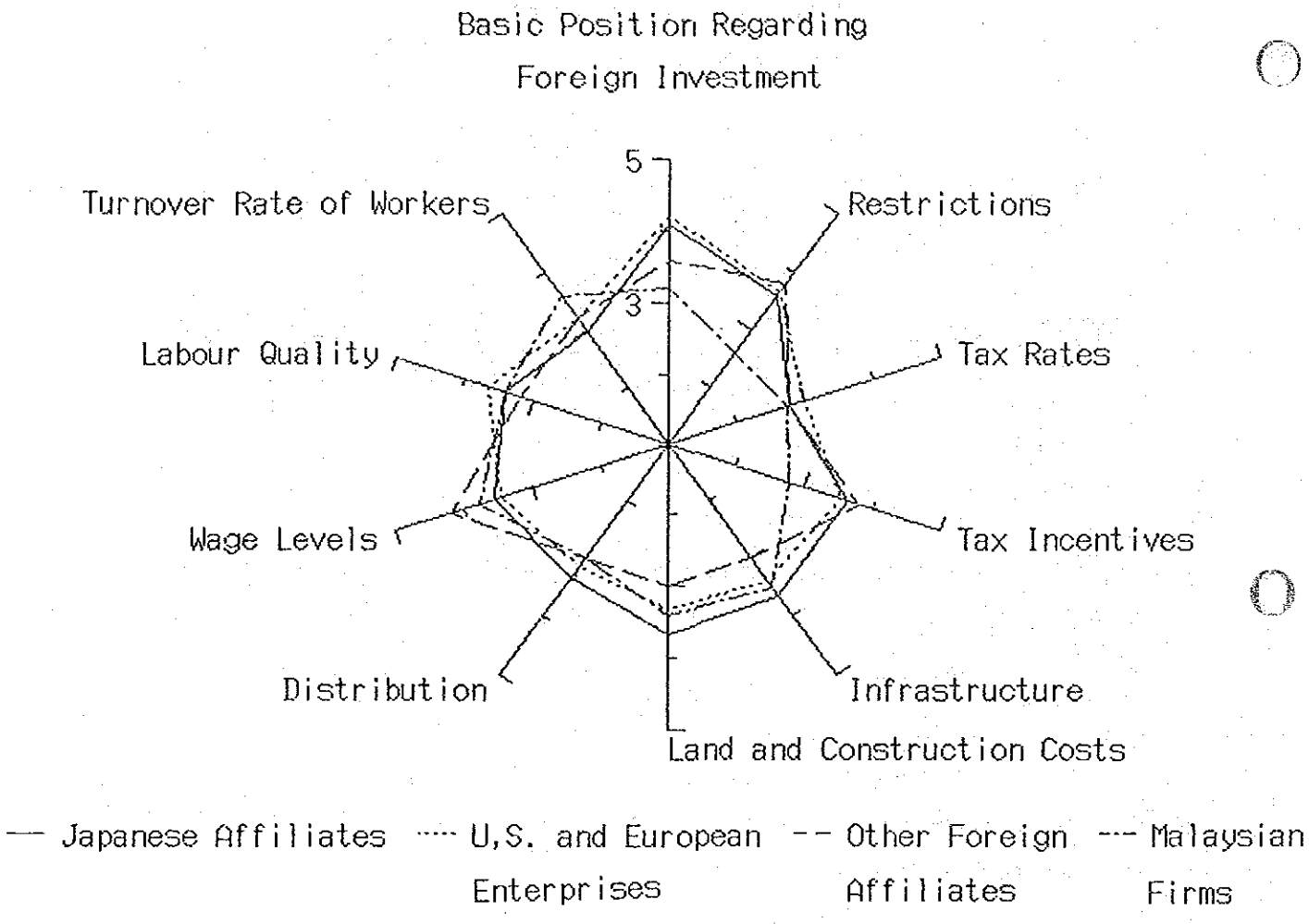
5) Labour Situation

Concerning "wage levels," the average score of 3.56 given by the Japanese firms was slightly higher than the 3.47 indicated by U.S. and European firms.

Concerning "labor quality," Japanese firms gave an average rating of 3.42, slightly less than the 3.67 given by U.S. and European firms.

Concerning "turnover rate," the Japanese evaluation of 2.97 was the second-worst for these firms (the worst being for "tax rates") and considerably lower than the scores of 3.60 and 3.20 given by Malaysian and U.S. and European firms, respectively.

Fig. III.4-2 Evaluation of the Malaysian Investment Climate by Firms which Filled Out the Questionnaire Sent in Malaysia



Note: The chart shows average scores of the evaluations graded from 1 (big negative factor) to 5 (big positive factor).

6) Comprehensive Evaluations

Viewed overall, the evaluations of Japanese and the U.S. and European firms are quite similar. Differences were that Japanese firms tended to give higher scores for infrastructure, land and construction costs, and distribution, while the U.S. and European firms tended to give better ratings to such things as labor quality, turnover rate, and tax rates.

When broken down by industry, there was not a great deal of difference in the evaluations of Japanese firms, but manufacturers of consumer electronics equipment did tend to give slightly higher overall scores to the government's position concerning foreign investment, restrictions, tax incentives, and infrastructure than component manufacturers.

III-4-4. Comparison of Questionnaires Conducted in Japan and Malaysia

When items common to the questionnaires conducted in Japan and Malaysia are compared, it can be seen that virtually the same results were obtained concerning the government's position regarding foreign investment, restrictions, and land and construction costs. Evaluations were higher for tax incentives, wage levels, and turnover rate within Japan, while the questionnaire conducted in Malaysia showed considerably higher evaluations of labour quality and infrastructure.

The results of the two questionnaires are as shown in Table III.4-4.

Table III. 4-4 Comparison of Questionnaires Conducted in Japan and Malaysia on the Evaluation of the Malaysian Investment Climate

	Survey Results Conducted in Japan	Survey Results Conducted in Malaysia
Government Policies		
Basic Position Regarding Foreign Capital Investment	3.95	4.11
Foreign Equity Restrictions	3.69 (Restrictions)	3.53
Corporate Taxes	2.97 (Tax Rates)	2.78
Tax Incentives	4.15	3.63
Labour Situation		
Wages	4.09	3.56
Educational Levels	2.63 (Labour Quality)	3.42
Employment of Natives	2.91	
Turnover Rate	3.34 (Turnover Rate)	2.97
Infrastructure		
Infrastructure	2.89	3.67
Land and Construction Costs		
Land and Construction Costs	3.75	3.69

III-5. Comparison of Promotion Policies for Electrical and Electronics Industries in Third Countries

This section has as its object a review of the past experiences of countries advanced in development and the policies being taken by countries currently struggling for development so as to assist the formulation of government support for the development of the electrical and electronics industries in Malaysia. The countries selected for review were Japan, Korea, Singapore, and Thailand. (For the situations in individual countries, see Annex 5).

Each country differs in its starting conditions, such as its industrial base, scale, and support, so a true comparison is impossible, but representative institutions and policies are listed in Table III.5-1 regarding four items: (1) industrial promotion policies, (2) development of human resources, (3) R&D promotion, and (4) promotion of supporting industries. The measures believed to have been effective in the above countries will be compared with respect to the four items.

(1) Industrial Promotion Policies

A look at the development of electrical and electronics industries by a time series shows Japan was first, followed by Korea and then Singapore. There is about a 10 year gap between Japan and Korea in the commencement of industrial promotion. Further, after the Korean War, Korea was forced to industrialise out of the ruins of its domestic industrial base. In comparison, while Japan was behind other industrialised nations when it began promotion of its electrical and electronics industries, it had already established a steelmaking, shipbuilding, and other basic industries. In other words, there was strong private capital and a receptacle enabling technology introduced from abroad to lead smoothly to the start of production. All these things must be considered.

A characteristic of Japananese policies was the establishment of separate policies for promotion of specific industries. Korea, looking at Japan's success, also embarked on industry-wise promotion. In implementation, due to the weak and young state of private enterprise in Korea, the government exercised more explicit leadership and had a large role in the selection of industries and the distribution of funds. Concrete promotion policies included low interest financing, tax exemption, and provision of subsidies for the selected industries. In the 1980s, "The Long-Term Development Plan for the Electronics Industry" was announced. In the plan, the government pointed out current problems in

the Korean electronics industry and set future targets for improvement. To push forward the plan, the government set up "The Electronics Industry Promotion Fund" and offered financial assistance, under good terms, for research and development and for new product development activity.

On the other hand, Singapore, Malaysia, and Thailand have not had visible, separate policies for industrial promotion. When these countries began industrialising, they were poor in domestic capital and technical expertise for industrialisation and required foreign investment for industrialisation in the area of all but a few light industries. Therefore, the promotion of the electrical and electronics industries came to be included in policies for promoting foreign investment covering industry as a whole.

In attracting foreign capital, these countries, with the exception of Thailand, which had markets of a certain size existing domestically, used such means as tax holidays, abatement and exemption of import duties, and other incentives, because it was almost impossible to offer the merit of tariff protection by import substitution policies.

From the end of the 1960s to the beginning of the 1970s, numerous foreign companies began to establish production bases in Malaysia for the purpose of export. This was due to the high regard for the low production costs and the above merits offered by Malaysia. In particular, there were large merits in the FTZ and LMW systems, which exempted duties for parts and materials used for export products in the electrical and electronics industries, focusing assembly type industries. Subsequent to this, the Malaysian government, in view of the expiration of the preferential measures accorded to electrical and electronics companies established in large numbers in the early period, came out in 1984 with "The Preferential Measures for the Electronics Material Industry" and thus sought to ensure the continuance of those companies with sustained preferential treatments. Never before had there been such policies aimed at individual industries. This may be said to reflect the magnitude of importance of the existence of the electrical and electronics industries in Malaysia. The policies increased the confidence of foreign capital companies to the Malaysian government and formed the basis for sustained investment.

Singapore had introduced foreign capital in the electrical and electronics industries at an earlier date. In the early 1980s, it formulated a long term strategy for industrial advancement and oriented itself toward high-technology type manufacturing industries. This strategy was revised due to a recession in 1985, but Singapore has been moving steadily to achieve its goals. In the strategy, certain industries were designated for promotion, but foreign investment in Singapore slowed down due to remarkably rising production costs which consisted mostly of personnel costs, and the reduction in the numbers of priority industries. In 1985, Singapore was confronted with the worst recession since its independence. The Singaporean government went all out to improve

the investment environment and further scrapped its practice of clear designation of industries for promotion in an effort to erase the image of "Singapore as a country emphasizing high-technology industries". In actuality, however, rising production costs led products suited for production in Singapore to a natural shift to higher value-added products. The reasons why foreign capital did not flee Singapore in this process are considered as follows: First, in striving to raise the level of its industry, the Singaporean government sought to improve the quality of its engineers and skilled workers and thus had foundation of manpower able to handle high value-added industries. Further, in these industries, the percentage of personnel costs in the product cost is small, so considering the infrastructure, small restrictions on economic activities, geological superiority, etc., there were still merits in locating their production activities in Singapore.

At present, Singapore does not designate specific industries for promotion, but its investment incentives are getting concrete in examining the companies in considerable detail case by case, considering not only industries for promotion, but also the characteristics of the companies. Since limitations in land and labour are clear, the Economic Development Board (EDB) has, in its investment promotion policies, striven to attract high quality investment by positive means such as direct approaches made to companies with large shares of the world market in their products, companies with special technical expertise, etc., even if small or medium ones in size.

At the present time Thailand has established, as a subordinate organization of BOI, The Subcommittee of the Export Electronics Industry Development. This subcommittee engages in surveys and the formulation of action programmes for the conversion of the electronics industry, which has become entrenched as an import replacement industry, into a competitive export-oriented industry and the subcommittee has a large influence in the field of investment promotion.

Malaysia has already established goals and strategies for individual industries in the Industrial Master Plan (IMP) announced in 1986. In the future, it would be necessary to continuously review the plan and establish more detailed policies for realisation of the goals.

(2) Development of Human Resources

In Malaysia, the majority of the employee training is performed in-house. This is because, in particular, production-related training differs with each company, it would be difficult for any official organization to take over, and training by the individual companies is the most effective. Right now, the government is trying to promote employee training by allowing training costs and the costs for training buildings to be

deducted from taxes, but approval of such deductions reported is not easily obtained. Further, it has been commented that there are mismatches of university education and vocational training centre education etc. with the needs of industry.

To promote front-line industries, as exemplified by the electronics industry, training of suitable engineers and skilled labourers is essential. Based on this understanding, these countries are making an effort to improve university education and vocational training.

In particular, Singapore, where it is said that "the only resource is its people", has been striving to raise the level of its industries since the end of the 1970s in view of its disadvantages in labor-intensive industries. A keypoint of its specific measures toward this end has been the raising of the bottom level of its labour force.

In the late 1970s, it launched the Skill Development Fund (SDF), which has since become one of the fiscal foundations for this effort. The SDF called for 2 percent of the salaries of the workers be held by the employees (1 percent as of 1989) and pooled for use as subsidies for promotion of technology. For development of human resources, there is a Training Grant System (TGS) which subsidies 30 to 90 percent of the costs for employee training by companies.

The Economic Development Board (EDB) has as its principle duty the promotion of industrial investment, but considers the stable, plentiful supply of skilled labour essential to its task of promoting investment and thus is also pouring effort into the development of human resources and pushing forward with a joint industrial training programme. Based on this programme, a semipublic vocational training centers are being established, drawing specialized knowledge from private manufacturing companies and foreign governments and funding from the Singaporean government. There are four centers offering general technical training, three offering specialized technical training, and organized within eight companies offering applied technical training. Korea also established a Vocational Training Act in 1976. Since then, it has set up public vocational training centers and has given large encouragement to companies to establish in-house training centres.

(3) Promotion of R&D

Full-fledged promotion of R&D in Japan began with the Large-sized Industrial Technology R&D System in 1966. At the time, the technological levels of Japanese firms were improving rapidly due to the absorption of technologies from Europe and the U.S., but the ability to develop original technology still remained immature. To cope with the problem, the system was established to bring together the financial resources of the

government and the R&D capacities of private firms. The system aimed at appropriating government funds and efficiently executing industrial-academic cooperation in areas of research and development difficult for private industry to carry out due to the large investment, long time, and heavy risk involved. Apart from such large-scale basic research and development, a system of providing subsidies for private industrial projects was created to complete the foundation.

Korea followed a similar pattern but set forth a more distinctive division of roles between government and private sector. Research and development was made the business of private industry in principle, and government role was limited to the core technology which is difficult for individual firms to deal with as well as the completion of a foundation for the promotion of research and development. The government also took the lead in designating advanced strategic technologies as a subject of joint study in order to concentrate financial resources. Establishment of research laboratories by private firms has increased remarkably since the mid-1980s, producing significant results in semiconductors and other sectors of advanced technology. Financial support of research activities has spread from long-term to medium- and short-term work. Thus, assistance through the Industrial Technology Up-Grading Fund and other systems is filtering down to the research and development activities of private firms.

In Thailand, the Sixth Five-Year National Economic and Social Development Plan (1986-1991) was the first to take up in earnest the importance to development of science and technology. The strategy, stated in concrete terms but not specifying any industrial fields, included: [1] nurturing of human resources in fields related to science and technology; [2] budget appropriation for the support of research in the area of strategic technology; and [3] encouragement of private investment in the area of science and technology. This strategy, however, remains far from realisation. The Thai government, although fully cognizant of the importance of research and development, is at present only encouraging the investment of foreign capital and the creation of joint ventures in the country.

In Malaysia, the promotion of R&D is under way in two main areas. One, the deduction of expenses and cost of buildings required for R&D, aims to encourage R&D activities by private firms. The other is research and development by official research organisations, which, as far as the electrical and electronics industry is concerned, is currently limited to the Malaysian Institute of Microelectronics Systems (MIMOS). Moreover, the activities of MIMOS are centered on the design of ICs and PCBs, little related to the items in the present survey. As a central measure for the promotion of R&D in the future, the Malaysian government is setting up a technology park intended to function as a catalyst and window for the transfer of technology. Envisaging that

government research organisations, R&D sections of private firms and R&D consulting firms will move into the park, the government is considering providing the tenant firms with tax deductions, subsidies and other incentives.

(4) Promotion of Supporting Industries

The promotion of supporting industries is a task facing each of the NIE's and the ASEAN countries and regions. Since these economies used foreign capital as a means of industrialization and began domestic production activities based on assembly of imported parts, while there are differences in degree, they have been slow in establishing domestic production of parts and materials.

Korea established "The Small and Medium Scale Industries Affiliation Promotion Act" in 1975 and was strongly aware of the need for formation of supporting industries, but did not embark on full-scale promotion until the mid-1980's. The reduction of the dependence on Japan for parts has in particular come to be considered urgent business since the appreciation of the Japanese yen. In the 1970's, the focus of promotion of small- and medium-sized companies was on the securing of markets for such companies through designation of products for promotion of affiliation, but in the 1980's, the promotion of the parts industries became the main task and efforts were made to strengthen the small and medium scale companies themselves.

In Singapore, where local companies have been slow to develop, almost equal emphasis has been accorded to promotion of supporting industries and promotion of local companies. Development of local companies in the field of supporting industries is considered to have large advantages as the multinational corporations (MNC's) already present in the country would serve as a market and simultaneously the MNC's would become more competitive.

As a specific measure for promotion, the afore-mentioned SDF is being made available as subsidies to companies with 30 percent local equity or more through the Product Development Assistance Scheme (PDAS) and the Research and Development Assistance Scheme (RDAS). Further, the Trade Development Board (TDB) offers assistance in overseas market development, introductions of subcontractors, and other services which assist the development of markets by local parts manufacturers, and these efforst seem to be bearing fruit.

Table III. 5-1 Comparison by Country of Promotion Policies Concerning Electric & Electronics Industries

	Japan	Korea	Singapore	Malaysia	Thailand
(1) Promotion Policies & Promotion Plans	1957 "The Temporary Active Law of the Electronics Industry Promotion" 1958 "The Five-Year Electronics Industry Promotion Plan" 1971 "The Temporary Active Law of the Specific Electronics and Machinery Industries Promotion" 1971 "The High Development Plan of the Counter Type Computer Production" 1978 "The Temporary Active Law of the Specific Machinery Information Industry Promotion" 1985 "The Facilitative Act of the Basic Technology Research" 1985 "The Market Release Active Plan"	1969 "The Electronics Industry Promotion Act" 1960-70 "The Parts Industry Promotion Policy" 1980 "The Long Term Development Plan of the Electronics Industry"	1967 "The Economic Expansion Promotion Act - The Income Tax Exemption Act"	1958 "The Pioneer Industry Act" 1968 "The Investment Incentive Act" 1975 "The Industrial Coordination Act" 1986 "The 1986 Investment Promotion Act" "The Industrial Master Plan"	1954 "The Industry Promotion Act" 1960 "The Industrial Investment Promotion Act" 1962 "The New-Industrial Investment Promotion Act"

	Japan	Korea	Singapore	Malaysia	Thailand
Financial Systems	The latter half of 1950s: "The Development Bank's Financing" (in sake of semiconductor manufacturers) 1985 "Financing & Investment" by the Basic Technology Research Promotion Center "The Technology Promotion Financing System"	1976 "The Financial Assistance for the Domestic Productionization of Machinery and Plants" 1976 The Medium & Long Term Export Assistance Financing 1969 "The Financial Fund for the Export Promotion" 1961 "The Temporary Active Law of the Subsidy Supply for the Export Promotion" 1970-1980 "The Financial Assistance for the expansion of the Export Industry Foundations"	(Because financial organizations and institutions in Singapore are relatively in good condition, it is comparatively easy for companies to gain the fund supply.)	1985 "New-Investment Fund" 1989 "ASEAN Japan Development Fund (For Small and Medium Scale Industries)"	"The Industrial Bill Refinance" "The IFCT Financing" "The Export Type Financing for Small-to-Medium-Scale Industries" "The SIFO Financing"
(2) Development of Human Resources	1968 "The Fostering Expense for the Information Management Technician" 1969 "The Qualification System of the Information Management Technician"	1967 "The Vocational Training Act" 1974 "The Specific Active Law for the Vocational Training" 1976 "The Vocational Training Organic Law"	1970 "The Joint Industrial Training Plan" 1979 "The Skills Development Fund" "The Training Grant System" "The Continuing Educational Training Plan"	"The Double Income Deduction System concerning the Training Cost" "The Deduction of the Building for the Training"	1967 "The Technology & Skill Examination Center" 1969 "The Establishment of the National Central Vocational Training Center"

	Japan	Korea	Singapore	Malaysia	Thailand
	1971 "The Test for the Specific Information Management Technician"				
(3) R&D Promotion	1968 "The Large-Sized Industrial Technology R&D System" 1974 "The New Energy Technology R&D System" 1978 "The Energy Technology R&D System" 1981 "The Conservation Next Generation Industrial R&D System" "The Computer Basic Technology Development" 1970 "The Subsidy System of the Important Technological R&D Expenses" 1985 "The Basic Technological Research	1973 "The Reserve Fund for the Technological Development" 1987 "The Computer Program Protection Act" "The Material Patent System" "The Establishment of the General Technology Institute"	1979 "The Bank-Rate Support System for Machinerization" "The Consultant Development System" "The Product Development Assistance Scheme" 1981 "The R&D Assistance Sheme"	"The Double Deduction for the Research Expense" "The Deduction for the Researching Building" "The Deduction for the Researching Plant & Machinery"	1980 "The Technology Development Programme" "The Development Administration Reform Programme"

	Japan	Korea	Singapore	Malaysia	Thailand
	& Promotion System" 1976 "The R&D System for the Medical Welfare Instrument" 1970 "The Subsidy System for the Computer Development" 1972 "The Subsidy for the New Computer Development Promotion" 1976 "The Large-Sized IC Development Promotion Assistance for the Next Generation Computer" 1967 "The Tax Volume Deduction System of the Additional Testing Research Expense" "The Technology Promotion Financing System"				
(4) Supporting Industry Promotion Policies	1974 "The Specific Remedy Financial System for the Small-to-Medium-Sized Enterprise"	1975 "The Small and Medium Scale Industries Affilication Promotion Act"	The Placement of the Recommendation Committee for Assisting Small and Medium Scale Industries	1989 "ASEAN Japan Development Fund (For Small and Medium Scale Industries)"	

	Japan	Korea	Singapore	Malaysia	Thailand
	1975 "Foreign Market Development Reserves for the Small and Medium Scale Industries" 1985 "The Technological Basis Strengthening Tax System for the Small and Medium Scale Industries" 1980 "The Commercialization Insurance System of the New Technology for the Small and Medium Scale Industries"	"The Establishment Assistance Fund" "The Promotion Fund of the Small and Medium Scale Industries" "The Credit Security Fund" "The Promotion Fund of the Machine Industry" "The Assistance by the Central Committee of the Small and Medium Scale Industries"			

III-6. Measures for Promotion of the Malaysian Electronics Industry

Of the products covered by this fiscal year's survey, Malaysia does not currently produce any of (1) office electronics equipment, (2) CRT's, or (3) ceramic IC packages/substrates. Therefore, the precondition for any development is an infusion of foreign capital to start up production activities. Any measures for promotion of these industries other than encouragement of foreign investment would only serve as indirect support.

There are primarily two areas in which indirect support could be provided for the products surveyed: support to the existing electrical and electronics industries and improvement of the investment climate for promoting foreign investment. In regard to the existing electrical and electronics industries, the market for CRT's is the TV industry and the market for ceramic IC packages and substrates is the IC industry. Development of these industries domestically would therefore mean an expansion of the markets and a rising need for domestic production of CRT's and ceramic IC packages and substrates. For the office electronic equipment industry, assistance is considered needed for promotion of related parts manufacturers from the standpoint of parts procurement.

To clarify the areas of the investment climate requiring improvement, we based our analyses on our judgement of the currently operating electrical and electronics industries, but we also wanted to obtain a grasp in Japan of the image the Japanese industries had of Malaysia as as investment site compared with competitors such as Thailand, Singapore, and Korea. Therefore, we broadened the scope of the survey, in particular the scope of the questionnaire, to cover the electrical and electronics industries as a whole.

On the government level, the most desirable form of assistance in promotion of the industries would probably be the establishment of the best environment for fostering the competitiveness and creativeness of private firms. Such improvements to the industrial base would cover a wide range of areas and would require long years before their effects would be felt. If we divide the industrial base into "hardware" and "software" aspects, Malaysia may still have problematic areas, but it may be said to be more advanced than neighboring countries when it comes to infrastructure and other "hardware" matters, so the emphasis should be placed on improvement of "software" aspects. The most important improvements of "software" aspects should be development of human resources and improvement of product quality, so we put stress on the judgement of the present status of the latter including establishment of an inspection system and the spread of TQC activities for quality assurance.

As a step in the process of working out a supporting programme, first we have been identifying problems through interviews and questionnaires with companies in Malaysia and have been formulating measures for resolution of the same.

To implemente these measures in practice, we reviewed the present status and problems of existing support institutions with respect to the electrical and electronics industries.

Further, we reviewed the supporting institutions and supporting measures used in the past and present by Japan, Korea, and Singapore, which are advanced in terms of the development of the electrical and electronics industries, and Thailand, which is currently working to promote the industry, as reference for preparation of our supporting programme. Figure III.6-1 shows the relationship between the content of the survey and the process up to preparation of the programmes for each industry from the study of the relevant measures. The recommended measures referred to in this section will be used in the final analysis as reference measures for the integration of a comprehensive promotion programme based on recommended measures for each industry surveyed.

Table III.6-1 shows the present status, problems and recommended measures in areas of production activities, promotion policies, supporting institutions and investment climate with respect to the electrical and electronics industries in Malaysia.

Fig. III. 6-1 Process of Preparation of Programmes

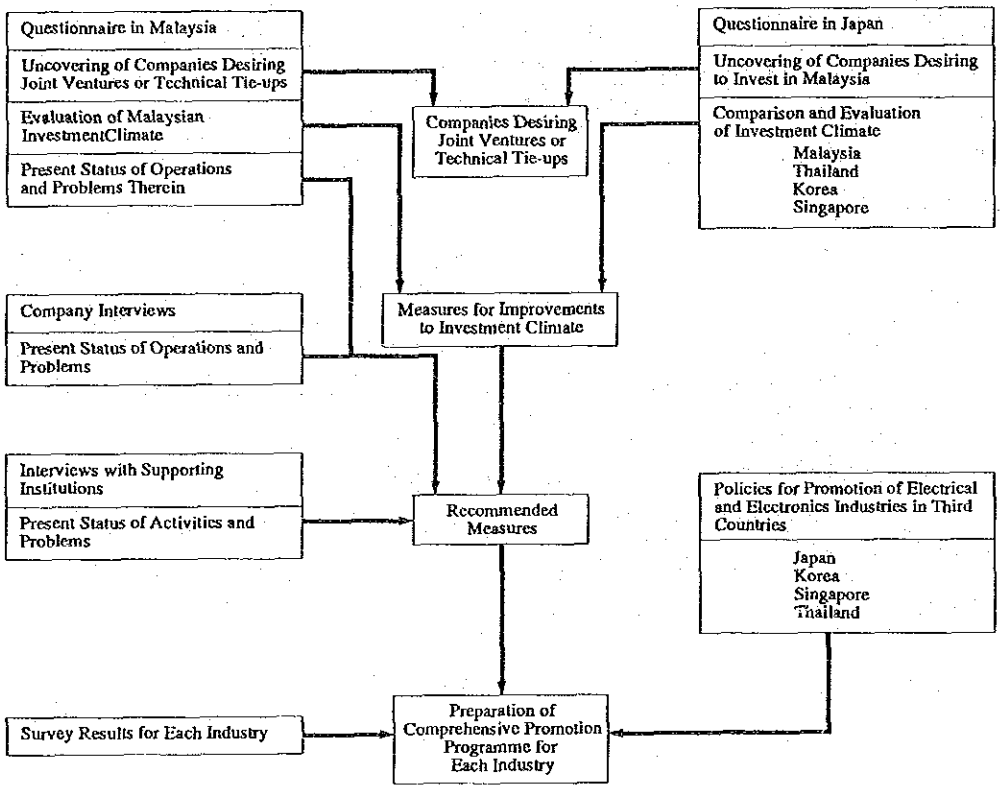


Table III. 6-1 Present State, Problems and Recommended Measures for Electrical and Electronics Industry

	Present State	Problems	Recommended Measures
Production Activities	The electrical and electronics industry is a core sector of Malaysian industry, accounting for about 70 percent of the country's total production. By sector, production of components comprises 78 percent of the industry's total production while consumer products and industrial products involve only 13 percent and 9 percent of the total production respectively. The figures show that the industry is heavily dependent on the production of components such as semiconductors. Priority should be given to the promotion of consumer products and industrial products as well as to the reduction of dependence on imported components through the development of supporting industries. Present Activities of electrical and electronics companies in Malaysia are as follows.		
	1) Employment - The percentage of production workers surpasses 70 percent of the total number of employees. - Workers with less than three years in service account for about 50 percent. - Skilled workers are insufficient in number. Another problem is frequent job hopping (high turn-over ratio).	• Lack of skilled workers and high turn-over ratio.	• Expand and improve vocational training schools.
	2) Training of employees - In-house training is used by more than 80 percent of companies for the training of employees.	• Costs for training employees are high.	• Strengthen incentives for employee training. • Establish subsidies and other supporting measures
	3) R & D - About 30 percent of the companies have	• Activities (such as R&D activities) in areas other than production are	• Attract R & D activities from foreign countries.

	Present State	Problems	Recommended Measures
	their own R & D departments.	insufficient.	• Improve R & D environment through education of engineers.
	4) Subcontractors - About 50 percent of the companies use subcontractors - About 60 percent of the local companies have business deals with foreign-affiliated companies.	• The measures to foster small and medium scale companies have been strengthened in terms of incentives, but the fostering of local entrepreneurs is required.	• Set up training courses for management.
	5) The local content ratio is low except for some home electric appliances.	• There is a lack of supporting industries.	• Promote the development of small- and medium-sized companies and attract related industries from foreign countries.
	6) Some of the local companies cannot afford to introduce machines and equipment.	• The revitalization of financing schemes for the promotion of the industry is required.	• Introduce low-interest loan schemes for companies in key industries like AJDF's new low-interest-rate-loan scheme for small- and medium-sized companies.
	7) The expansion of the IC industry into the preceding processes is now being promoted by the government, but the supply of electric power is unstable.	• The supply of electric power is unstable.	• Establish a stable power supply system.
	8) Because of poor facilities for processing of sludges, each manufacturer has to keep them in stock.	• Facilities for the treatment of industrial wastes are still poor.	• Set up a well-organized system for the treatment of industrial wastes.
Supporting Policies	There are no promotion measures specifically targeted at the electrical and electronics industry. Due to revisions since 1986, the tax incentive system has been expanded to promote investment in the manufacturing industry in general. Higher priority is given in the tax incentive system to the electrical and electronics industry. As a result, the industry can use the majority of the incentive		

	Present State	Problems	Recommended Measures
	schemes. The outcome of the questionnaire survey is as follows. 1) Incentives for export promotion Utilization ratio: 60.8 percent The utilization ratios of ECR and the abatement of adjusted income for exports are high. 2) Incentives for investment Utilization ratio: average 80 percent Breakdown: PS : 39.4 percent ITA: 19.7 percent 3) Incentives for training Utilization ratio: 10 percent (of the 73 companies which have already introduced their training programmes) 4) Incentives for R & D activities Utilization rate: 20 percent (of the 26 companies which are engaged in R & D activities)	• Generally speaking, tax incentive schemes are more often used by foreign-affiliated companies than local companies. This is because many local manufacturers are not eligible for these schemes. A lack of information and doubt about the advantages of the schemes are also referred to as reasons for the low utilization rate by local manufacturers. • It is difficult to receive incentives for training and R & D activities. Strengthening of these supports is desirable.	• Incentives for small- and medium-sized companies have been strengthened since 1989. The effective supporting measures should be continuously examined. • Review requirements for incentives for training and R & D activities. • Create new promotion measures such as subsidies.
Supporting Institutions	There are no special institutions for the electrical and electronics industry. For the industry in general, the following institutions can be utilized. 1) Institutions for training of skilled labour National Industrial Training Centre of the Ministry of Labour MARA Vocational Training Schools Training Centres of the Ministry of Youth and Sports Training Centres of the Mnistry of Welfare Services	• Regarding education in general, the following two points can be referred to as problems. 1) Failure to match the training curriculum to the needs of manufacturers. 2) Insufficient technology guidance by training institutions for private companies (due to geographical constraints and other	• Improve and expand resources for training. • Strengthen the cooperation between universities and industry. (i.e. Establishment of academic-industry training centers.) • Study the possibility of setting up local branches of supporting institutions.

	Present State	Problems	Recommended Measures
		factors)	• Introduce subsidy schemes for training by companies.
	2) Institutions to train engineers 5 Polytechnics in the Nation Universiti Malay (UM) Universiti Kebangaam Malaysia (UKM) Universiti Sains Malaysia (USM)	• Some institutions have their own concepts for the solution of these problems. The concepts, however, have not been realized due to financial constraints etc.	
	3) Others SIRIM = Currently 28 home electric appliance items are subject to SIRIM inspection. R&D activities are not underway yet in the area of electronics.	• Rapidly increasing the number of items inspected is impossible because of limited manpower and facilities. The inspection of MNC's products is different at each company. MNCs do not expect public institutions to take over these inspections from private companies.	• Take realistic approaches. For example concentrate on targets in the local supporting industries related with electronics.
	Technology Park. = The establishment of a Technology Park is planned to promote R&D activities. The outline of the project has already been worked out.	• Promotion targets are limited to industries which are too highly advanced.	• Promote product development. It is also necessary to more clearly identify the companies eligible for promotion measures. • Examine the possibility of temporarily opening training courses in local areas.
	NPC = Priority is given to courses on quality control.	• Use by companies outside KL and the surrounding regions is difficult. • The utilization rate is not very high.	• Examine the subjects and curriculum for training courses. • Strengthen PR activities.
Investment Climate	The investment environment in Malaysia has been showing a steady improvement since 1986. The restrictions on foreign equity and expatriate posts have been eased. The strengthening of incentives and quicker investment procedures have also been realized. Attempts are now being made to introduce industry with higher value-added	• More segmented approaches are needed to attract foreign investment.	• Strengthen activities to attract foreign investment. In particular, it is necessary to concentrate the focus of study and attraction efforts in the desired areas.

	Present State	Problems	Recommended Measures
	(4) A comparison based on the outcome of a survey conducted on resident Japanese firms shows that higher ratings are given by resident Japanese firms in terms of the education level of workers, infrastructure and basic position toward foreign investment. On the other hand, resident Japanese firms give lower ratings of the investment climate in terms of tax incentives, wages and the turnover rate of workers.	• A supply of accurate information concerning the investment climate in Malaysia is needed	• Strengthen public relations activities with emphasis on the advantages of Malaysia's investment climate.

IV. Office Electronic Equipment Industry

IV. Office Electronic Equipment Industry

IV-1. Overview of the Industry

IV-1-1. Market Size

None of the four models of office electronic equipment covered by the current survey is being produced domestically*. The market is completely reliant on imports. The results of statistical data analysis and the field interview survey are summarised below for each model of equipment.

(1) Word Processors

The word processors currently in use may be generally classified into personal computer types and electronic typewriter types. Estimates made based on the field survey indicate that, out of the 25,000 personal computers which were sold in 1988, 80%, or 20,000 units were equipped with word processing software and that, out of the 12,000 electronic office typewriters sold, 15%, or 1,800 units, had word processing function. In the past, there were also sales of American specialised word processors, but these were relatively high in price and were not able to withstand the competition. The market shifted to personal computers and the share of these specialised word processors has shrunken tremendously.

(2) Photocopying Machines

The U.S.'s largest manufacturer entered the market in 1968. Four years later, another American manufacturer began marketing. In the following year 1973, a Japanese manufacturer began sales activities there.

Table IV. 1-1 shows the import statistics for the years 1983 to 1986, the import projections for 1987 to 1980, and the demand projections for 1983 to 1989.

Note: * Some companies had acquired manufacturing permits for word processors, photocopying machines and telex machines but none of them were engaging in actual production.

Table IV. 1-1 Imports and Demand for Photocopying Machines in Malaysia

(Unit: Set)

	1983	1984	1985	1986	1987	1988	1989
Imports	7,996	10,105	8,556	5,838	6,662	6,500	6,750
Demand	7,800	9,700	8,600	6,100	6,500	6,250	6,500

Source: Malaysian Annual Statistics of External Trade 1983 to 1986, and for Imports for 1987 to 1989 and Demand Estimate Based on Field Interview Survey.

As the above table shows, imports of photocopying machines rose at a fast pace since 1983 and peaked in 1984. In 1985, imports declined in reaction to an excess of orders in the previous year and in 1986 the market was struck by a year and in 1986 the market was struck by a business recession, resulting in plummesting imports. In 1987, however, demand recovered and in 1988 will settle down at the level of 6,250 units.

The share of imports by country, based on the import statistics for 1986, shows Japan accounting for 91.5%, overwhelming imports of other countries. Europe as a whole accounted for 5.6% and North America for 1.8%.

Table IV. 1-2 Share of Imports of Photocopying Machines

	Set	Share (%)
Europe	323	5.6
Netherlands	(135)	
West Germany	(123)	
Switzerland	(30)	
Denmark	(18)	
Italy	(12)	
France	(5)	
North America	108	1.8
U.S.	(90)	
Canada	(18)	
Japan	5,342	91.5
Others	63	1.1
Total	5,838	100.0

Source: Malaysian Annual Statistics of External Trade

(3) Facsimile Machines

Facsimile machines began to be introduced in Malaysia in the 1970s. At the start, they were expensive pieces of machinery and therefore demand was limited to the police, military, broadcasting, and multinationals. In 1984, however the government called for nationwide use of facsimile machines and due in part to this, interest soared and sales took off. The industry estimates that sales jumped 1.9 fold in 1987 and will similarly jump 2.5 fold in 1988.

Table IV. 1-3 Sales Trend of Facsimile Machines in Malaysia

(Unit: set)

Year	Sales Volume		Increase
1984	150		-
1985	750		+ 600
1986	1,750		+ 1,000
1987	3,259		+ 1,509
1988	8,000		+ 4,741
1989	12,000 + 2,000	Government demand	+ 4,000
1990	15,000 + 2,000	Government demand	+ 3,000

Source: Field Interview Survey

Table IV. 1-4 Subscription to STM (Facsimile Machines)

Year	Number of Subscribers	Increase
1983	88	-
1984	275	+ 187
1985	603	+ 328
1986	1,158	+ 555
1987	4,674	+ 3,516

Source: STM

(4) Telex Machines

Demand for telex machines, as reflected by subscriptions to STM, increased in 1984. While it subsequently increased, there was only an increase of 1,600 subscriptions in the three years from 1984 to 1986. Further, it is projected that demand will have declined to 10,000 subscriptions in 1988. Government organisations predict demand is falling in Malaysia due to the declining usage of such equipment around the world. The overwhelming opinion in the industry is that demand disadvantageous compared with facsimile, which are easy to operate and do not require any special operators or training.

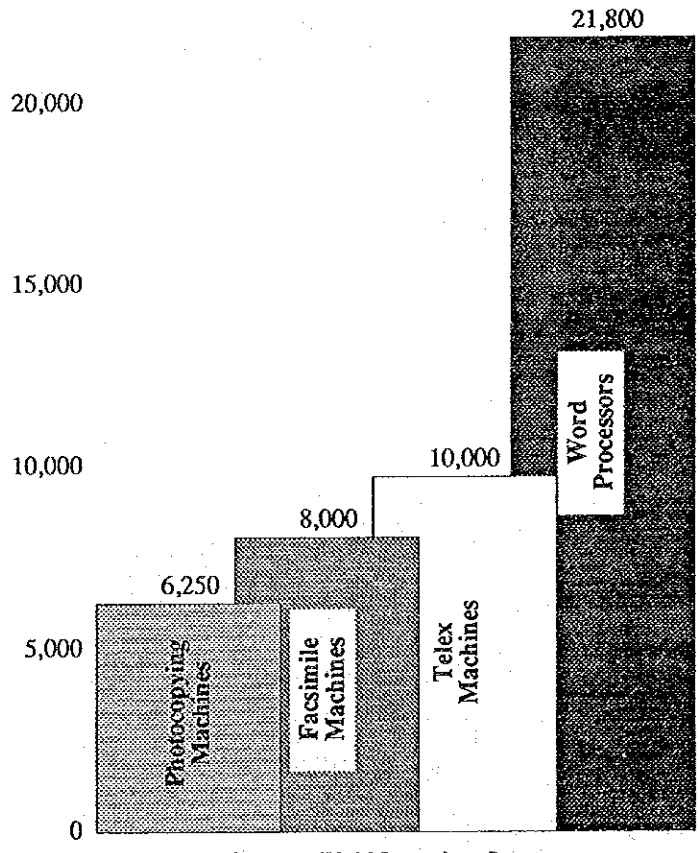
Table IV. 1-5 Subscriptions to STM (Telex Machines)

Year	Number of Subscribers	Increase/Decrease
1983	7,980	-
1984	9,774	+ 1,794
1985	10,881	+ 1,087
1986	11,383	+ 502
1987	11,228	- 155
1988	10,000	- 1,228

Source: STM for 1983 to 1986 and Field Interview Survey Results for 1987 to 1988

Fig. IV. 1-1 Size of OA Equipment Market in Malaysia (Estimated Demand in 1988)

Unit: Sets



Source: Field Interview Survey

IV-1-2 Sales and Distribution

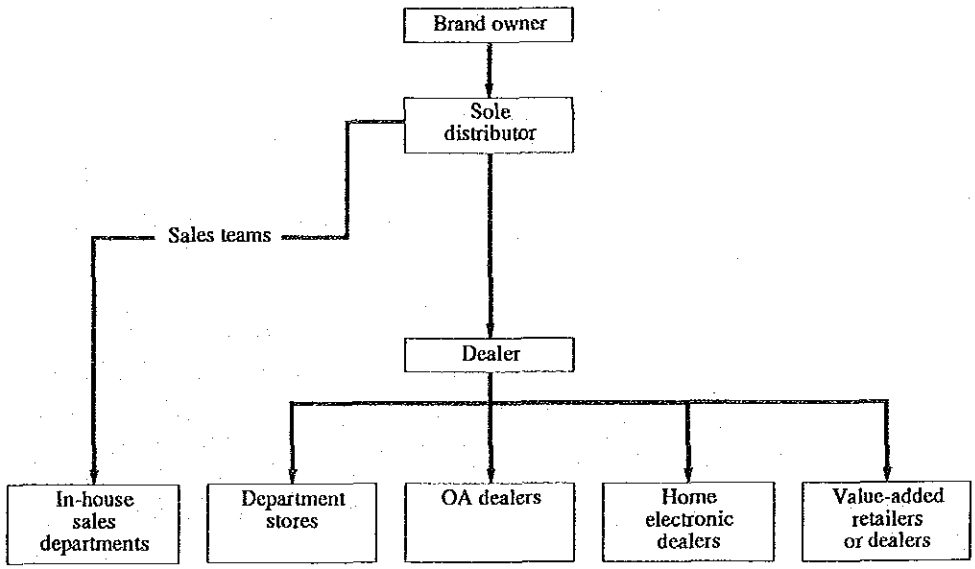
(1) Word Processors

1) Market Share

Based on a field interview survey of the marketing sectors of the industry, estimates were made of the market shares of personal computer types and electronic typewriters types. As a result, it is estimated that, for personal computer types, IBM and IBM compatibles account for 20% and 64%, for a total of 84%, and Italian manufacturer and an U.S. manufacturer for 5% each, and others for 6%. For the latter electronic typewriter types, five large companies account for an 80% share. Three of the five companies are European, each of which is an established firm which began with manual typewriters. The other two are top rank manufacturers of Japan. The remaining 20% of the share are held by three Japanese manufacturers. These Japanese manufacturers special features of their products, i.e. their portability of medium size.

2) Distribution channels for word processors are illustrated below:

Fig. IV. 1-2 Distribution Channels for Word Processors



In the case of word processors 80% of the market is concentrated in Kuala Lumpur and Petaling Jaya. Personal computer types are primarily distributed through dealers. Fortypewriter types, some brand owners do not go through dealers, but have the sole distributor that organises its own direct sales system throughout the country.

3) Sales Strategy

The mode of sales at the end users is 60% leasing and 40% purchase.

4) Tariffs

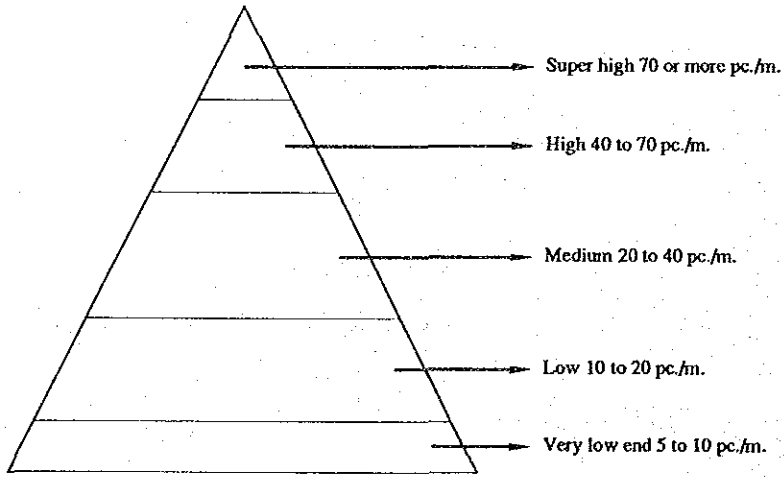
The import duty is 30% and the sales tax 10%.

(2) Photocopying Machines

1) Market Share

The photocopying machines market may be classified as follows by the speed functions:

Fig. IV. 1-3 Market Structure of Photocopying Machines by Speed Function



"Super high" speed models represent a very small part of the market in terms of units. The "medium" and "low" speed models constitute the mainstream of the market and, together with "high" speed one, account for 80% of the market. This mainstream market is held by one U.S. manufacturer and five Japanese manufacturers. Three other companies etc. hold a 10% market share. The share of used machines is estimated at about 10%.

2) Distribution Channels

The distribution channels for photocopying machines vary according to the company. Examples are shown in Fig. IV. 1-4.

Fig. IV. 1-4 Distribution Channels for Photocopying Machines

	Importer/ sole agent	Kuala Lumpur/ Petaling Jaya Regions	Other Peninsular Regions	East Malaysia
(Company A)	Own sales company	Direct	Direct	Direct
(Company B)	Sole agent	Direct	Dealers	Dealers
(Company C)	Own sales company	Direct	Dealers (OE, OA Dealers)	Dealers (OE, OA Dealers)
(Company D)	Own sales company	Telecommunication equipment dealers	Telecommunication equipment dealers	Telecommunication equipment dealers
(Company E)	Sole agent	Dealers	Dealers	Dealers, Distributors

Source: Field Interview Survey

The Kuala Lumpur and Petaling Jaya region are a large market accounting for 50% of sales but strategically speaking there are numerous companies stressing the local markets. There are also companies, like the above-mentioned company A, which is establishing three branches each in Sabah and Sarawak.

3) Tariffs

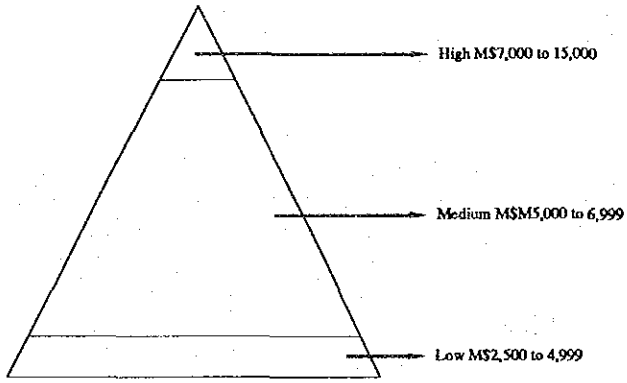
The import tariff is 20% and the sales tax 10% (Imports of colour photocopying machines are banned).

(3) Facsimile Machines

1) Market Share

The following figure shows the structure of the market by price range:

Fig. IV. 1-5 Market Structure of Facsimile Machines by Price Range



Of the three classifications, the "low" price models account for 90% of the market, the "medium" price ones for 9%, and the "high" price ones for 1%. The "low" price ones, which account for the largest part of the market, are supplied by six Japanese manufacturers.

2) Distribution Channels

The general practice is for the sole agent or the sales company of the manufacturer to make direct sales to the Kuala Lumpur/Petaling Jaya market and to sell through dealers or to engage in direct sales for the rest of the Peninsular Region and East Malaysia, with a ratio of about 50/50.

3) Payment Terms

The usual modes of sale are cash payment in 30 days or leasing. A breakdown according to the locations interviewed shows 30% cash sales, 40% leasing and 30% 30 days' payment after contracting.

4) Tariffs

The import duty is 30% and the sales tax 10%.

IV-2. Present Status of the Industries Related to the Domestic Production of Office Electronic Equipment in Malaysia

IV-2-1. Outline of the Production Process of Office Electronic Equipment

(1) Basic Flow of Manufacturing Processes

The manufacturing processes of photocopying machines, facsimile machines, and word processors may be considered as largely consisting of the following three stages:

1) Manufacturing of Parts

This is the stage where parts are manufactured by specialised parts manufacturers.

Those general use electronic components, such as RAMs and the like are produced as standard parts based on the specifications set by the individual specialised manufacturers. So office electronic equipment manufactures would select the same form catalogues for use. On the other hand, metal pressed parts, plastic injection moulded parts, etc. are usually produced by subcontracting processors according to the specifications presented by office electronic equipment manufacturers.

2) Assembly of Units (Sub-assembly)

"Units" refer to the assemblies which are formed by the combination of a number of components and which perform one or more functions in the final product. Roughly speaking, one may divide them into mechanical units, electrical units, and composite mechanical-electrical units.

Mechanical units are assemblies of metal pressed parts, plastic injector moulded parts, and other mechanical parts which are assembled by such measures as welding, fusion, adhesion, caulking, pressure fitting, screwing, and by other methods. These units primarily support the overall structure as the frame fulfill the function to transmit power as a lever or actuator.

Most of electrical units are produced by assembling components on printed circuit board by soldering. These function to supply power to the different portions of the product, to control the flow of the products, and to give various signal.

The composite mechanical-electrical units are produced by combining a mechanical unit comprised of metal pressed parts, plastic injection moulded parts, and the like and an

electrical unit such as a lamp or motor by the same kind of method as in the assembly of mechanical units.

These composite mechanical-electrical units function to convert electrical signals to mechanical operation and vice versa.

3) Final Assembly

In this process, the final products of photocopying machines, facsimile machines or word processors are produced by the assembly of a number of units and components. In general, this includes the assembly work, inspection and adjustment, aging inspection, and other testing and then the packaging and shipment.

(2) In-house Processing Process

Photocopying machines, facsimile machines and word processors are comprised of a large number of parts and it is uneconomical to maintain in-house all the and manufacturing facilities needed to produce them integrally from the raw materials. Japanese office equipment manufacturers usually process only a limited number of parts in-house such as those manufacture of which is technically difficult or other key components. Their major operations are the assembly of units, and the final assembly and, for the rest, they largely rely on purchases of standard parts or on subcontracting processing by specialised manufacturers (subcontractors). The in-house processing includes precision machining, metal plating, printed circuit board assembly, phase adjustment and inspection, and the fabrication of specific components. The range of processing work handled in-house differs according to manufacturer and also according to the factories of any one manufacturer.

(3) Types of Parts and Units

Fig. IV. 2-1 shows the parts and units used in photocopying machines, facsimile machines and word processors. They are shown in accordance with above-mentioned process flow.

Parts are shown divided into parts which can be used in common by any of the above three products and special parts which can only be used for individual products.

The composition of the units differ according to the manufacturer and often differ according to model even in the same manufacturer. Therefore, the general structure of the units are shown.

(4) Machinery and Equipment

Fig. IV. 2-2 shows major machinery and equipment used in the in-house processing. Because the in-house processes differ according to the manufacturer and even according to the factory, the facilities required for the same differ accordingly. Basically, the final assembly is conducted by manufacturers directly, so assembly facilities are considered essential.

Fig. Ⅳ. 2－1 Process Flow Chart (Photocopying Machines・Facsimiles・Word Processors)

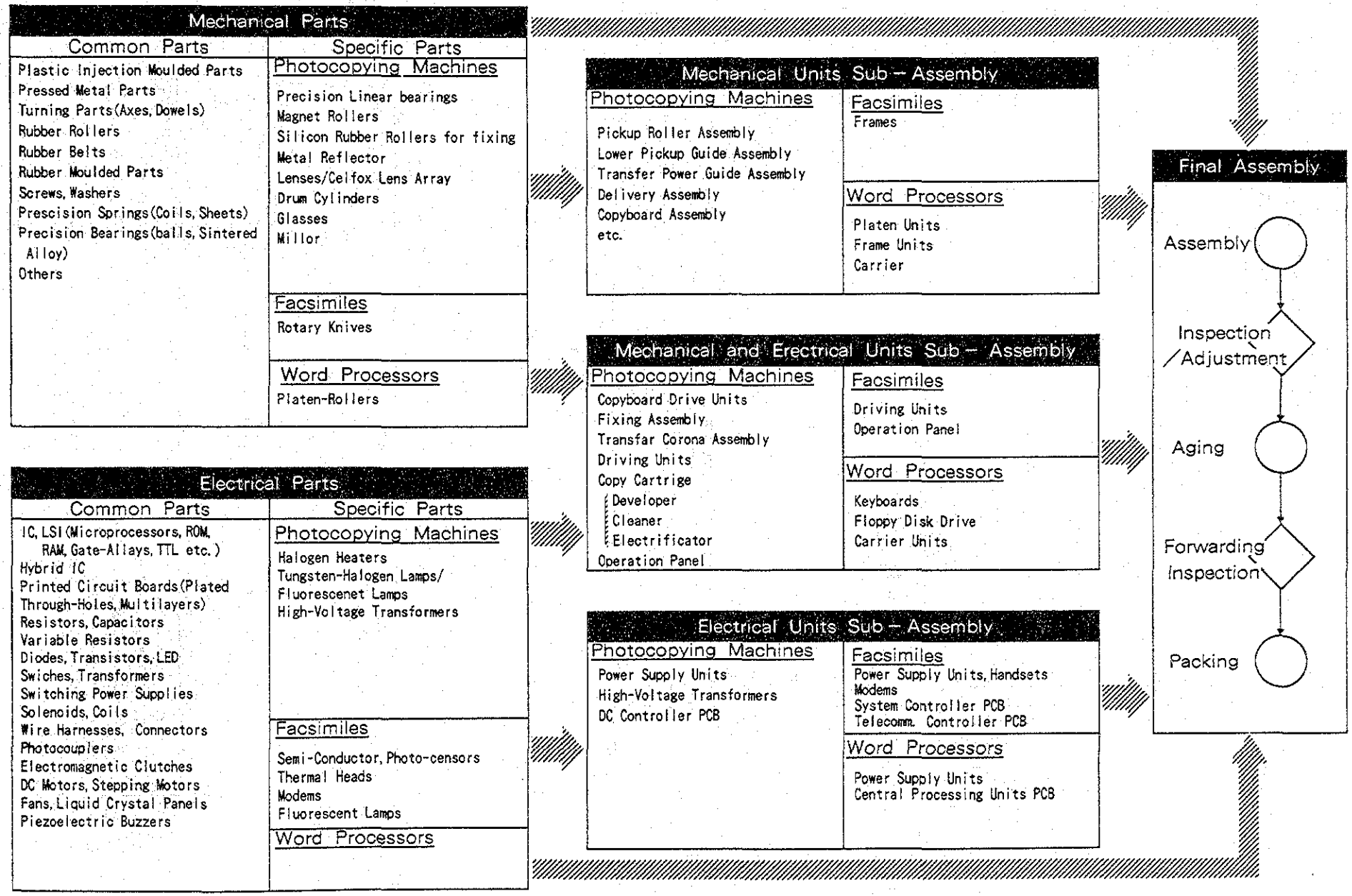


Fig. Ⅳ. 2 – 2 Major Facilities Used Manufacturing Office Electronic Equipment

Major facilities, equipment, dies jigs and fixtures used in manufacturing Business Machines are as follows.

1. Machinery
   1) Machining Centre
   2) Electric spark machines, Wire-cut machines
   3) Jig bollers
   4) Turning (Numerically Controlled)
   5) Milling (Numerically Controlled)

2. Equipment for PCB Ass'y
   1) Device Insertion equipment(Automatic)
   2) Chip-components mounters
   4) IC Insertion equipment(Dip type)
   5) Board tester (PCB tester)
   6) Incircuit tester
   7) Fanction tester
   8) Soldering equipment (Automatic)

3. Assembling facilities
   1) Belt conveyors/ Roller conveyors
   2) Chain-traction conveyors
   3) Isothermal chamber for aging
   4) Assembling Robbot

4. Measuring equipment
   1) Three-dimensional measuring equipment
   2) Laser Measuring equipment
   3) Interferometer
   4) Scanning electron microscope
   5) High-voltage resistance testing equipment

5. Plant facilities
   1) Chemical Nickel plating facility
   2) Zinc plating facility
   3) Electrodeposition facility

6. Transfer/Delivery facility
   1) Automatic storage & Retrieval system
   2) Automated Guided Vehicle
   3) Automatic packing equipment

7.In-house developed facilities
   1) Auto-ass'y line
   2) Photo-conductive application equipment
   3) Toner manufacturing plant

8. Die, tool and fixtures.
   1) Plastic injection Moulding Machines
   2) Pressing machines
   3) Others

9.Others
   1) Drainage plant
   2) Computer/Programmable controller
   3) Clean Room
   4) Environmental testing rooms

IV-2-2. Electrical-Electronic Equipment Assembly Industry

At present Malaysia does not have any manufacturer producing photocopying machines, facsimile machines or word processors. Therefore, the assembly manufacturers for other electrical and electronic equipment, which perform similar assembly work with office electronic equipment, are investigated and the basic data were collected for analysis of the feasibility of establishment of assembly manufacturers for photocopying machines, facsimile machines and word processors.

Among the manufacturers visited, there were 12 assembly companies.

(1) Level of Technology

1) Methodology

In order to evaluate the technology level of assembly manufacturers in Malaysia, the operation of their factories were analysed from various angles and a judgement was made by comparing their level with that of advanced Japanese electrical and electronic equipment manufacturers. Specifically the following procedures were taken:

(a) The check lists which are shown in Fig. IV. 2-3 and IV. 2-4 were prepared. The levels of operation of the companies visited were evaluated by the classification of A, B, and C for each check sub-items. The measures of evaluation shown in the check lists are just indicative. In practice, in some cases, the ranking was made based on other criteria.

(b) The sub-items of the check lists were reclassified into the following seven main items:

-Facilities
-Operation management
-Production management
-Physical distribution and stock management
-Quality control
-Safety, hygiene and pollution
-Others

(c) Each of the sub-items was weighted in three ranks of A, B, and C with the most important as A, down to C.

(d) Three, two and one points were respectively given to the rankings A, B, and C for both the weights and the evaluation results of the sub-items and the

evaluation points for each main item were calculated in accordance with the following formula:

$$\text{Evaluation points} = \frac{\left(\text{weight of sub-items} \times \text{ev. points per sub-item}\right)}{\left(\text{weight of sub-items} \times 3 \text{ point}\right)}$$

When 1.00 in evaluation points is given, this means that the manufacturer could be considered equal in level to advanced Japanese electrical and electronic equipment manufacturers.

Fig. IV. 2-3 Factory Survey Check List: Common to All Industries (1/2)

Name of company :

	Check Items	Check method	Evaluation	Evaluation Scale		
				C	B	A
Facilities	Use of latest equipment	Visual Check		Mostly employs conventional machines	Partly uses NC and MC machines	Has introduced CNC and NC machines and adopted automatic control
				Process consists of hand work except belt conveyer	Automated packing and conveyance	Introduced robots and insertion machines
	Operation ratio	Interview & VC		50 % or below, many machines are out of order	51 % to 90 %, Many setup operations	More than 90 %
	Maintenance	Interview & VC		Does not maintain equipment until it gets out of order	Inspects equipment, but not periodically (according to schedule)	Carries out systematic PM and conditions of machines are clearly indicated
Operation Management	Standard Time	Interview		No notion of standard time or only has time measures based on experience	Has a standard time system (PTS , Data method,etc)	Has a standard time system and maintains it favorably
	Standard work instructions	VC		Oral instructions only	Work manuals are prepared	Has well – ordered standard work instructions
	Efficiency and operation speed	Rating		80 or below	81 to 100	101 or above
	Organization of production line and job allocation	VC		Production line and job allocation are disorganized and many workers who have nothing to do	A few workers have no work	Production line and job allocation are well – organized
Production Management	Production control system	Interview		Production management is done by hand work	EDP system deals with part of production management	EDP system is completed
	Schedule and delivery control	Interview		Poor system of monitoring delays	Monitors data of production target and achievement on a daily basis	Indicates a progress in real time at workshops
	Order cycle	Interview		More than 1 month	10 days to 1 month	9 days and below
Physical Distribution, Stock management	Level of stock Production period	Inverview		Stock for 30 days or above	Stock for 10 days and above	Stock for 9 days or below
	Layout, line of physical distribution flow	VC		No intention of arrangement	Flow is rationally arranged	Well arranged and seen in a line
	Plant location	VC		Some inconveniences	Appropriate	Optimum

Factory Survey Check List: Common to All Industries (2/2)

Name of company :

	Check Items	Check method	Evaluation	Evaluation Scale		
				C	B	A
Quality Control	Inspection Standards	Interview & VC		Inspection flow and inspection standards are not established	Inspection flow and inspection standards are established	Inspection standards are controlled well and are posted
	Controlling defective ratio	Interview & VC		Always takes a temporary measure to a problem	Data is displayed but the indication is not sufficient	Data management is fully carried out
	Organization in charge of quality assurance	Interview		None	There is a sort of quality assurance organization	Has established a well organized system
	Lot Stratification	VC		There is a possibility that different lots of parts or goods in process get mixed up	Uses labels which distinguish lots	Uses a check sheet by lot concerning such factors as quality, etc
	Controlling measuring equipment	Interview		Instruments are kept in bad condition	Takes care of instruments up to a point	Periodically regulates instruments
	Non – defective ratio	Interview		70 % or below	71 % to 90 %	91 % or above
Safety, Cleanness	Application of 5Ss (Orderliness , neatness , cleanliness disposal , discipline)	VC		Improper	Acceptable	Keeps everything in good order
	Safety programme	VC		Improper	Has a set of safety implements and safeguards	Makes best use of safety implements and safeguards
Others	Small group activities	Interview		No activity	Small group activities are carried out	Small group activities are actively carried out
	Suggestion system	Interview		No system	Suggestion system is carried out	Suggestion system is actively carried out
	Personnel development	Interview		Does not educate and train employees systematically	Education and training of employees are done as far as work requires them	Trains employees by position
	Qualification of industrial standards	Interview		None	Acquired qualifications of two or more kinds of standards	Acquired qualifications of more than three kinds of standards

Fig. Ⅳ.2－4 Factory Survey Checklist : Assembly

Name of company :

Assembly Line Facilities	Tact Control	Work Style
☐Belt Conveyer ☐Carrier Type ( ) ☐Roller Conveyer ☐Others ( ) Model ☐One product purposed line ☐Changeable line /day ☐Mixture production	☐Forced Tact ☐Free Flow ☐Manual Drive	☐Moving work → ☐Line work ☐Fixed work → ☐ Unloading type

	Check Items	Importance grade	Evaluation	Evaluation Scale C	Evaluation Scale B	Evaluation Scale A	Remarks
Product applied technology	Product Handling	B		Rough	Acceptable	Handled carefully	
	Assembly non－defective rate	B		89% or below	90% to 94%	95% or above	
Work Designing	Use of tools	A		No attention paid to torque	Torque etc are well controlled	Torque etc are controlled fairly well	
	Efficiency of line balancing	B		Less than 80%	80% or above	95% or above	
	Layout of working desks	B		Working efficieincy is bad	Normal	Good	
	Parts supply	B		No JIT concept employed (Quantity and time are irregular.)	Supplied in less than day quantity at lineside.	Parts are in order in kit or set style.	
	Work movements	B		Many losses and extra work	Rationalized	Little loss , improvement is progressing	
Managements	Progress recognition	A		Uncertain whether production is progressing according to plan or not.	Flowability curve provided according to day quantity unit.	Plans／Results are indicated.	
	Flow condition	B		Many rejects and irregularities.	Some rejects are found along line.	Line flow is smooth : no rejects.	
	No. of staff for Relief, Rework	B		6 or above /20 workers	5 to 3 /20 workers	2 or below /20 workers	

Fig. Ⅳ. 2－5 Technology Level Evaluation : Assembly (Local)

	Evaluation Items	Importance grade	Local A		Local B		Local C		Local D		Average	Remarks
Facilities	Use of latest equipment	B	C		C		C		C			
	Operation ratio	B	A	0.67	(B)	0.67	A	0.78	B	0.50	0.66	
	Maintenance	B	(C)		A		A		(B)			
Work management	Standard time	B	C		B		A		C			
	Standard work instructions	A	B		B		B		B			
	Efficiency and operation speed	B	B		(B)		A		B			
	Job allocation	B	B		(B)		A		B			
	Efficiency of line balancing	B	B		(B)		A		B			
	Layout of work desks	B	B	0.60	(B)	0.72	A	0.93	B	0.67	0.73	
	Parts supply	B	C		B		B		B			
	Work movements	B	B		(B)		A		B			
	Product handling	B	B		(B)		A		B			
	Use of tools	A	C		B		A		B			
	No. of staff	B	A		A		A		A			
Production management	Production control system	B	(C)		C		C		(C)			
	Schedule and delivery control	B	B		(B)		A		A			
	Order cycle	B	(B)	0.62	A	0.67	(A)	0.85	(B)	0.90	0.76	
	Progress recognition	A	C		(B)		A		A			
	Flow condition	B	A		(A)		A		B			
Physical distribution / stock	Level of stock	B	B		(B)		A		B			
	Layout	B	B	0.67	(B)	0.67	A	0.93	B	0.67	0.74	
	Plant location	C	B		B		B		B			
Quality assurance	Inspection Standards	A	B		A		A		B			
	Controlling defective ratio	A	B		(A)		A		B			
	Organization in charge of QA	B	B		B		A		B			
	Lot stratification	B	C	0.67	B	0.88	B	0.90	B	0.67	0.78	
	Controlling measuring equipment	B	B		A		B		B			
	Defective rate	B	A		A		A		B			
	Assembly non－defective rate	B	(B)		(B)		(A)		(B)			
	Qualification of industrial standards	B	(B)		(B)		(B)		(B)			
Safety, Cleanness	5S (Clean－your－workshop activity)	B	C	0.50	B	0.67	A	1.00	C	0.50	0.67	
	Safety Programme	B	B		(B)		A		B			
Workshop Activation	Small group activity	B	C		C		C		C			
	Suggestion system	B	C	0.33	C	0.44	C	0.44	C	0.44	0.41	
	Personnel development	B	C		B		B		B			

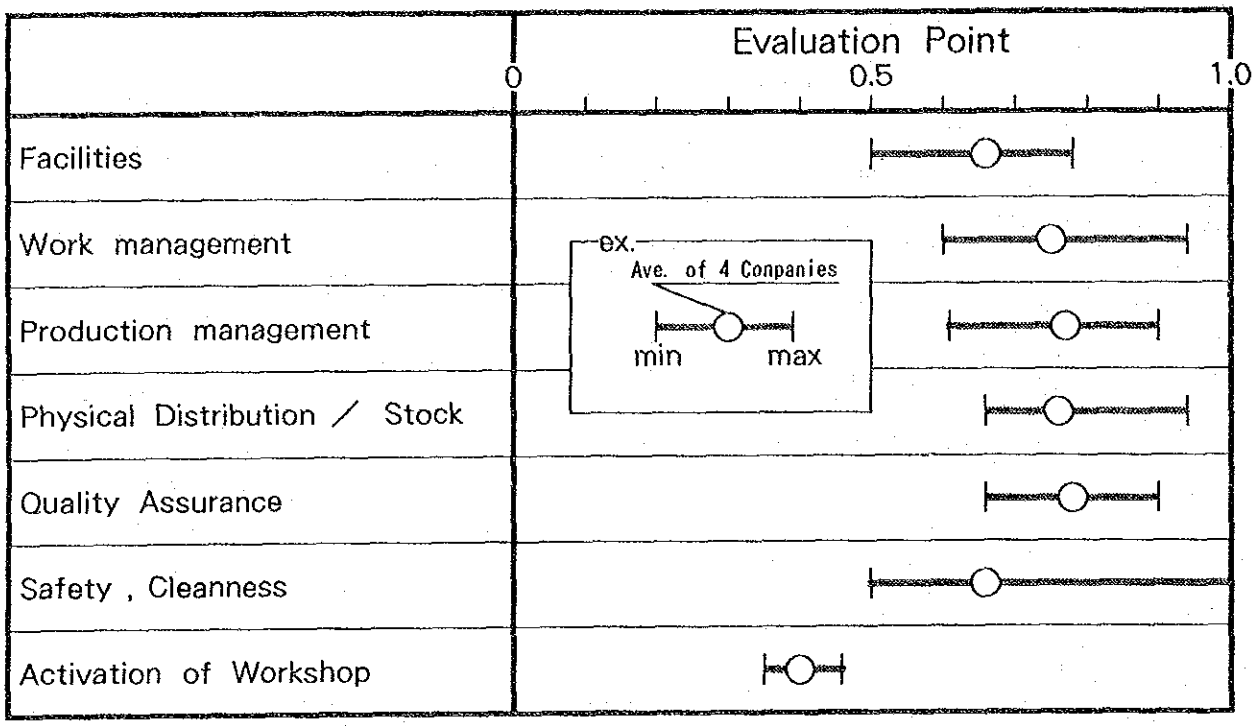
(Note) ( ) indicates results which were not added on the final calculation because of low reliability on data caused by lack of information.

Fig. Ⅳ. 2－6 Technology Level Evaluation : Assembly (Japanese)

	Evaluation Items	Importance grade	Japa-nese E		Japa-nese F		Japa-nese G		Japa-nese H		Japa-nese I		Japa-nese J		Average
Facilities	Use of latest equipment	B	B	0.89	A	1.00	A	0.83	B	0.89	A	0.89	B	0.78	0.88
	Operation ratio	B	A		(A)		B		A		B		A		
	Maintenance	B	A		(A)		(A)		A		A		B		
Work management	Standard time	B	A	0.76	B	0.81	(A)	0.75	A	0.92	B	0.75	A	0.88	0.81
	Standard work instructions	A	A		A		A		A		A		A		
	Efficiency and operation speed	B	B		B		B		B		B		A		
	Job allocation	B	B		B		B		B		C		A		
	Efficiency of line balancing	B	B		B		B		A		B		A		
	Layout of work desks	B	B		B		B		A		B		B		
	Parts supply	B	B		B		B		B		B		A		
	Work movements	B	B		B		B		A		B		B		
	Product handling	B	B		A		A		A		B		B		
	Use of tools	A	B		A		B		A		A		B		
	No. of staff	B	A		A		(A)		A		A		A		
Production	Production control system	B	A	0.94	A	0.94	A	1.00	(B)	0.85	A	1.00	A	0.93	0.94
	Schedule and delivery control	B	A		A		A		B		A		B		
	Order cycle	B	B		B		(B)		B		(B)		(B)		
	Progress recognition	A	A		A		A		A		A		A		
	Flow condition	B	A		A		A		A		A		A		
Physical distribution / stock	Level of stock	B	B	0.87	A	0.87	A	0.93	B	0.67	A	0.80	(B)	0.67	0.80
	Layout	B	A		B		A		B		B		B		
	Plant location	C	A		A		B		B		B		B		
Quality assurance	Inspection Standards	A	A	0.93	A	0.94	A	1.00	B	0.81	A	0.90	A	0.81	0.90
	Controlling defective ratio	A	A		A		A		B		A		B		
	Organization in charge of QA	B	A		B		A		B		A		A		
	Lot stratification	B	B		A		A		A		B		B		
	Controlling measuring equipment	B	A		(A)		A		A		B		B		
	Defective rate	B	A		(A)		A		A		A		(B)		
	Assembly non－defective rate	B	A		(A)		A		B		(A)		(B)		
	Qualification of industrial standards	B	B		A		(A)		A		(B)		(A)		
Safety, cleannes	5S (Clean－your－workshop activity)	B	A	1.00	B	0.67	A	0.83	B	0.67	B	0.83	B	0.67	0.78
	SAafety Programme	B	A		B		B		B		A		B		
Workshop activation	Small group activity	B	A	1.00	A	0.89	B	0.67	B	0.67	C	0.44	A	1.00	0.78
	Suggestion system	B	A		A		B		C		C		(B)		
	Personnel development	B	A		B		(A)		A		B		A		

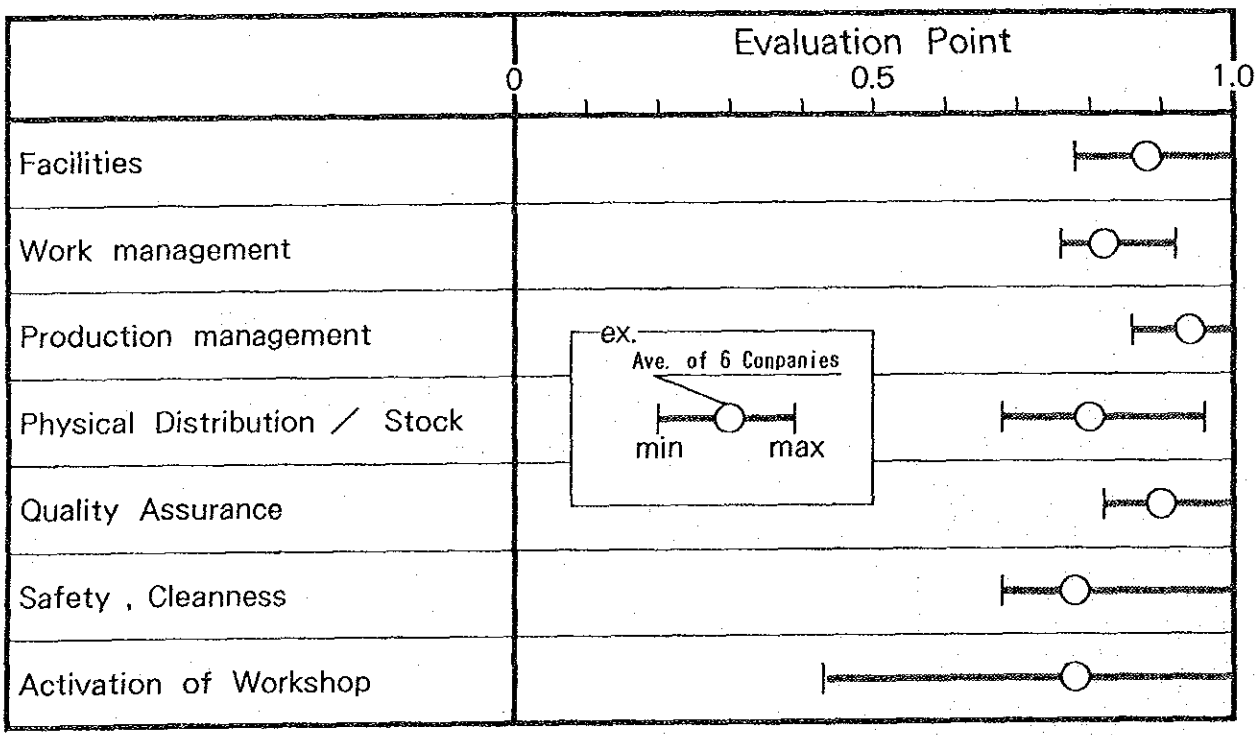
(Note) ( ) indicates results which were not added on the final calculation because of low reliability on data caused by lack of information.

Fig.Ⅳ. 2－7 Evaluation Result : Assembly (Local)



(Note) Point 1.0 will be given to Japanese premier companies of the industry.

Fig.Ⅳ. 2－8 Evaluation Result : Assembly (Japanese)



(Note) Point 1.0 will be given to Japanese premier companies of the industry.

2) Results of Evaluation

The study was made in accordance with the above-mentioned method. Out of 13 companies visited, factory inspection was not allowed in 3 companies. Accordingly, the evaluations were made for other 10 companies.

Fig. IV. 2-5 and IV. 2-6 show the results of the evaluation by company, largely divided into local manufacturers and Japanese affiliated manufacturers**. Further, the averages for each were calculated, the results of which are illustrated in Fig. IV. 2-7 and IV. 2-8. In the figures, the averages of the evaluation points and the highest and lowest values are shown for each item, which would support to examine the distribution of the evaluation points.

a) General Review

Overall, the Japanese affiliated manufacturers had a higher level of technology than the local manufacturers. However, the range of distribution of the evaluation points largely overlapped and the deferences were not so great. Among the local manufacturers were some manufacturers superior to some of the Japanese affiliated manufacturers. In particular, the local company C showed values comparable with Japanese affiliated manufacturers for all of the seven main items of evaluation. Local company C assembles decks for cassette tape players for a Japanese affiliated company S. Company S sends engineers for a visit twice a week to give detailed guidance on technical matters and the good performance may be considered a result of this.

As many as three of the four local manufacturers surveyed assemble products and units for Japanese manufacturers and are receiving some sort of technical guidance. Therefore, the difference in the level of technology shown in Malaysia closely resembles in nature the difference in technology between the large contracting companies and medium and small sized subcontracting companies in Japan.

b) Facilities

Note: ** Factories were classified as local manufacturers or Japanese affiliated manufacturers primarily based on whether their management was mostly local or Japanese.

The local manufacturers own conventional types of facilities, belt conveyor as a main. Most of their measuring equipment and tools for adjustment or inspection are leased from Japanese affiliated manufacturers, European manufacturers, and other prime contractors or OEM buyers.

The Japanese affiliated manufacturers produce parts in-house as well as the assembly in many cases. Four out of six companies had performed the PCB assembly in-house and were introducing automatic insertion machines and other latest facilities.

In both the local manufacturers and Japanese affiliated manufacturers, there were almost no highly automated facilities such as seen in Japanese plants, e.g., assembly robots, automatic guided vehicles, automated warehouses, etc. The assembly work in Malaysia is in most cases aimed at low cost production of a labour intensive nature. The average wage of an operator is around M$340 per month. Personnel expenses for 5 years, which is an assumed depreciation period, are M$4,000 x 5 = M$20,000. It is considered difficult to obtain automation facilities enabling the substitution of one person's labour. Therefore, the assembly plants in Malaysia are considered to rely primarily on human labour for the time being.

c) Operation Management

All of the factories, either local or Japanese affiliated, had some system of standard times and standard work manuals, but there were wide differences seen in the degree of the same. Local company A uses work manuals with very rough illustrations at the work location of difficult processes. According to them, standard time system is established. However it simply means that they have the concepts of total assembly time. In one of Japanese affiliated manufacturers, the standard work manuals written in Japanese were used.

The pace of work of the workers, according to the interviews, was about the same as in Japan. But supposing the pace of Japanese workers as an average 100 with a range of from 80 to 120, an average of local manufacturers would be 95 with a range of 70 to 105.

Regarding the line organisation and work allocation, in general, greater degree of allowance for working time were set in Malaysia than in Japan.

In none of the factories big problems were observed in operation control, in work table layout, in parts supply, in product or tool handling.

All of the manufacturers had a proper factory organisation structures making use of supervisors, line leaders, and other managers, and the number of such personnel was also considered appropriate.

d) Production Management

All of the Japanese affiliated manufactures were using computers for production control or were in the process of installing the same why not using computers.

All manufacturers had control boards etc. showing the daily schedules and performances. Some manufacturers even mounted on the belt conveyors the display units showing the volume completed in real time.

The implant flow was smooth in all factories and no such problems were observed as defective semi-finished products piling up.

e) Physical Distribution and Stock Management

Because manufacturers in many cases rely largely on imports for parts and materials, the required period from an order of parts to delivery is longer. All factories, therefore, held larger volume inventories compared with factories in Japan. One of the local manufacturers in Johor was working on an extremely short lead time (three days) both in the receipt of parts to the delivery of the finished product between them and a Japanese affiliated prime contractor in Singapore.

f) Quality Control

All of the factories had quality assurance organisations. Inspection standards were all established and even among local manufacturers data on defect rates etc. was being properly managed. According to the interview survey results, however the non-defective ratio in a Japanese affiliated manufacturer in Malaysia was 70 to 85%, lower than that of their parent company in Japan.

g) Safety, Hygiene and Pollution

All of the manufacturers consider safety measures as essential. As for the 5S ("seiri, seiton, shitsuke, seiketsu, seisou", "meaning put in order, keep tidy, train well, make clean, and throw dust away"), both in local company A and in local company D insufficient care was taken. But in other factories everything was in order and tidy.

h) Others

None of the factories of the local manufacturers had QC circles, small group activities or suggestion for improvement systems. Japanese affiliated company E, company F and company J had active QC circles and other activities such as company-wide recreation meetings, but company I have not yet introduced any of such activities.

It was only Japanese affiliated manufacturers which offer systematic, planned personnel training schemes.

3) Technical Possibility of Assembly of Office Electronic Equipment in Malaysia.

The assembly of photocopying machines, facsimile machines and word processors requires technical elements which are not involved in the assembly of radio

cassette tape recorders, air-conditioners and other electronic equipment. They are adjustment of optical systems or telecommunication tests etc. However, from the results of the current study, it could be judged that with the provision of necessary equipment and appropriate work guidance, the assembling work of office electronic equipment in Malaysia would become possible, in terms of the technical level of the assembly work.

(2) Research and Development (R & D) Activities

Electronics assemblers set up by foreign firms from such countries as Japan, the U.S.A., and Europe generally do not have an R & D function. Product development is on the whole conducted within their parent companies or laboratories. They engage in production according to specifications provided by parent companies. Even consumer electronics manufacturers whose products are partly directed to the domestic market rely on their parent companies for R & D activities.

For the development of technology, efforts are directed in order to solve production problems or up-grade the technology level. In line with this direction, education and training are provided to their engineers.

The subsidiary and affiliated companies of Japanese companies interviewed for this survey do not conduct R & D activities, especially in the field of new product development at their factories. Accordingly, the efforts of Malaysian firms are confirmed in those areas as productivity increase or quality control. As for process engineering, there are some companies where efforts are made to enforce process engineering activities here in order to improve their assembly operations by training local engineers and/or providing guidance by Japanese engineers sent from their parent companies. One company carries out process designing and modification of cover designs. In addition, there is a company which intends to transfer some part of its designing activities to Malaysia in order to make the use of local parts and components easier.

One common process of the acquisition of R & D capabilities for local electronics assemblers is, as the first step, to absorb technologies through their devotion to OEM manufacture under the technical assistance of foreign manufacturers, and secondly to start the production of products of their own brands. At the same time , there are some local manufacturers which have sufficient capability of product development.

The present state of product development at local electronics companies interviewed for this survey is as follows:

Type of Manufacturer	State of Product Development
Telephone manufacturer	Telephone assembly under the license of a Belgian manufacturer. The company has an R & D department. They also assemble and sell telephones of their own brand.
Microcomputer	The company carries out product development based on its own R & D capabilities.
Car stereo manufacturer	OEM manufacturer of foreign brands. The company has a plan to manufacture foreign brands. The company also has a plan to manufacture products of its own brand.
TV/VCR manufacturer	OEM manufacturer of foreign brands. The company has a plan to manufacture products of its own brands.
Car stereo manufacturer	OEM manufacturer of foreign brands. The company carries out circuit design although cover designs are supplied by the buyer.

(3) Business Administration

1) Number of Assemblers

There are 53 manufactures presently engaging in the production of electronics end products as of the end of 1987 in Malaysia, according to the list of approved manufacturers, while there are 89 electronics component manufacturers.

Investments in the electronics industry has been recently accelerated. Thus, in 1987, 21 projects of electronics end product manufacturer were approved.

The manufacture of office electronic equipment requires rather precise assembly technology and relatively large amount of investment. In consideration of the requirements, those assemblers which would furnish information necessary for the accomplishment of this study were selected and interviewed.

2) State of Location

A look at the locations of electronic product assemblers shows that they have tended to be concentrated in Johor, the area around Kuala Lumpur and the area around Penang. According to the list of approved manufacturers, the geographical distribution of electronics end product manufacturers which are considered to be closely related with this survey is as follows:

Table IV. 2-1 Geographical Distribution of Electronics End Product Assemblers as of the End of December 1987

State	Consumer End Product	Industrial End Product	Total
KL/Selangor	8	8	16
Penang	11	3	14
Johor	10	3	13
Others	7	3	10
Total	36	17	53

Source: MIDA

Japanese electronics end product assemblers are distributed as follows:

Table IV. 2-2 Geographical Distribution of Electronics End Product Assemblers Set Up by Japanese Companies as of the End of December 1987

State	Number of Companies
KL/Selangor	6
Penang	4
Johor	2
Others	1
Total	13

Source: JETRO

3) Reasons for Investment in Malaysia

(a) Japanese affiliated companies

According to the companies visited under this study, the following were pointed out as the major factors which pressed them to transfer part of their production overseas.

-Necessity of cutting down production costs

They came under pressure for severe cost reduction because of the increase in labour costs, difficulty in securing sufficient manpower, and the increase in plant expansion costs due to the rise in land and construction costs.

-Revaluation of Yen

The recent sharply-strengthened yen rate has weakened the price competitiveness of Japanese manufacturers in the world market. This has accelerated the overseas investment of Japanese electronics manufacturers seeking to restore their competitiveness.

-Actions taken by the U.S.A. and the European countries to restrict imports from Japan

Setting up production bases in the ASEAN countries was considered an effective way to avoid the effects of import restrictions imposed by these countries. Some companies expected to receive benefits from the Generalised System of Preferences (GSP).

-High growth potential of the ASEAN economies

The ASEAN countries have been sustaining relatively high rates of economic growth. In keeping pace with the economic growth, the size of markets in this region has been expanding at a stable pace.

The companies interviewed for this survey pointed out the following factors as the reasons they chose Malaysia for a production base.

-Good investment incentive system.

-High-quality and relatively low-cost labour force.

-Good infrastructure, including such transportation necessities as ports and roads, telecommunication, electricity, etc.

-Possible benefit from GSP for exports to Europe and the U.S.A.

To summarise the results of the interviews, the following were considered disadvantages of other Asian investment target candidate countries when compared with Malaysia.

--Rapid increase in labour costs
--Revaluation of currency
--Shortage of labour and increase in labour costs
--Shortage of factory sites
--Relatively weak infrastructure
--Less favourable political stability
--English is not in common use
--Technological level is still low

(b) Other Foreign Affiliated Companies

As for Singaporean companies, there are some cases that Singaporean companies shifted part of their production to Malaysia due to such factors as labour shortage and rise in labour cost. Investments in electronic product assembly from Singapore are mostly export-oriented. One company visited has transferred most of the production to Johor and only some parts of production processes such as a quality assurance process are left in Singapore.

On the other hand, it was reported that there were cases that many company groups based on Singapore and Malaysia establish manufacturing plants in Malaysia from the view of considering both countries as one business area. Among electronics component manufacturers interviewed, for reference, there are some of that type of manufacturers.

Affiliated companies of Taiwanese and Hong Kong firms, which principally produce electronic products for the lower-end of the market, are also export-oriented and export their products mostly to Europe and the U.S.A. while some of them direct a certain percentage part of the products to the domestic market.

(4) Employment

The size of electronic end product assemblers varies from small-sized companies of around 50 employees to large scale companies of more than 2,000 employees.

The product lines of small scale assemblers range from rather simple assembly of audio equipment such as radio and car stereo to assembly of high-technology products such as computers and computer peripherals.

The larger portion of large scale assemblers are affiliated companies set up by foreign firms from such countries as Japan, the U.S.A. and Europe. They mostly direct their products to exports due to the small size of the domestic market.

The manufacturers interviewed are for the most part satisfied with the skill level of workers. Assemblers choose either the adoption of labour-intensive process or the introduction of up-to-date equipment from the viewpoint of efficiency and cost reduction. At the companies visited for this study, assembly lines were decided taking this factor into consideration. In Malaysia the level of wages paid to employees, especially to general workers, in relatively low and it gives an advantage to the introduction of labour-intensive and diversified small-quantity production. Thus, they rather tend to adopt labour-intensive processes.

Decision of wage level depends on the each company's policy and type of manufacture. Japanese firms generally decide their wage level according to the level of the area where they are located.

Difficulty in recruiting middle-level engineers is sometimes pointed out, especially by assemblers located in the Johor area, but this does not present a serious problem at present.

However, in the Johor area, the shortage of labour force is gradually becoming an issues to electronics assemblers as well as to other manufacturers.

The point which was emphasised concerning to training of employees is the necessity of teaching the sense of quality into workers although the level of their skill was favourably evaluated.

At the manufacturers visited for this study, the most common training system is on-the-job training. On-the-job training is provided to attain the level of a company's standard in production operation. Some companies prepare training curricula for supervisors and middle level engineers.

Among Japanese electronics manufacturers including electronic component makers, it is also popular that engineers are sent from the parent companies and provide technological guidance for the introduction of new equipment or new production technology. There is a company where local employees are regularly sent to Japan for training. It was pointed out that the system offers a good work incentive to local employees.

(5) Sales Strategies

Due to the small size of the domestic market, the electronics industry is generally forced to look to exports for its sales growth. The supposed office electronic equipment factory would rely on exports for most of its sales considering the size of the potential market in Malaysia.

One of the major purposes of investment in the electronics industry in Malaysia has been to establish a production and export base. Existing electronics companies located in the free trade zones (FTZs) or granted licensed manufacturing warehouses (LMWs) are exporting their products to Singapore, Japan, the U.S.A., Europe, etc.

Major export-oriented foreign manufacturers of noted brands, localted in FTZs or LMWs, export their products through their established worldwide sales channels. Most of them, positioned as a production base, do not have marketing function and follow production schedule provided by their overseas headquarters. Their parent companies take responsibility for the marketing of products.

There are also foreign consumer electronics manufacturers whose products are directed to the domestic market as well as exports. Such Japanese companies in general have set up its affiliated sales & service company or adopted sole distributor and organised the dealer network nationwide. All the Japanese consumer electronics firms visited for this survey have such domestic sales networks.

As for office electronic equipment, although there is at present no production factory in Malaysia, the distribution channels have been established for major brands.

Local electronic assemblers can be roughly divided into export-oriented manufacturers, most exports of which are OEM shipment and electronics firms targeting mostly the domestic market. For OEM exports, marketing is handled by overseas buyers. Marketing capabilities are generally weak at export-oriented local companies.

IV-2-3. Possibility of Procurement of Key Components and Materials for Production of Office Electronic Equipment

(1) Industrial Classification of Components and Their Cost Weights

A large variety of components, are used for the production office electronic equipment as shown in Fig. IV.2-1. The figure shows the breakdown of components used in office electronic equipment factories dividing into those made in-house and those contracted outside. In Fig. IV.2-9, the cost share of each component to the procurement cost is shown assuming that all components are procured and all sub-assemblies are done by sub-contractors. The models taken up in Fig. IV.2-9 are personal type photocopying machines, personal type facsimile and word processors, which would be the types of equipment chosen for the financial evaluation to be conducted in the following stage of the study.

(2) Evaluation of the Procurement Possibility

1) Methodology

For the evaluation of the procurement possibility, the following two methods were used:

a) Field survey by visits to parts manufacturers

Among the various components shown in Fig. IV. 2-9, the following components were selected:

- Metal pressed parts
- Plastic injection moulded parts
- Printed circuit boards mounted

The check lists shown in Fig. IV. 2-10 through IV. 2-12 were used, in addition to the check list shown in Fig. IV.2-3. The same evaluation method of the level of technology is applied as used for the evaluation of assembly manufacturers.

Above three component industries are selected from the following reasons:

- The precision of processing of the above components reflects largely on the quality of the final products.
- There are existing manufacturers in Malaysia
- The evaluation of the technology level is possible by the field survey (factory inspections and interviews)

Fig. IV. 2-9 Share of Each Component in Total Component Cost

(%)

Component Industries \ Products		Photocopying Machines	Facsimiles	Word Processors
	Pressed Metal Parts	10.0	1.1	2.7
	Plastic Injection Moulded Parts	21.0	3.1	6.1
	Metal Turning Parts	2.0	0.2	0.6
	Rubber Rollers	7.1	1.5	0.4
	Precision Springs	0.7	0.0	0.0
	Screws, Washers	0.6	0.1	0.3
	Others	1.3	1.3	0.5
	Mechanic Parts Total	(42.7)	(7.3)	(10.6)
	IC , LSI	3.4	17.5	18.0
	Resistors , Capacitors	1.0	2.5	2.3
	Diodes , Transistors	1.5	1.1	2.3
	Transformers	3.1	0.7	1.9
	Solenoids , Coils	1.4	0.3	0.3
	Printed Wiring Boards	1.6	4.1	7.8
	Motors	5.8	1.6	1.8
	Power Supplies	8.1	8.2	1.9
	Connectors, Wire Harnesses	0.8	2.2	1.8
	Switches	1.7	0.4	0.4
	Others	5.4	6.9	6.1
	Electrical Parts Total	(33.9)	(45.5)	(44.6)
	Specific Parts	Lenses 5.5	Modems 12.7	Key Bords 4.4
		Sheet Glass 1.2	Inverters 2.0	CRT Displays 19.6
		Linear Bearings 1.0	CCD-sensors 16.3	FDD 15.6
		Drum Cylinders 1.8	Thermal Heads 13.6	Platen-Rollers 1.4
		Sleeves 0.8		Others 0.1
		Magnet Rollers 0.8		
		Heaters 1.9		
	Specific Parts Total	(13.0)	(44.6)	(41.1)
	PCB Assembly	4.6	1.2	2.2
	Sub – Assembly	5.8	1.4	1.5
	Asssembly, others, Total	(10.4)	(2.6)	(3.7)
	Total	(100)	(100)	(100)

Fig.Ⅳ. 2－10 Factory Survey Checklist : Metal Pressing

Name of company :

Types of Processing	Materials for pressing Plate thickness =		Secondary process
☐ Shearing ☐ Punching ☐ Bending ☐ Restriction ☐ Fine blanking press ☐ Manufacturing dies.	Material	Country of Origin	☐Tapping ☐Spot welding ☐Painting ☐Cauling ☐Assemby

	Check Items	Importance grade	Evaluation	Evaluation scale C	Evaluation scale B	Evaluation scale A	Remarks
Product Applied Technology	Hole Precision	A		Less than level 9	Leve 7 or 8	Level 6 or above	
	Dimensional tolerancetoleranceTolerance	A		± 0.3	± 0.15	± 0.05	Flat
	Bending angle	B		± 2 to 3 ° or aboveabove	± 1° or below	± 30' or below	
	Observation of plane of shear	B		Section surface is irregular and rough.	Proportion of shear and rough surface is 4 : 6 in average.	Proportion of shear and rough surface is 4 : 6. Regular on all configuration . surfaceis 4 : 6 in average regularly on all configuration.	
Production Technology	Automation of production process	B		Not automated	Part of process is automated.	Actively automated	
	Die manufacturing ability	A		Cannot repair dies	Capable of maintenance	Dies can be mfr. in－house . In－house production rate is ( )	
	Guide posts	B		No guide posts	Guide posts are provided	Guide posts are wel－set.	
	Material of die	B		SK materials	SKD11	SKH (Highspeed steel)	
	Die Heat treatment	B		No Heat Treatment	Surface hardening , Brief Quench	Total Quench	
	Washing	B		No washing	Air blowing	With Washing	
	Set up	C		No intention of shortening setup time.	Have knowledge of shortening setup	Set up time is being tried to be	
	Die maintenance	B		Cannot overhaul in－house	In－house overhaul at troubles	Regular overhaul.	
	Die storage	B		Stocked	Put in order	Automated storage	
	Measuring equipments	B		Steel surface plate	Pin gauge and projectors . Rock surface plate.	Three dimensional measuring equipments.	

Fig.Ⅳ. 2－11 Factory Survey Checklist : Plastic Injection Moulding

Name of company :

Types of Products	Types of Materials
☐Outer appearance and covers	☐ABS
☐Structual parts	☐PC
☐Transparent parts	☐PS
☐Gears	☐PPO
☐Others ( )	☐Glass contained PC
	☐Flame resistant ABS
	☐PMMA
	☐POM
	☐Others
	☐Use of regenerated material

	Check Items	Importance grade	Evaluation	Evaluation scale C	Evaluation scale B	Evaluation scale A	Remarks
Product Applied Technology	Moulding precision (preciseness limit)	A		Up to 50 ±.3mm	50 ±.3 to 50 ±.05 mm	50 ±.05 mm or above	
	Colour	B		Modified by painting , blended	Blended by colour maker	Provided with colour samples	
	Outer Appearance	B		Many Weld, sink marks, crack	Some welds in difficult parts	No problem	
Production Technology	Automation of Moulding Works	A		Manual molding 1machine ／1	Manual molding 1machine ／1	Automated	
	Material Supplypre－drying	B		Manual supply／no pre－drying	Manual supply／pre－drying	Automatic supply ／pre－drying	
	Delivery and storage of products	C		Piled baside moulders,treated without care	Delivered to warehouse by carriage individually	Delivered to warehouse by belt conveyers (Concentrated delivery)	
	Die facilities	A		Can repair	Can overhaul and repair	Can mfr. moulds & dies in－house.	☐ Embossing facility
	Secondary processing ability	C		Gate cutting only	Part of secondary processing is possible.	Unit assembly, printing and adhesion are possible.	☐Printing (Silk, Hot Stamping, ☐ Application (heat , ultrasonic)
	Inspection tools	B		Tools and measuring are both inadequate	Micrometer, are used, measuring dies only	Three dimensional measuring	
	Products Inspection	A		No regular inspection.	Sample inspection	Sample inspection following inspection	
	Maintenance of dies Overhauling ability	B		In－house impossible	In－house , when troubling	Regularily (washed 1／w)	
	Moulding conditions control	B		No data taken,	Moulding condition is standardized	Inspection data and moulding condition data are controlled	
	Use of mould release agent	C		Used	No use		
	Die Temperature control	B		No control	Thermo controller is provided	Surface thermostat is provided, well controlled	

Fig.Ⅳ. 2－12 Factory Survey Checklist : PCB Assembly

Name of company :

Types of PCB Assembly	Types of devices	Procurement Ability
☐High density stereo assy ☐Multilayer Board ☐Double Sided Board ☐Single Sided Board	☐Flat packagge IC ☐Chip Components ☐Radial/Axial /Different types Normal devices	☐ PWB (In house made / ☐IC/LSI ☐Custom made parts ☐General Purpose Electronics Parts

	Check Items	Importance grade	Evaluation	Evaluation Scale C	Evaluation Scale B	Evaluation Scale A	Remarks
Product Applied Technology	Max . assembly size	B		Smaller than 300mm × 300mm	300mm × 300mm or above	500mm × 500mm or above	
	Main Devices , Boards	A		Main device : Analogue	General – devices & DIPs	Chip components and FPIC	
Production Engineering	Automation of Insertionwork	A		Mainly, Manually inserted	Automatic inserters are introduced.	Automatic Inserters are mainly used.	☐Chip mounters ☐IC inserters ☐IC mounters ☐ Radial / Axial inserters ☐ Differential divices inserters ☐ Manual insertion aiding equipments.
	Soldering	B		Automatic soldering , but many reworks.	Automatic soldering , few reworks.	Reflow soldering is well – handled.	☐Reflow soldering ☐Flow soldering ☐Dip soldering ☐ Supplemental machines (flux applicator) ☐
	Manual soldering work	B		Standardizing of work method is not enough.	Temperature of soldering iron is controlled.	Have an inhouse regulation for solder workers' qualification.	
	Flux washing	A		Washing is not enough	Washing is carried out.	Washing/Drying is carefully carried out	☐Water wash ☐Solution wash ( )
	Aging	A		Go through isothermal box		Time and method are rationally	☐Humidity, gravity, preheating conditions
	Inspection ability	A		Defects are found by visual checks.	Function Defects can be found. Able to rework.	Able to make Testing programmes .	☐Bare board tester ☐IC tester ☐Open, Short tester ☐Incircuit tester ☐ Function tester ☐ Modified machines for inspection purpose
	Anti – electrostatic measures	B		No measures taken / not enough.	Measuress taken for some places.	Adequate	☐Working clothes ☐ Packaging / Packing material ☐Floor, desks ☐Shose ☐Earthwire
	Solder bath control	B		Control condition is not adequate.	Bathes are Checked for sometimes.	Checked , data taken everyday.	

b) Interview Survey with the assembly manufacturers which use the parts and components which were not covered by above survey.

For the parts and components not convered by the above srurvey, the possibility of procurement was surveyed through interviews with the assembly manufactures using them.

For the possibility of procurement of transformers, power supply units, rubber rollers, and keyboards, it was investigated through the interview survey with parts manufacturers.

(3) Results of Direct Visit Survey

1) Metal Pressed Parts

For the metal pressing work, factory inspections were conducted on one local sub-constractor company and another Japanese affiliated air-conditioner company conducting the work in-house. The results of the evaluation are shown in Fig. IV.2-13 and Fig. IV.2-14.

In terms of operation management, production control, and physical distribution and inventories, these companies were lower in level compared with assembly manufacturers. In metal press work, a small lot production is generally required and the precise production control is difficult due to the need for frequent job changes. Thus, even in Japan, it is rare to find the factory having an excellent control system in the metal pressing industry. Therefore, the results of evaluation shown in Fig. IV.2-13 do not directly indicate the low level of technology in Malaysian manufacturers in this industry.

As for other items of inspection, the Japanese affiliated manufacturer having in-house metal press facilities has shown a high level which is comparable with that in Japanese companies.

(a) Japanese Affiliated Company B

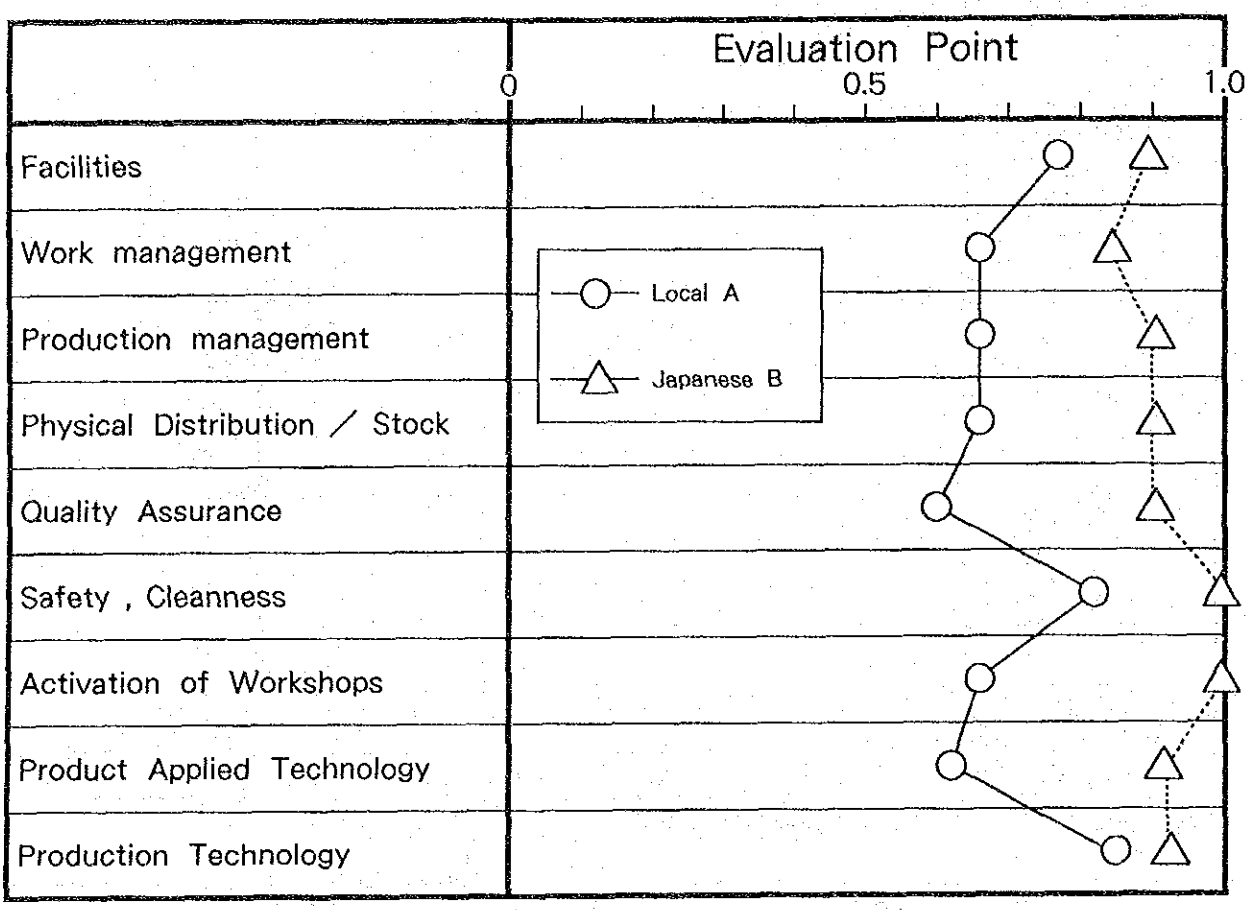
In Japanese affiliated company B the metal pressed parts used for air-conditioners or rotary compressors are produced in-house. The housing parts which hold bearing for the compressors are pressed to a precision in the order of 1/100 mm. With this level of technology the precision requirement from office electronic equipment manufacturers could be satisfied.

Fig. Ⅳ. 2－13 Technology Level Evaluation : Metal Pressing

Evaluation Items		Importance grade	Local A (Singapore 100%)		Japanese B		Remarks
Facilities	Use of latest equipment	B	B		B		
	Operation ratio	B	A	0.78	A	0.89	
	Maintenance	B	B		A		
Work management	Standard time	B	C		A		
	Standard work instructions	B	B		A		
	Efficiency and operation speed	B	A	0.67	B	0.83	
	Job allocation	B	B		B		
Production management	Production control system	B	C		A		
	Schedule and delivery control	B	A	0.67	A	0.89	
	Order cycle	B	B		B		
Physical distribution / stock	Level of stock	B	B		B		
	Layout	B	B	0.67	A	0.89	
	Plant location	B	B		A		
Quality assurance	Inspection standards	B	B		A		
	Defective rate	B	C		A		
	Organization in charge of QA	B	B		A		
	Lot Stratification	B	B	0.62	B	0.90	
	Controlling measuring instruments	B	B		A		
	Non－defective rate	B	A		A		
	Qualification of industrial standards	B	C		B		
Safety cleanness	5S (Clean－your－workshop activity)	B	A	0.83	A	1.00	
	Safety measures	B	B		A		
Workshop activation	Small group activity	B	(C)		A		
	Suggestion system	B	(C)	0.67	A	1.00	
	Personnel development	B	B		A		
Product applied technology	Hole precision	A	C		(B)		
	Dimensional tolerance	A	B	0.63	A	0.90	
	Bending angle	B	B		B		
	Plane of shear	B	A		A		
Production technology	Automation	B	B		B		
	Die manufacturing ability	A	A		A		
	Guide posts	B	A		A		
	Material of die	B	A		(B)		
	Die heat treatment	B	B	0.85	(B)	0.93	
	Washing	B	A		A		
	Setup	C	B		B		
	Die maintenance	B	B		(A)		
	Die storage	B	A		A		
	Measurements	B	B		A		

(Note) ( ) indicates results which were not added on the final calculation because of low reliability on data caused by lack of information.

Fig. Ⅳ. 2－14 Evaluation Result : Metal Pressing



(Note) Point 1.0 will be given to Japanese premier companies of the industry.

(b) Local Company A

Because it is difficult for new office electronic equipment manufacturers to procure components from such Japanese affiliated company as Company B, evaluation of the technology level of local manufacturers would be more important. Local company A, supplies parts to Japanese affiliated audio manufacturers and their parts manufacturers. Because the company's largest press machine is a 110 ton model, they cannot press such large components as those used for office-use photo copying machines (requiring 300 to 600 ton models). Even in personal type of small equipment, large parts require the pressing capability of press machines over 150 tons. Thus, they are insufficiency in terms of facilities at present. In terms of the processing precision, the company has had no experience in press work of the level demanded from office electronic equipment manufacturers, e.g., dimensional allowances of 0.05 mm and bending curves of ±30 seconds. Therefore, it would be rather difficult for them to immediately satisfy the needs from office electronic equipment manufacturers. It would have to take a little time and to learn the required technology and know-how especially in die precision, die mounting adjustment methods, etc.

2) Plastic Injection Moulded Parts

For plastic injected moulded parts, factory inspections were conducted on three local subcontracting companies (one wholy local company, one European affiliated company and one Japanese affiliated company) and three Japanese affiliated assembly and parts manufacturers conducting in-house processing. The results of the evaluation are shown in Fig. IV.2-15 and Fig. IV.2-16.

(a) In-House Processing in Japanese Affiliated Manufacturers

Of the three Japanese affiliated manufacturers inspected, two were supplying key tops and key switch parts for keyboards and the remaining one was supplying internal mechanical parts for air-conditioners.

For the key switch parts, POM and ABS materials are used. A high level of precision has been achieved in their processing.

For moulds, one company fabricated them all in-house one only repairs them and relies on imports or on local subcontractors for new moulds, and the remaining company imports all the moulds from Japan.

(b) Local Subcontractors

Of the three companies visited which are operating as subcontractors, one was established by local capital, one 70% by European capital and the remaining one 60% by Japanese capital.

The three local companies engaging in plastic moulding as sub-contractors are primarily producing cabinets for air-conditioners, radio cassette tape recorders and audio equipment. Table IV.2-3 summarises the outline of these firms.

Table IV. 2-3 Subcontractors (Plastic Injection Moulding)

	Company A	Company B	Company C
Capital Structure	Local 100%	European Company 70% Local 30%	Japanese Company 60% Local 40%
Major Products	Housing Parts for Car Radio Casette Recorders and Audio Equipment	Housing Parts for Air Conditioners and TVs	Housing Parts for Air Conditioners
Number of Injection Moulders (Inhouse Owned)	21 (Range: 25 to 500t)	15 (Range: 25 to 650t)	20 (Range: 40 to 800t)

For personal type photocopying machines, facsimile machines and word processors, the plastic injection machines of a capacity of 25 to 650 tons are usually used (for office-use photocopying machines, a maximum 1,200 ton capacity machine is required). Therefore, in terms of the production size requirement, the companies have the necessary facilities. However, injection machines of special specifications are usually required for the high precision parts such as cartridges for photocopying machines and frames for facsimile machines. None of above companies owns such machines.

As for materials, in many cases, they use ABS, PC, PS, PPO, PMMA, POM, and other resigns supplied from the contractor. No problem is observed for the procurement of those materials mostly from overseas. They also use such special material as incombustible resin and glass filled resin.

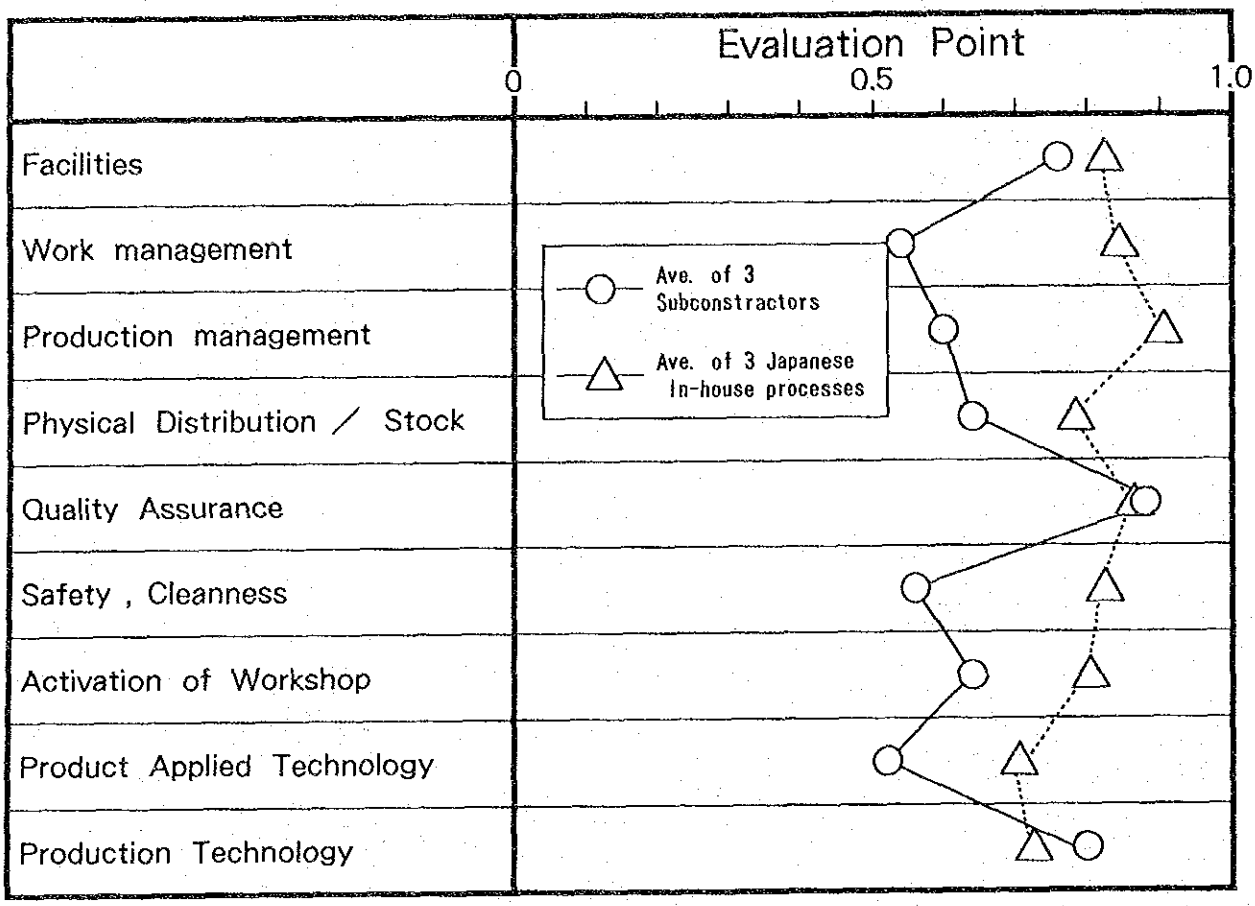
At present, the processing precision would be the problem. A mechanical deck assembly manufacturer visited imports from Japan or Singapore all of the necessary precision parts such as frames, gears, pulleys, and others. All of the three companies presently supply parts sufficient for their current customers' needs, but would not be able to supply the precision parts requested from office electronic equipment manufacturers (for example, their requirement level would be the dimensional tolerances of 50 ±0.05mm).

Fig. Ⅳ. 2－15 Technology Level Evaluation : Plastic Injection Moulded Parts

	Evaluation Items	Importance grade	Subcontractor							Inhouse						
			Local		European		Japanese		Average	Japanese A		Japanese B		Japanese C		Average
Facilities	Use of latest equipment	B	B		A		B			B		A		B		
	Operation ratio	B	B	0.67	A	1.00	B	0.67	0.78	A	0.89	B	0.89	A	0.67	0.82
	Maintenance	B	B		A		B			A		A		C		
Work management	Standard time	B	C		C		C			A		B		A		
	Standard work instructions	B	B	0.58	B	0.50	B	0.50	0.53	A	0.83	A	0.67	A	1.00	0.83
	Efficiency and operation	B	B		C		B			B		B		A		
	Job allocation	B	B		B		C			B		C		A		
Production management	Production control system	B	C		A		B			A		A		A		
	Schedule and delivery control	B	B	0.50	B	0.78	B	0.56	0.61	A	0.89	A	1.00	B	0.83	0.91
	Order cycle	B	(B)		B		C			B		(B)		(B)		
Physical distribution / stock	Level of stock	B	A		B		B			B		A		(B)		
	Layout	B	C	0.56	B	0.67	B	0.67	0.63	A	0.89	B	0.78	B	0.67	0.78
	Plant location	B	C		B		B			A		B		B		
Quality assurance	Inspection standard	B	A		A		B			A		A		A		
	Defective rate	B	A		A		B			A		A		B		
	Organization in charge of QA	B	A		A		B			A		A		A		
	Lot stratification	B	A	0.90	A	1.00	B	0.78	0.89	B	0.90	B	0.89	B	0.83	0.87
	Measuring control	B	B		A		(B)			A		B		B		
	Non－defective rate	B	A		A		A			A		A		A		
	Qualification of industrial standards	B	B		(B)		A			B		(B)		(A)		
Safety, cleanness	5S (Clean－your－workshop activity)	B	C	0.50	B	0.67	C	0.50	0.56	A	1.00	B	0.83	B	0.67	0.83
	Safety measures activity	B	B		B		B			A		A		B		
Workshop activation	Small group activity	B	B		C		B			A		C		A		
	Suggestion system	B	B	0.67	C	0.56	B	0.67	0.63	A	1.00	C	0.44	(B)	1.00	0.81
	Personnel development	B	B		A		B			A		B		A		
Product applied	Moulding precision	A	C		B		C			(B)		B		B		
	Colour	B	B	0.52	C	0.52	B	0.52	0.52	B	0.67	B	0.76	B	0.67	0.70
	Outer appearance	B	B		B		B			B		A		B		
Production technology	Automation of moulding work	A	A		B		A			B		A		A		
	Material supply, pre－drying	B	B		B		B			B		B		B		
	Delivery and storage of products	C	B		B		B			B		B		B		
	Die facility	A	A		B		B			C		A		C		
	Secondary processing ability	C	A		A		A			A		B		B		
	Inspection tools	B	B	0.84	B	0.84	B	0.75	0.81	B	073	B	0.90	B	0.59	0.74
	Products Inspection	A	A		A		A			A		A		B		
	Maintenance of dies	A	B		A		B			(A)		A		C		
	Moulding condition control	A	A		A		B			(A)		A		(B)		
	Use of mould release agent	C	B		B		C			B		(B)		B		
	Die temperature control	A	B		A		B			A		(A)		B		

(Note) ( ) indicates results which were not added on the final calculation because of low reliability on data caused by lack of information.

Fig. Ⅳ. 2－16 Evaluation Result : Plastic Injection Moulded Parts



Note) Point 1.0 will be ginven to Japanese premier companies of the industry.

3) Printed Circuit Board Assembly

For PCB assembly, five companies were visited. Two were Japanese affiliates shipping entire products to their affiliated assembly plants in Malaysia and in overseas. The other three companies included two of wholly Malaysian and one of Singaporean affiliated company.

The results of the evaluation are shown in Fig. IV.2-17 and Fig. IV.2-18.

Differences were observed between the Japanese affiliates and other firms both in items of facilities and motivation activities.

Motivation activities including QC circles and other small group activities and suggestion system for work improvement, are the systems typical in the Japanese-style management so it is natural that the Japanese affiliated manufacturers recorded higher marks.

Some Japanese affiliated manufacturers have been introducing automatic insertion machines and in-circuit tester, but three local companies all depend on manual insertion works and have not introduced sophisticated inspection equipment.

The domestic companies surveyed mainly produce PCB for radio bassette tape recorders, radios, televisions, CD players, and others.

Most of the PCBs are analog type. On single sided paper-phenol boards, such discrete semi-conductors as resistors, capacitors, and others are mounted.

For photocopying machines, facsimile machines and word processors, PCBs using digital circuits and mounting CPUs are needed. For the assembly of such board, Malaysia still lacks both in components and mounting technology. Especially domestic companies lack in the experience of processing double-side through holes or multilayer boards and are not skilled enough technically for surface mounting.

For the surface mounting, chip mounters, IC mounters, and other automatic mounters, in-circuit testers and other inspection equipment, reflow soldering units, and other high priced facilities are required (a total investment of several million Malaysian dollars would be needed), as well as engineers well versed in digital circuitry.

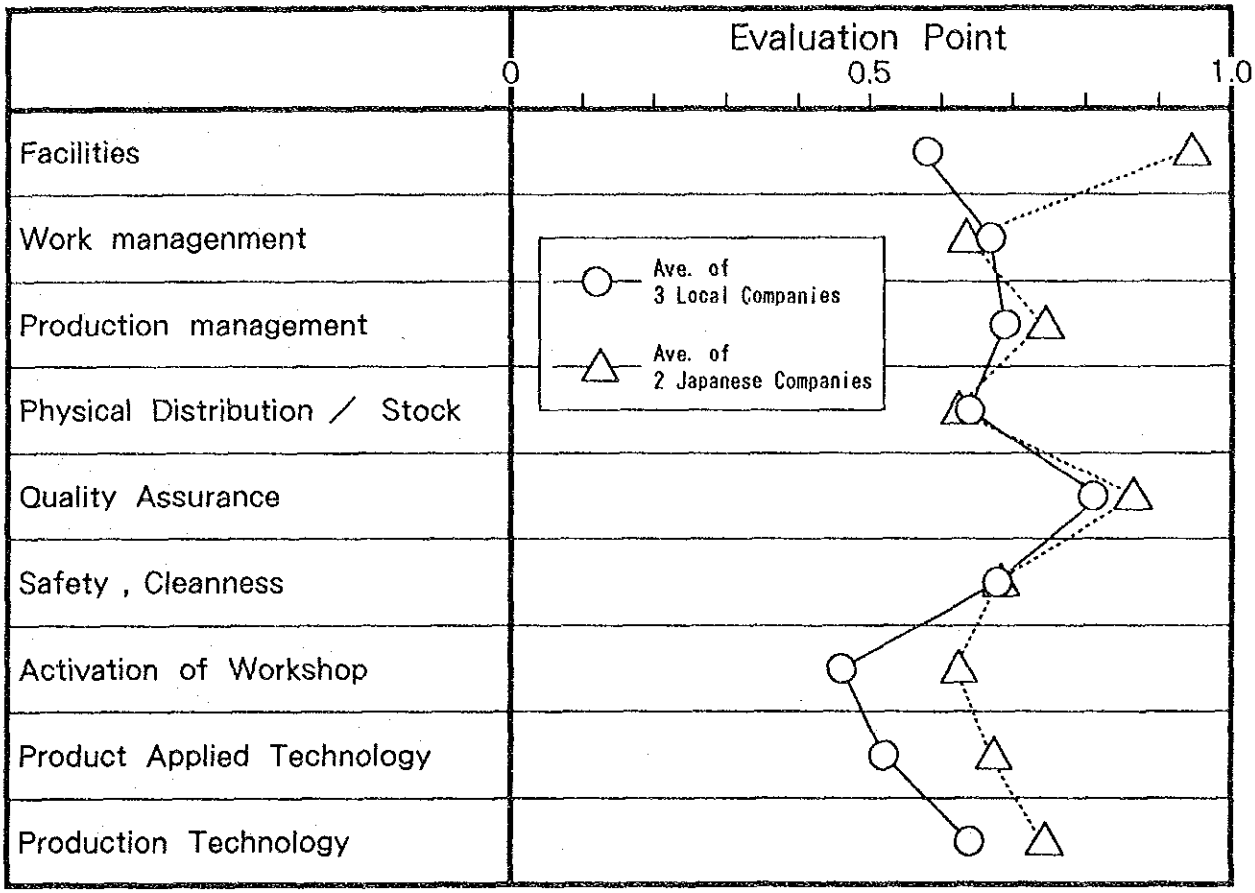
At present only the assembly of analog type circuit boards used for power supply units or high voltage transformers could be undertaken by local sub-contractors.

Fig. Ⅳ. 2－17 Technology Level Evaluation : PCB Assembly

	Evaluation Items	Importance grade	Local A		Local B		Local C		Ave. of Local	Japanese D		Japanese E		Ave. of Japanese
Facilities	Use of latest equipment	B	B	0.78	C	0.67	C	0.33	0.59	A	0.89	A	1.00	0.94
	Operation ratio	B	B		B		(B)			B		A		
	Maintenance	B	A		A		C			A		A		
Work management	Standard time	B	B	0.58	C	0.58	B	0.83	0.66	B	0.50	B	0.75	0.63
	Standard work instructions	B	B		B		A			B		A		
	Efficiency and operation speed	B	C		B		(B)			C		B		
	Job allocation	B	B		B		(B)			C		B		
Production management	Production control system	B	B	0.67	(C)	1.00	C	0.33	0.67	A	0.89	C	0.56	0.73
	Schedule and delivery control	B	B		A		(A)			A		B		
	Order cycle	B	B		(B)		C			B		B		
Physical distribution ／ stock	Level of stock	B	C	0.56	B	0.67	B	0.67	0.63	C	0.56	B	0.67	0.62
	Layout	B	B		B		(B)			B		B		
	Plant location	B	B		B		(B)			B		B		
Quality assurance	Inspection standard	B	B	0.83	B	0.67	A	0.94	0.81	A	0.94	A	0.78	0.86
	Defective rate control	B	A		B		A			A		B		
	Organization in charge of QA	B	B		B		A			A		B		
	Lot stratification	B	A		B		A			A		A		
	Measurement control	B	A		B		(B)			A		(A)		
	Non－defective rate	B	(B)		B		A			B		B		
	Qualification of industrial standard	B	B		(B)		B			(B)		B		
Safety, cleanness	5S (Clean－your－workshop activity)	B	A	0.83	C	0.50	B	0.67	0.67	B	0.67	B	0.67	0.67
	Safety measures	B	B		B		B			B		B		
Workshop Activation	Small group activity	B	B	0.67	C	0.44	C	0.33	0.48	B	0.67	C	0.56	0.62
	Suggestion system	B	B		C		C			B		C		
	Personnel development	B	B		B		C			B		A		
Product applied technology	Maximum assembly size	B	B	0.67	C	0.33	C	0.53	0.51	B	0.67	B	0.67	0.67
	Assembling devices	A	B		C		B			B		B		
Production technology	Automation of insertion work	A	C	0.78	C	0.51	C	0.61	0.63	B	0.72	B	0.73	0.73
	Soldering	B	B		B		B			B		B		
	Manual soldering work	A	B		B		B			(B)		A		
	Flux washing	B	A		B		A			(B)		(B)		
	Aging	B	A		C		C			A		B		
	Inspection ability	A	A		B		B			B		B		
	Anti－electrostatic measures	B	B		C		B			B		B		
	Solder bath control	B	A		B		B			(A)		(A)		

(Note) ( ) indicates results which were not added on the final calculation because of low reliability on data caused by lack of information.

Fig. Ⅳ. 2－18 Evaluation Result : PCB Assembly



(Note) Point 1.0 will be given to Japanese premier companies of the industry.

4) Possibility of Procurement of Other Miscellaneous Parts

(a) Machining Parts

The main machining parts used for photocopying machines, facsimile machines and word processors are axles for moving parts and other round metal parts. Most of the machining works for these products are done by automatic lathes and NC lathes.

In the field interview survey, it was informed that few subcontractors are able to handle the machining of these components. While there are some manufacturers engaging in high precision machining for the military sector, the cost is said to be very high.

(b) Rubber and Rubber Rollers

In order to examine the possibility of local procurement of these parts, two Japanese manufacturers of rubber products (they produce keyboard rubber contacts, V-belts, etc.) were visited.

At present, these companies are not producing rubber moulded articles (rubber feet etc.), rubber rollers, etc. Further, it is informed that there is no other company manufacturing them products. However, it is said that there are no problems in rubber moulding technology and the companies visited expressed their interest in starting production if the demand exists. However, according to them, the demand level of 3000 units per month is not attractive enough for them to start new production.

(c) Springs, Screws, and Washers

There were no manufacturers locally procuring any of the small sized coil springs, leaf springs, etc, which are needed for photocopying machines, facsimile machines and word processors.

Among screws and washers, the local procurement of self-tapping screws and clamping washers is not possible.

(d) ICs and LSIs

CPUs, ROMs, RAMs, logic ICs and various other types of digital ICs are domestically manufactured in Malaysia, but except for a few cases, almost all of the assembly manufacturers are importing their ICs. In particular, there are large imports from Singapore. One of the reasons for this is that in most cases Malaysian manufacturers of semiconductors have no sales functions. Prices of ICs are not low because sales prices are set by their overseas parent companies. Thus, while semiconductors are being produced in Malaysia, this is not resulting in any benefit to assembly manufacturers in Malaysia.

(e) Resistors, Capacitors, Diodes, and Transistors

Some leading Japanese manufacturers have already started the production of these components in Malaysia.

(f) Transformers and Power Supply Units

As for transformers, one Japanese affiliated manufacturer and one local manufacturer were visited. By showing the specifications of transformers used for photocopying machines, facsimile machines and word processors, the possibility of their local procurement was examined. The results shows that there are no problem in the procurement of these products but that further study would be necessary for high voltage transformers.

(g) Solenoids and Coils

For solenoids and coils, there are both local and foreign affiliated manufacturers. However, the possibility of procurement of specific solenoids and coils used for photocopying machines, facsimiles, and word processors was not confirmed.

(h) Printed Circuit Boards

Single-side circuit boards are produced domestically but both double-side circuit boards and multi-layer circuit boards are imported from Singapore or Japan.

(i) Motors

Although stepping motors are produced in Malaysia by a Japanese affiliated manufacturer, assembly companies have to import their products from Singapore because of their distribution arrangements. Synchronous motors are usually manufactured according to the special specifications set by office electronic equipment manufacturers, and thus, would have to be imported from Japan for the time being.

(j) Connectors and Wire Harnesses

Malaysia is not producing connectors for printed circuit boards at present. However, it is reported that a Japanese affiliated wire harness manufacturer which has already established operations in Malaysia is considering the in-house production of connectors.

(k) Switches

All of the dip switches which are mounted on PCBs are imported. However, there are manufacturers producing power switches in Malaysia.

(l) Special Components by Product

Among the components shown in Fig. IV.2-9, keyboards (only membrane types) and sheet glass could be procured in Malaysia. The other items are either not produced in Malaysia or their facility levels are low compared to the specifications required. For the start of production of office electronic equipment in Malaysia, they would have to be imported from Japan, Taiwan, Republic of Korea, Hong Kong, Singapore etc.

5) Summary of the Results of the Investigation on Parts Procurement

Based on the results of the above examination of the present situation, the potential sources of parts procurement are summarised for each type of part which is needed for some office electronic equipment manufacturers to start operation in Malaysia in Fig. IV.2-19.

Fig. Ⅳ. 2－19 Countries where potential parts suppliers exist

	Purchased from / Parts	Malaysia	Import			Remarks
		Domestic	Singapore	Japan	Others	
Mechanical Parts	Pressed Metal Parts	○	○	○	○	
	Plastic Injection Moulded Parts	○	○	○	○	
	Metal Turning Parts		○	○	○	
	Rubber Rollers			○		
	Presision Springs		○	○	○	
	Screws Washers		○	○	○	
	Others			○		
Electrical Parts	IC , LSI	○	○	○		
	Resistors , Capacitors	○	○	○	○	
	Diodes ,Transistors	○	○	○	○	
	Transformers	○	○	○	○	
	Solenoids , Coils		○	○	○	
	Printed Circuit Boards		○	○		
	Motors	○	○	○	○	
	Power Supplies	○	○	○		
	Connectors, Wire Harnesses	○	○	○		
	Switches	○	○	○		
	Others			○		
Specific Parts	Lenses			○		
	Sheet Glass	○		○		
	Linear Bearings			○	○	
	Drum Cylinders			○		
	Sleeves			○		
	Magnet Rollers			○		
	Heaters			○	○	
	Modems		○	○	○	
	Inverters		○	○		
	CCD－sensors			○		
	Thermal Heads			○		
	Key Boards	○	○	○	○	
	CRT Displays			○	○	
	FDD			○		
	Platen－Rollers			○		
	Others			○		

(Note) Purchasing rate from each country will be set forth in F/S based on results of the survey on the third countries.