THE STUDY ON SELECTED INDUSTRIAL PRODUCT DEVELOPMENT IN MALAYSIA

SECOND YEAR FINAL REPORT

JULY 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of Malaysia, the Government of Japan decided to conduct a study on Selected Industrial Product Development in Malaysia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Malaysia a study team headed by Mr. Heihachiro Aoki, Japan External Trade Organization, from October 16 to December 14, 1988 and from March 15 to March 24, 1989.

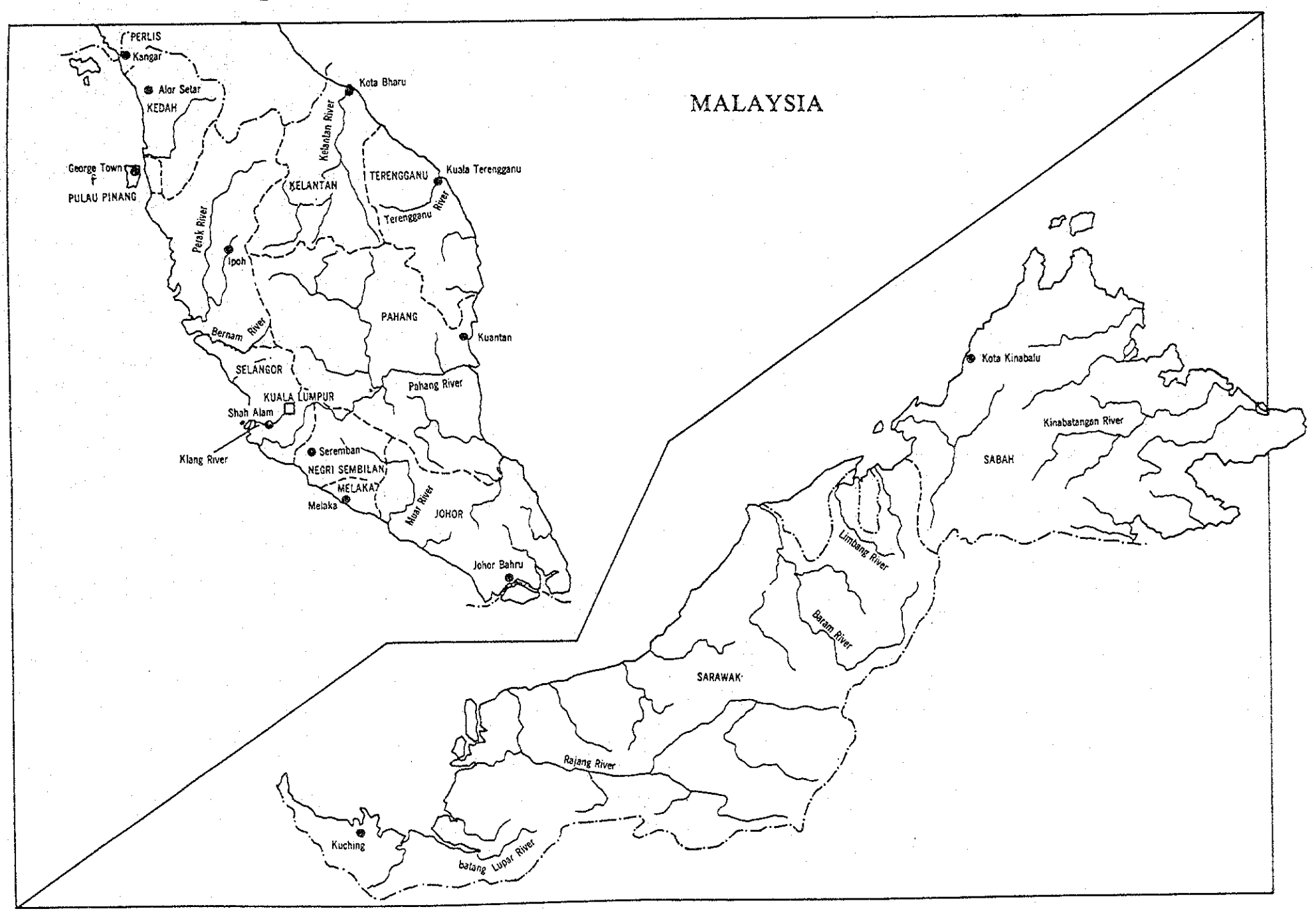
The team exchanged views with the officials concerned of the Government of Malaysia and conducted field surveys in the study-related areas. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the development of the selected industrial products and to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of Malaysia for their close cooperation extended to the team.

July 1989

Kensuke Yanagiya
President
Japan International Cooperation Agency


MALAYSIA
PERLIS
Kangar
Alor Setar
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George Town
PULAU PINANG
Kota Bharu
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TERENGGANU
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Shah Alam
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Kota Kinabalu
Kinabatangan River
SABAH
Limbang River
Baram River
SARAWAK
Rajang River
Kuching
batang Lupar River

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Abbreviations

AJDF	ASEAN Japan Development Fund
BOI	Board of Investment
CIAST	Centre for Instructor and Advanced Skill Training
CGC	Credit Guarantee Corporation
CRT	Cathode Ray Tube
ECR	Export Credit Refinancing
EDB	Economic Development Board
EPC	Export Promotion Council
EPU	Economic Planning Unit
FMM	Federation of Malaysian Manufacturers
FTZ	Free Trade Zone
HICOM	Heavy Industry Corporation of Malaysia
HRD	Human Resources Development
ICA	Industrial Coordination Act
IMP	Industrial Master Plan
ISIS	Institute of Strategic and International Studies
ITA	Investment Tax Allowance
ITI	Industrial Training Institute
LMW	Licensed Manufacturing Warehouse
MAMPU	Malaysian Administrative Modernisation and Manpower Planning Unit
MARA	Majlis Amanah Rakyat
MECIB	Malaysian Export Credit Insurance Berhad
MEXPO	Malaysian Export Trade Centre
MIDA	Malaysian Industrial Development Authority
MIDF	Malaysian Industrial Development Finance
MIMOS	Malaysian Institute of Microelectronic System
MRPMA	Malaysian Rubber Products Manufacturers' Association
MTI	Ministry of Trade and Industry
NEP	New Economic Policy
NIF	New Investment Fund
NITTCB	National Industrial Training and Trade Certification Board
NPC	National Productivity Centre
PDAS	Product Development Assistant Scheme
PS	Pioneer Status
RDAS	Research Development Assistant Scheme

RRIM	Rubber Research Institute of Malaysia
SDF	Skill Development Fund
SEDC	State Economic Development Corporation
SIRIM	Standard and Industrial Research Institute of Malaysia
SMI	Small and Medium-scale Industry
STM	Syarikut Telekom Malaysia
TDB	Trade Development Board
UKM	Universiti Kebangsaan Malaysia
UM	Universiti Malaya
USM	Universiti Sains Malaysia

I. Introduction

I. INTRODUCTION

This is the Final Report of the Second Year Study on Selected Industrial Product Development in Malaysia.

This study is based on the Scope of Work for the Study on Selected Industrial Product Development in Malaysia agreed upon by the government of Malaysia and the Japan International Cooperation Agency on August 1, 1987. The study began in the middle of October 1988 and the results of the study were compiled as the Final Report in July 1989.

I-1. Background and Objective of the Study

The Asian countries are striving to build up local industries so as to strengthen their economic structures and to push forward with aggressive programmes for the invitation of foreign investment in order to rapidly build up export-oriented industries contributing to the acquisition of foreign currency instead of promoting import-substitution type industries.

Malaysia is currently pushing forward with the promotion of 12 sectors, primarily export-oriented industries of the type using existing resources, in line with the "Industrial Master Plan (IMP) 1986-1995," which was officially announced in January 1986. The Malaysian Export Trade Centre (MEXPO) selected certain key products for export promotion. The IMP is envisaged as the pillar of the economic plan and aims at an annual 8.9% increase in exports of manufactured goods from 1986 to 1995.

Since the G5 conference of the financial heads of five advanced nations in September 1985, the yen has been appreciating in value and the U.S. dollar has been depreciating. The currencies of the Asian NIES are also under pressure for reevaluation upward against the U.S. dollar. This has led to a rapid change in the international environment for exports. In particular, in the highly labour-intensive manufacturing fields, Japanese and NIES' companies have been increasingly investing in the ASEAN region in export-oriented industries. Under the Fifth Malaysia Plan, which began in 1986, Malaysia has been striving to enlarge the role of the private sector, achieve greater efficiency in the management of its economy, and promote industrial development. In line with this, it has relaxed its restrictions on foreign investment for export-oriented manufacturing industries and has come out aggressively to promote foreign investment.

The present Study on Selected Industrial Product Development in Malaysia aims at comprehensive cooperation for the development of strategic export industries. The objective of this study is to survey and analyse the state of selected industries in Malaysia

and to formulate a comprehensive programme for industrial development with the aim of promoting exports. Further, it seeks to organize information on Japanese firms wishing to make investments or establish joint ventures in these industries so as to promote joint ventures and technological tie-ups between Japan and Malaysia.

I-2. Implementation of the Study

In April 1986, the Malaysian government submitted a request to the Japanese government for a "Technical Cooperation Project on Industrial Sector Development." Receiving this, the Japan International Cooperation Agency (JICA) sent a contact mission in September 1986 to deliberate with the Economic Planning Unit, Prime Minister's Department (EPU), the Ministry of Trade and Industry and the Malaysian Industrial Development Authority (MIDA) and reached agreement with them on the basic objectives and content of the technical cooperation in industrial sector development between Japan and Malaysia. Based on this, the JICA sent a short-term expert to MIDA from February to August 1987 to select the target industries, resulting in the selection of the later mentioned industries. JICA then sent the Preliminary Survey Team in August 1987 and signed the Scope of Work including the selected industries with the Malaysian side.

Domestic preparatory work for the First Year Study began in the latter half of January 1988 and was followed by a field study from January 31 to March 30 and partly from May 22 to June 5. After the field survey, a questionnaire survey and interviews were conducted on related domestic companies and third-country studies were run on the competing countries and export markets for the industries concerned. A comprehensive analysis was then made and the report was completed in September 1988.

For the Second Year Study, the field survey was executed from October 16 to December 14, 1988. Then, the study was supplemented from March 15 to 24, 1989. Based on the results and further study, the Final Report was completed in July 1989.

I-3. Industries to be Surveyed

The industries surveyed for the Second Year were as follows:

Electronics : (1) Office electronic equipment
1) Word processors
2) Photocopying machines
3) Facsimile machines
4) Telex machines
(2) Cathode ray tubes (CRT)

(3) Ceramic IC packages/substrates

Rubber : (4) Rubber footwear

The industries surveyed were selected based on the list proposed from the Malaysian side.

As mentioned earlier, the Malaysian government has selected the following 12 industries for priority development in its Industrial Master Plan 1986-1995.

(1) Resource-based Industries
- [1] Rubber Processing Industry
- [2] Palm Oil Products Industry
- [3] Food Processing Industry
- [4] Wood-based Industries
- [5] Chemicals and Petrochemical Industries
- [6] Nonferrous Metal Products Industry
- [7] Non-Metallic Mineral Products Industry

(2) Non-resource-based Industries
- [1] Electronics and Electrical Industry
- [2] Transport Equipment Industry
- [3] Machinery and Engineering Products Industry
- [4] Ferrous Metal (Iron and Steel) Industry
- [5] Textiles/Apparel Industry

Further, the Malaysian Export Trade Centre (MEXPO) has designated the following as important items for export:

> Foodstuffs (including cocoa, seasonings, fruits, and seafood), feed, beverages, tobacco, cement, precious stones, ceramics, glass, furniture, wood products, rattan products, chemical products, fertilizers, pharmaceuticals, oils and fats, textiles, apparel, weaving thread, weaving cloth, carpets, handicrafts, jewelry, electronic and electric products and parts, musical instruments, machinery, metal products, sports goods, toys, cut flowers, rubber products, plastic products, footwear, leather goods, stationery, and auto accessories.

The Malaysian government proposed industries and items to be covered under this study by taking into consideration the priority industries identified under the IMP and the key items for export promotion identified by MEXPO as well as the recent trends in direct investment by Japanese firms and firms from NIES and other areas. A final decision on which industries and items would be surveyed was made through negotiations between

the Malaysian and Japanese sides based on the subsectors and products proposed by the Malaysian government.

I-4. Scope of Study

The details of the items of the survey under this study were decided as follows, based on the Scope of Work agreed on August 1, 1987:

(1) To overview the present situation of the selected industrial products:
   a) Production items and their production, trade and manufacturers; and
   b) investment, technological partnership, finance, taxation, introduction of foreign capital, etc.

(2) To study the existing status of manufacturing establishments in Malaysia for the selected industrial products. These studies are to cover the following areas:
   a) Manufacturing processes and specifications
   b) Technical level (quality control, etc.)
   c) Product development (designs, etc.)
   d) Business administration (business management, fund-raising, etc.)
   e) Sales strategies (market research, marketing, etc.)
   f) Relation with periphery industries (raw materials, equipment, etc.)

(3) To study the export markets of the selected industrial products:
   a) Supply and demand and import situations in major importing countries; and
   b) marketability of the selected industrial products in major importing countries

(4) To recommend policies and measures for development, technical upgrading and export promotion for the selected industrial products. The areas to be covered are as follows:
   a) Systems and policies
   b) Technical improvement
   c) Product improvement
   d) Sales strategies
   e) Business administration
   f) Manpower development
   g) Improvement of infrastructure relating to the selected products

(5) To undertake cost-analysis studies for the selected industrial products which are to include cost-comparison studies for the production of similar products in Japan.

(6) To undertake a study and survey to ascertain and identify Japanese companies for the selected industrial products which are keen to undertake direct investment and/or technical collaboration in Malaysia. The study/survey is to cover the following:

a) Survey on companies intending direct investment and technical collaboration

b) List of companies

I-5. Survey Method

(1) Outline

Fig. I.5-1 shows the procedure followed in determining the programme in the present survey. In the actual implementation of the study, the survey items and methods were changed slightly with each industry due to the characteristics of the selected industries as well as the varying stages of development.

Differences were particularly evident in the case of the rubber footwear industry, which is already producing and has begun selling its products abroad, and the electronics industry (including office equipment, CRTs and ceramic IC packages and substrates), which has yet to begin production.

Within the electronics industry as well, survey items and methods varied somewhat between the manufacturers of office electronic equipment, which are basically assembly industries, and the manufacturers of CRTs and ceramic IC packages and substrates, which function as component suppliers.

(2) Office Electronic Equipment (Word Processors, Photocopying Machines, Facsimile Machines, and Telex Machines)

Fig. I.5-2 shows a preliminarily supposed scenario for promotion of the office electronic equipment industry. As production of these items has yet to begin in Malaysia, in order to promote the growth of this industry and promote exports, it was first necessary to confirm the possibility of production. At the same time, it was necessary to examine the possibility of fostering local parts and components suppliers for this industry. While examining the stage of development of industries related to the office electronic equipment field, the possibilities for joint ventures and technological tie-ups with foreign firms were also examined based on the current technical levels of Malaysian firms.

In the scenario of Fig. I.5-2, three criteria are shown: 1) the possibility of promoting local industry; 2) the possibility of foreign capital and technological tie-ups; and 3) confirmation of the feasibility of domestic production. For the final criteria in

particular, financial evaluations were carried out according to the survey items shown in the scenario. This is mainly based on the recognition that there is nothing to be gained by developing a national policy for an industry if there is no realistic basis for it in the private sector. Although a detailed feasibility study was not possible under the present survey, long-term profitability was projected based on the assumption that local production would be started with an optimal production scale under the current market conditions.

(3) CRTs and Ceramic IC Packages and Substrates

Fig. I.5-3 shows a scenario for the promotion of the CRT and ceramic IC package and substrate industries. The study's main focus was the supply of CRTs and ceramic IC packages to manufacturers of television sets and ICs as these are the main users of these items. As a result, the survey aimed at examining the possibility of local production start-up based on: 1) an examination of the views of TV and IC manufacturers concerning domestic sourcing, 2) the review of current stage of development of peripheral industries which would be required for the local production of these items, and 3) an analysis of domestic production costs. As production of CRTs and ceramic IC packages requires the introduction of some of the world's most advanced technology, priority was also placed on the possibility of direct investment from overseas and technological tie-ups with foreign firms as well as an evaluation of the Malaysian investment climate by foreign affiliate companies, the latter being very important in any attempt to strengthen invitations for foreign investment.

The judgement criteria shown in the scenario were similar to those for the office electronic equipment industry. Given the fact that a limited number of manufacturers control virtually all of the world market, however, more emphasis was given to the judgements on the possibility of foreign investment and technological tie-ups and on the possibility of domestic production in Malaysia based on its financial feasibility.

(4) Rubber Footwear

Fig. I.5-4 shows the predicted scenario for promoting the rubber footwear industry and exports thereof.

Production of rubber footwear has already commenced in Malaysia, and exports have also been quite successful. The survey therefore focused on uncovering current problems by comprehensively reviewing the current industry situation, including manufacturing costs, technical levels, export competitiveness, and so on. Solutions to the problems were then sought out in an attempt to improve product quality, expand the scale

of production, and promote exports. Another important topic was the possibility of foreign investment and technological tie-ups as a means of promoting Malaysian exports.

As being indicated in the scenario, the recommendation of the comprehensive promotion programmes for the development of the industry was made from the identified measures for: 1) solving existing bottlenecks observed during the review of current problems; 2) increasing the possibility of foreign investment and technological tie-ups; and 3) increasing the possibility of export promotion.

(5) Field Surveys

This study involved field surveys both in Malaysia and in Japan. It was conducted with the aim of formulating a comprehensive programme for industrial development and export promotion based on the survey and analysis of the present status of the selected industries. For the surveys in Malaysia, an interview survey conducted through direct visits to the companies in selected industries was used as the principal method. In order to get the maximum results from the short-time visits, a written interview guide and factory visit check lists were prepared. However, for actually performing the survey, the in-depth interview method was basically adopted, in which the interviewees and interviewers exchanged opinions freely.

The summary of the direct-visit interview survey is shown in Table I.5-1.

Table I. 5-1 Number of Companies Covered by the Field Interview Survey in Malaysia

Industry Breakdown	Number of Companies
Office Electronic Equipment Total	30
Electronic Equipment Assemblers	(13)
Electronic Parts Manufacturers	(13)
Others	(4)
Cathode Ray Tubes (CRT) Total	28
TV Set Assemblers	(7)
Related Industries	(15)
Others	(6)
Ceramic IC Packages/Substrates Total	32
IC Manufacturers	(11)
Related Industries	(10)
Others	(11)
Rubber Footwear Total	32
Rubber Footwear Manufacturers	(9)
Related Manufacturers	(17)
Related Organizations	(6)

Because the companies which were covered by direct visits were limited in number, a mailed questionnaire survey was conducted in Malaysia. Because of the necessity for tabulation, mailed questionnaires were also sent to the companies visited for interviews. The outline of the mailed questionnaire survey in Malaysia is shown in Table I.5-2. Mailed questionnaires are attached to Annex-3 and the results (excluding the results of rubber footwear) are summarized in Annex-7.

Table I. 5-2 Number of Companies Covered by the Mailed Questionaire Survey in Malaysia

	Number of Questionnaires Sent	Effective Answers	Rate of Effective Answers
Electronic Equipment and Parts Manufacturers	152	87	57.2%
Rubber Footwear Manufacturers	23	13	56.5%

Because the questionnaire survey related to the three types of electronic industries (office electronic equipment, CRTs and ceramic IC packages/substrates) is aimed at evaluating the investment climate and finding companies wishing a joint venture or a technological tie-up, the questionnaires were sent to firms throughout the entire electric and electronic industries.

In drawing up a list of Malaysian firms sending the questionnaire, the following directories were used. To make the number of samples as large as possible, firms considered to be related were all included in the list.

"Directory of Electrical and Electronic Parts and Services Industries in Malaysia"

"FMM Directory"

"Kompas Malaysia"

"Electronics Industry in Malaysia"

For reference, the number of electrical and electronic firms in Malaysia as of the end of 1988 is as follows:

*The number of firms covered by the industrial survey

Refrigerators, air conditioners, etc.	14
Radio, TVs, audios, etc.	23
Semiconductors, other electronic parts,	

communication equipment, etc.	62
Total	99

*The number of operating firms identified by MIDA

Total	290

In drawing up a list of Malaysian firms sending the questionnaire on rubber footwear, the following directories were used and advice from MIDA was also provided. Leather shoes and PVC manufacturing firms were excluded from the list because they were out of the subject range of our survey.

"Malaysian Rubber Products Manufacturers' Directory" MRPMA May 1985

"1988 FMM Directory" FMM February 1988

"Malaysian Export Trade Directory 1985/86" MEXPO & FMM April 1985

"MRPMA Members List as of 29 July 1988" MRPMA

"Malaysian Trade News No.3, 86" MEXPO

"Industrial Master Plan Sectoral Task Forces Annual Report 1986/87" MIDA March 1988

"Project Report for Developing Exportable Goods (Rubber Footwear and Wooden Moulding)" JETRO March 1985

"Attendants' List of ASEAN Products Exhibition and Business Negotiation" JETRO September 1988

For the survey in Japan, a questionnaire survey was conducted for the purpose of exploring the possibility of investment by and technological tie-ups with Japanese companies.

Outline of the mailed questionnaire survey in Japan is summarised in Table I.5-3. Additional information was collected where necessary by direct interviews and telephone interviews.

Table I. 5-3 Number of Companies Covered by the Mailed Questionaire Survey in Japan

	Number of Questionnaires Sent	Effective Answers	Rate of Effective Answers
Electronic Equipment and Parts Manufacturers	420	136	32.4%
Rubber Footwear Manufacturers	21	13	61.9%

As for the three electronics-related industries, a questionnaire survey was conducted on a wide range of firms including related component and material manufacturers in order to accomplish the primary goal of discovering potential investors.

In preparing a list of firms to be surveyed, the membership list of the Electronic Industries Association of Japan, the largest group of electronics-related businesses in Japan was used. Out of its total membership of 497 companies, non-manufacturing firms and other obviously unrelated firms were deleted. As for office electronic equipment, the list of members of the Japan Business Machine Makers Association, another industrial body, was used to identify other additional firms to be surveyed which do not belong to the Electronic Industries Association of Japan.

As for rubber footwear, a survey was conducted of 21 member firms of the Japan Rubber Footwear Manufacturers Association. Some regular members of the association were excepted from the list because they manufacture the *jikatabi* split-toed heavy-cloth footwear used by some Japanese workers. The association's membership represents virtually the entire rubber footwear industry of Japan.

For the purpose of identifying the targeted export market for the selected products and the present status in competing countries, a survey plan was drawn up for third-countries in addition to a survey of Japan, and it was carried out by using the services of specialized research agencies in the related countries. The names of the countries surveyed through overseas agencies are shown below.

Export Market Survey:

Office Electronic Equipment	;	U.S.A.
Rubber Footwear	;	U.S.A.

Survey of Competing Countries:

Office Electronic Equipment	;	Korea
		Singapore
		Thailand
Cathode Ray Tube	;	Korea
		Singapore
		Thailand
Ceramic IC Packages/Substrates	;	Korea
		Singapore

Rubber Footwear	;	Korea
		China
		Indonesia

Fig. I. 5-1 Process of Formulation of Comprehensive Industrial Promotion Programmes

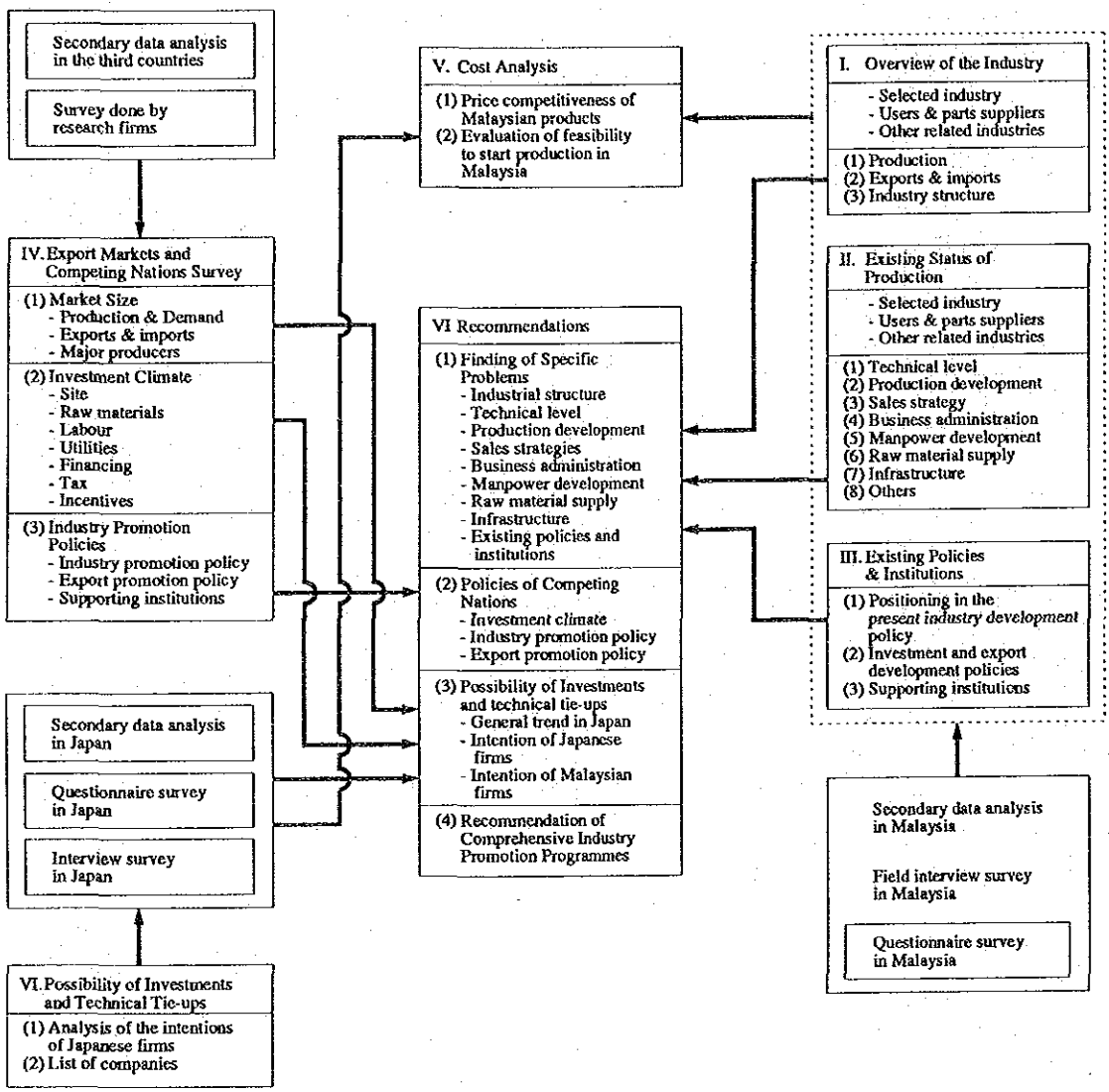


Fig. I. 5-2 Scenario for the Development of the Office Electronic Equipment Industry

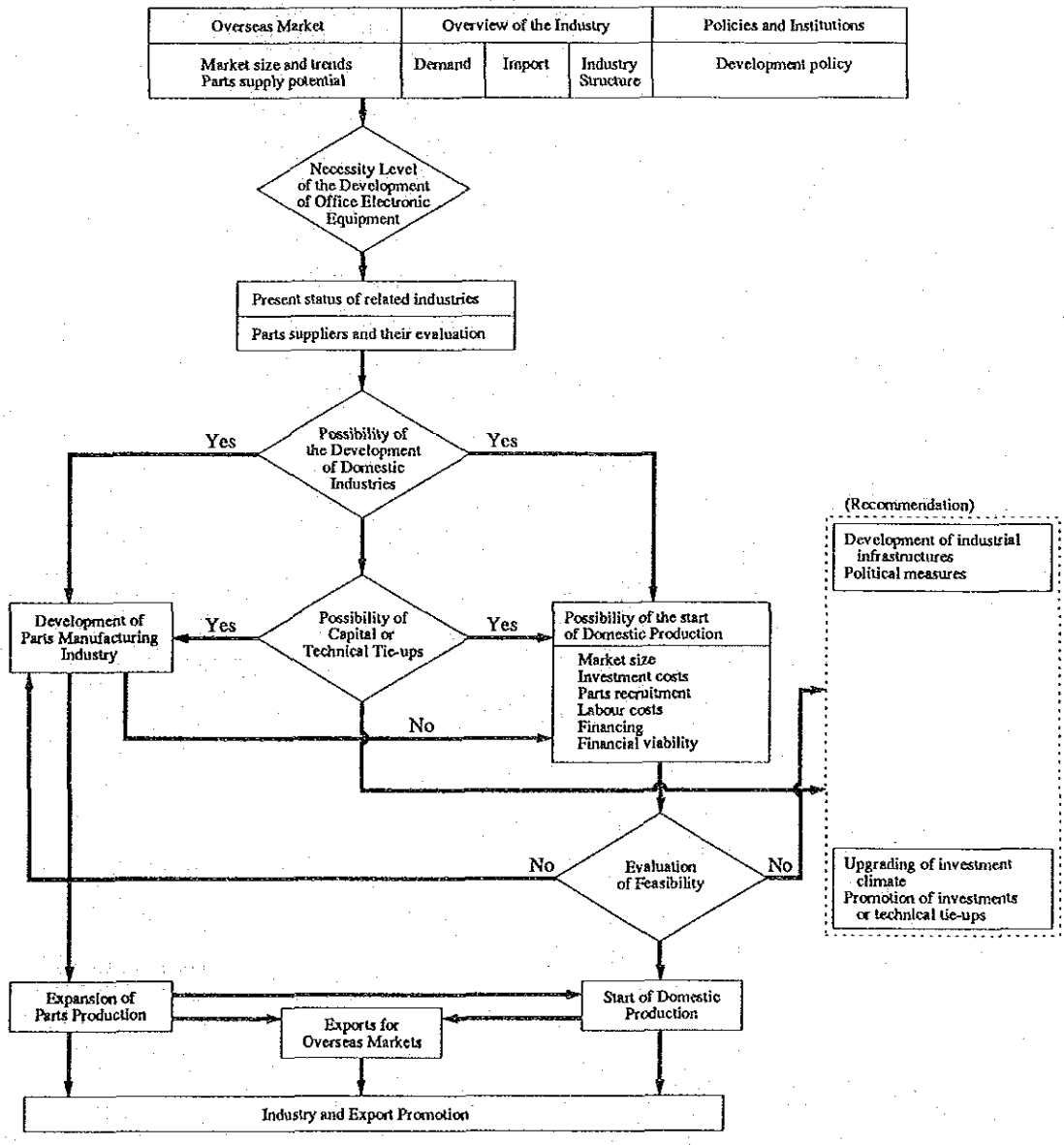


Fig. I. 5-3 Scenario for the Development of the CRT or Ceramic IC Package/Substrate Industry

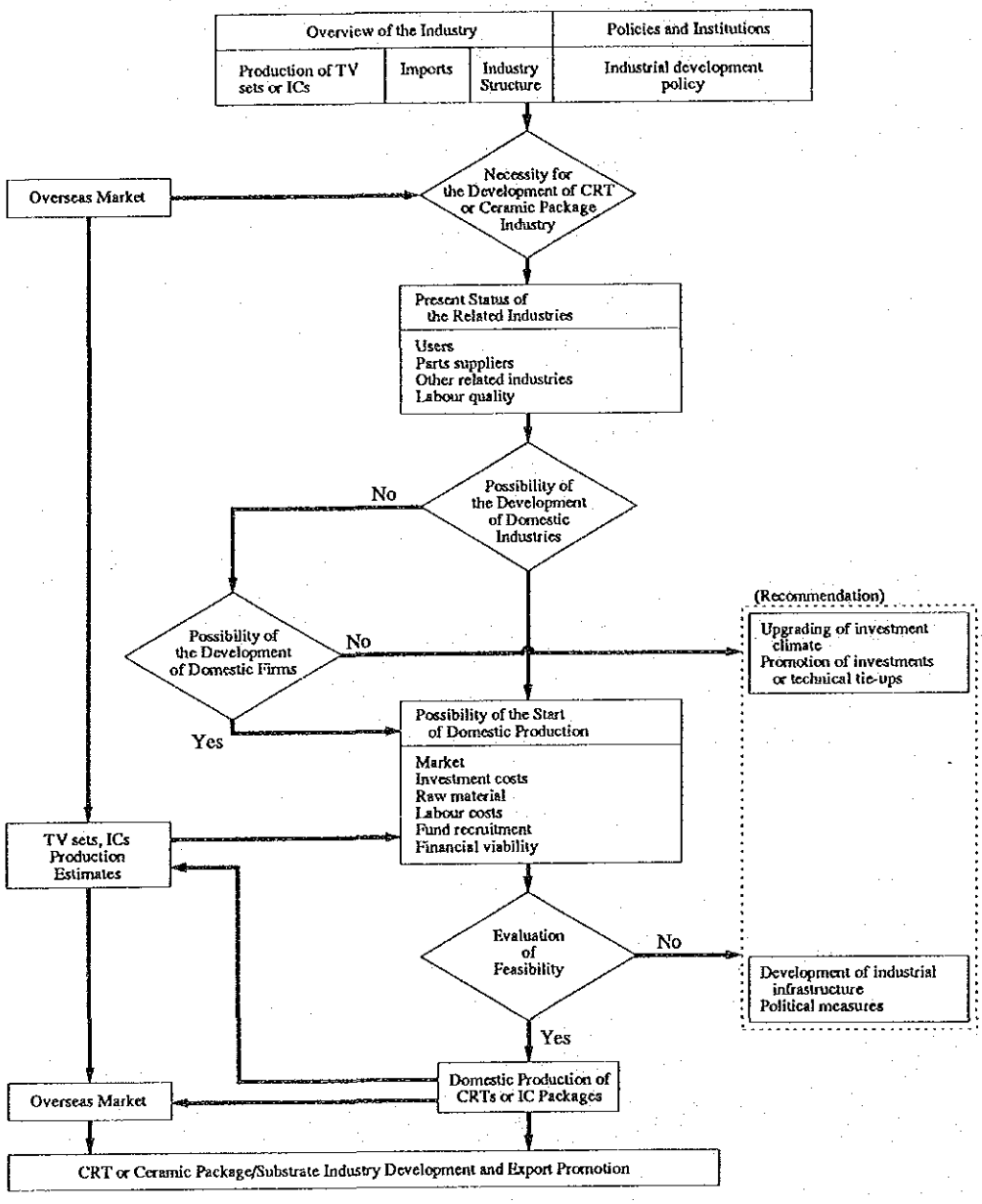
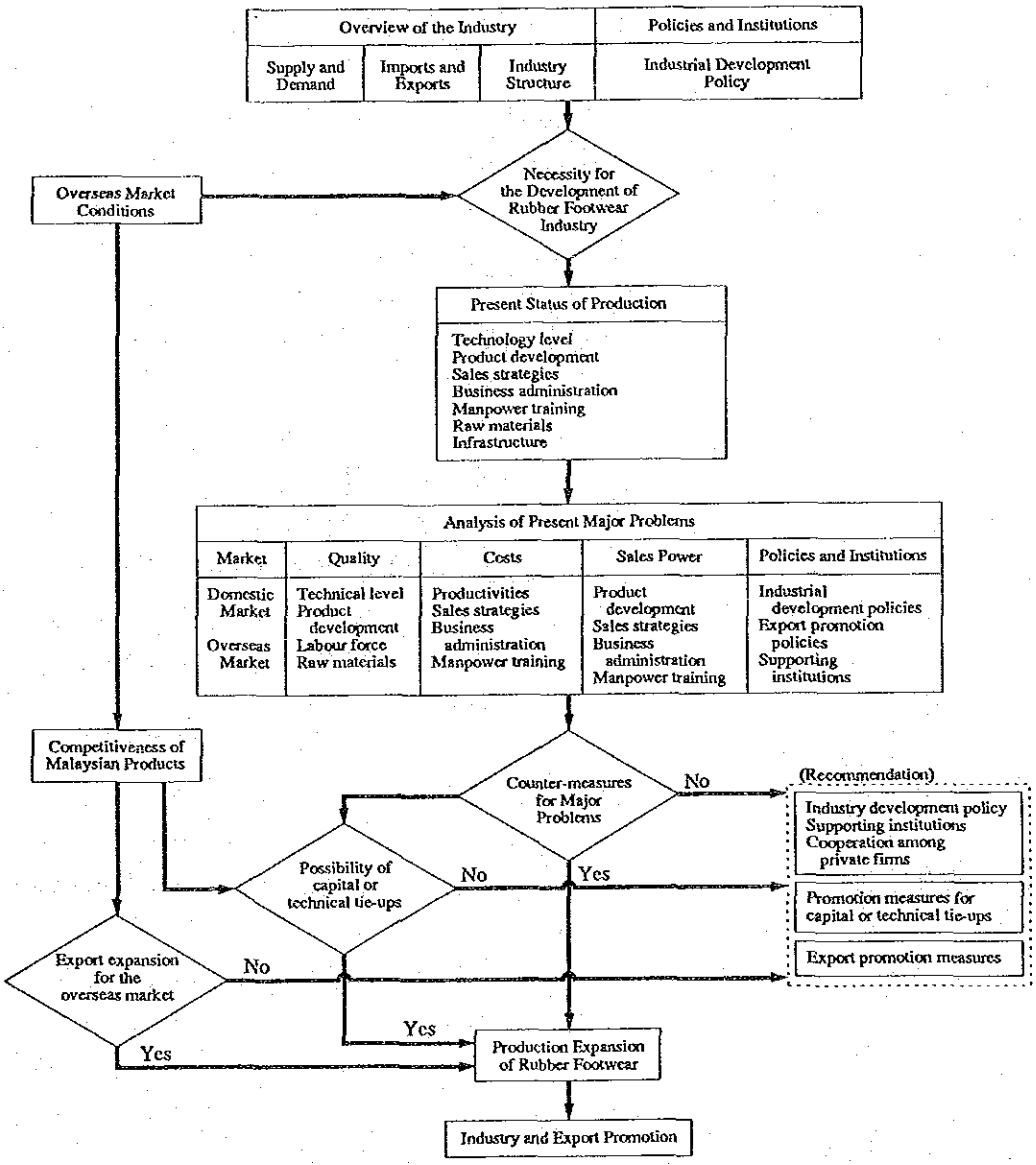


Fig. I. 5-4 Scenario for the Development of the Rubber Footwear Industry



The JICA Industrial Product Development Study Team was composed of the members listed below.

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Hidenori AKIYOSHI	Industrial Engineer/Rubber Footwear Asahi Corporation

II. Summary

II. Summary

II-1. Summary of the Study Results by Industry

II-1-1. Office Electronic Equipment

(1) Market Trends of Office Electronic Equipment in Malaysia

1) Production

None of the four models of office electronic equipment is produced in Malaysia at present. Malaysia wholly depends on imports for office electronic equipment.

2) Market Size

Demand for office electronic equipment in Malaysia in 1988 was estimated as follows.

Table II.1-1 Estimated Demand for Office Electronic Equipment in Malaysia

(Unit: Set)

Word Processors	
Personal Computer Type	20,000
Electronic Typewriter Type	1,800
Photocopying Machines	6,250
Facsimile Machines	8,000

Source: Field Interview Survey

There is no statistical data on demand for telex machines in Malaysia. According to the statistics of telex subscribers, the number of telex subscribers in 1988 decreased by 1,200 from the previous year, and subscribers tend to decrease year by year.

3) Consumption Trends

Word processors:

It is common, especially among businessmen, that needs for the word processing function are satisfied by personal computers which are equipped with word processing software. For such users as secretaries, they mainly use electronic typewriters with word processing functions. It is predicted that personal computers will continue to be the mainstay of demand for word processing functions.

Photocopying machines:

Demand for photocopying machines fluctuates according to the performance of the Malaysian economy. The market size is estimated to be approximately 6,500 machines for the next several years. Medium to low-end level products, with copying speed of less than PCM 40, represent a larger part of the market in terms of units.

Facsimile machines:

Demand for facsimile machines has drastically increased in the past five years. The size of yearly demand is expected to grow to 15 thousand units in 1990.

Telex machines:

With the progress of the diffusion of facsimile machines, the replacement of telex machines by facsimile machine has accelerated. The number of telex subscribers is predicted to decrease significantly, and they will be limited to such users as multinational enterprises which have frequent business transactions with overseas firms.

(2) Results of the Survey Conducted in Malaysia

1)Evaluation of Technological Level of the Assembly Industry in Malaysia

Methodology:

There, at present, exists no manufacturer engaging in production of word processors, photocopying machines, facsimile machines in Malaysia. Therefore, the assembly manufacturers of electrical and electronic equipment which perform similar assembly work with office electronic equipment are surveyed and the possibility of establishment of assembly manufacturers of office electronic equipment was evaluated.

For the evaluation of the technological level of Malaysian assembly manufacturers through the survey conducted in Malaysia, the operation of factories were evaluated in

comparison with that of advanced Japanese electrical and electronic equipment manufacturers from various viewpoints following the steps described below.

[1] The checklists were prepared consisting of 25 items which fall into 7 categories, i.e., facilities, operation management, production management, physical distribution/stock management, quality control, safety/cleanness, and others. According to the checklists, the factories visited were evaluated.

[2] Score of each item was calculated by multiplying the evaluation point of an item and the weighting of importance of the items. A score of each category was calculated by adding up the scores of the items which compose the category. Finally, an evaluation point of each category was calculated by dividing a score of a category by the maximum score.

When 1.00 in evaluation points be given for a category, the technology level of that category of the manufacturer could be considered equal in level to advanced Japanese electrical and electronic equipment manufacturers.

Results of Evaluation:

The average evaluation points of 4 local assemblers were 0.66 for facilities. 0.73 for work management, 0.76 for production, 0.74 for physical distribution/stock management, 0.78 for quality control, 0.67 for safety/cleanness, and 0.41 for employees morale lifting.

The average evaluation points of 6 Japanese affiliated assemblers were 0.88 for facilities. 0.81 for work management, 0.94 for production, 0.80 for physical distribution/stock management, 0.90 for quality control, 0.78 for safety/cleanness, and 0.78 for employees morale lifting.

Generally speaking, the Japanese affiliated manufacturers had a higher level of technology than the local manufacturers. However, the ranges of distribution of the evaluation points largely overlapped and the deferences were not so great.

The assembly of word processors, photocopying machines, and facsimile machines requires technological 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, telecommunication tests, etc. However, the results of the survey in Malaysia shows that, with the provision of necessary equipment and appropriate work guidance, the assembly of office electronic equipment in Malaysia would become possible, in terms of the technological level of assembly factories in Malaysia.

2) Evaluation of the Possibility of Procurement of Key Parts and Components Necessary for the Production of Office Electronic Equipment

Methodology:

For the metal pressed parts, plastic injection moulded parts, and chip-mounted printed circuit boards, the evaluation of technological level was made by factory visit according to the technological level checklists. For transformers, power supply units, rubber rollers, and keyboards, the possibility of procurement was evaluated by visiting parts and components factories.

For the parts and components which were not covered by factory visit survey, the possibility of procurement was evaluated based on the interviews with assembly manufacturers using them.

Results of Evaluation:

From above results, the potential sources of parts and components used by the word processor, photocopying machine, and word processor factories which are assumed to be set up in Malaysia have been summarized.

3) Summary of the Industry Survey Related to Office Electronic Equipment Production in Malaysia

Results of the survey conducted in Malaysia can be summarised as follows.

a) The size of the domestic market for office electronic equipment in Malaysia is small. Thus, in order to secure the production volume which would realise a marginal production cost lower than the import price, it is required that most of products be directed to exports.
b) There is no office electronic equipment plant in Malaysia at the moment. Investment in a new office electronic equipment plant is required. Promotion of investments by foreign office electronic equipment manufacturers is one of the most effective ways for the development of the office electronic equipment industry in Malaysia.
c) The technological level of production of existing foreign electronics product assemblers has nearly reached the level required for the production of office electronic equipment. Therefore, it is considered that, if new investment in office electronic equipment took place, there would be few technological

problems concerning technology transfer and the acquisition of technology for the start of production.

d) There still exists some gap between the production technology level of existing Malaysian-local electric/electronic product assemblers and the level required for the production of office electronic equipment. The improvement of production control management is required for the production of office electronic equipment.

e) Foreign manufacturers who have invested in Malaysia on the whole have taken the policy of leaving R&D activities in their home countries and have not transferred R&D activities to Malaysia. These situations result in the reliance on overseas technologies and the effects of foreign investments in Malaysia on the accumulation of R&D capability in the fields of up-to-date technologies are limited.

f) The availability of engineering personnel, especially technicians and medium-level engineers, is becoming insufficient. Training of engineers is of significant importance for the successive growth of the whole electronics industry in Malaysia as well as the growth of the office electronic equipment industry.

g) In respect of production cost, the availability of local parts and components will have a significant impact on the cost competitiveness of office electronic equipment to be manufactured in Malaysia. Considering the number of existing Malaysian parts manufacturers and their technological level, if an office electronic equipment plant is established and starts production, it will have to depend mostly on imported parts and components at the earlier stage. It is important that continuous efforts be directed to the promotion of local parts and components manufacturers for the development of the office electronic equipment industry.

(3) Results of the Survey on Overseas Countries

1) Industry Structure

Suppliers of office electronic equipment in the international market are limited to major Japanese, American and European manufacturers of office equipment, precision equipment, general electric equipment, and information and telecommunications equipment due to the following factors.

a. The pace of technology development is very rapid, and a product life cycle has become shorter. Thus, many new products are continuously placed in the the market.
b. Integrated and high-level technology development capabilities are inevitable and the accumulation of R&D activities are required.
c. A large amount of investments for the establishment of sales channels and service network are necessary.

2) Pattern of Competition

Due to the high growth of the market for OA equipment including office electronic equipment and its high prospect of growth, new entries are seen in the OA market from the relevant businesses for the purpose of diversification of business line and systematisation of product groups. However, there is an entry barrier for those companies which do not have a business basis in high-technology electronics, due to the necessity of a large amount of investment and required high-level technology development capability. There is severe competition between a limited number of companies in the OA business and the technology development race and price competition are becoming harder. Under such circumstances, business tie-ups among office electronic equipment manufacturers and some business partnerships have taken place.

The key factors for success in the market can be summarised as follows.

- Ability of developing of new products
- Wide range of products which constitute OA equipment system
- Brand recognition based on high technologies
- Sales network

3) Overseas Business Operation of Office Electronic Equipment Manufacturers

The major driving forces of overseas investments by Japanese office electronic equipment manufacturers are the revaluation of the yen and the issue of trade conflicts. The recent revaluation of the yen has promoted investments by Japanese office electronic equipment manufacturers in NIES and recently in ASEAN countries. Trade conflicts have resulted in investment in EC countries and the U.S.A. by Japanese office electronic equipment manufacturers. In the case of photocopying machines, investments in the EC and the U.S. by Japanese manufacturers have finished the first phase. There is a possibility that facsimile machines would be taken up for an issue of trade balance negotiations in the future. A photocopying machine factory can start the production of

facsimile machines rather easily by shifting a production line from photocopying machines to facsimile machine production. Japanese manufacturers invested in a photocopying machine plant taking this possibility into consideration.

Overseas investments by Japanese office electronic equipment manufacturers are expected to be active in the future. It is forecast that the rate of overseas production of Japanese office electronic equipment manufacturers will reach 50% in the early 1990s as the result of the progress of production shift to foreign countries.

There are two patterns of overseas investments by Japanese office electronic equipment manufacturers in terms of region; one is investments in EC countries and the U.S.A. for the purpose of securing existing markets; and the other is investments in Asian countries including ASEAN countries, Mexico and the like for the purpose of production cost reduction.

(4) Evaluation of Alternatives for the Promotion of the Office Electronic Equipment Industry in Malaysia

Promotion of new investments in office electronic equipment production is essential for the development of the office electronic equipment industry in Malaysia due to the nonexistence of office electronic equipment manufacturers in Malaysia.

There are four patterns of new investment by types of supposed investors as follows.

a. Investment in office electronic equipment production by foreign office electronic equipment manufacturers which do not operate in Malaysia
b. Investment in office electronic equipment production for the diversification of product lines by foreign electronics manufacturers which are operating in Malaysia
c. Investment in office electronic equipment production for the diversification by Malaysian electronics manufacturers
d. Investment in office electronic equipment production or joint-venture partnerships by the Malaysian government

The investment pattern alternative among the four which should be given the top priority was evaluated considering the following four factors for the development of the electronic office equipment industry in Malaysia. It is concluded that the promotion of investments by foreign office electronic equipment manufacturers should receive the top priority.

a. Trends in the international market and measures to deal with these trends

b. Business growth possibilities in case the production of office electronic equipment production starts in Malaysia.
c. Matching the industrial development policy taken by the Malaysian government
d. Economic, financial and social burdens on the Malaysian government.

(5) Results of the Feasibility Study of Investment Projects

The feasibility analysis of office electronic equipment plant projects was conducted in order to evaluate the possibility of promoting the office electronic industry in Malaysia and promoting foreign investments. The results of the analysis are as follows.

Table II. 1-2 Operating Profit Ratio of Office Electronic - Equipment Factories

(Unit: M$1,000)

	Production After the Second Year (Unit)	Initial Investment	Operating Profits in the Sixth Year	Ratio of Operating Profits to Total Sales in the Sixth Year
Word Processors	120,000	21,449	3,659	2.1%
Photocopying Machines	120,000	74,423	5,104	4.1%
Facsimile Machines	120,000	21,393	2,857	1.5%

Source: JICA Study Team

Financial internal rates of return (FIRR) were calculated, assumed that the project period is ten years. They are as follows.

Word Processor Machine Factory	11.60%
Photocopying Machine Factory	7.83%
Facsimile Machine Factory	6.90%

The comparison of production cost per unit in Malaysia and that of Japan is as follows.

Table II. 1-3 Comparison of Production Costs in Malaysia and in Japan

(Unit: Malaysia $)

	Production Cost per Unit in Malaysia	Production Cost per Unit in Japan	Cost Merit by Producing in Malaysia
Word Processors	1,404	1,566	162
Photocopying Machines	1,009	1,026	17
Facsimile Machines	1,529	1,537	8

Source: JICA Study Team

The comparisons of prices of office electronic equipment manufactured in Malaysia and those in Japan on the EC market, the American market, and the Japanese market are as follows.

Table II. 1-4 Comparison of Product Costs in the Major Markets

(Unit: Malaysia $)

	Export from Malaysia	Export from Japan	Cost Merit of Export from Malaysia
North American Market			
Word Processors	1,503	1,663	160
Photocopying Machines	1,066	1,082	16
Facsimile Machines	1,652	1,659	7
European Market			
Word processors	1,542	1,708	166
Photocopying Machines	1,124	1,145	21
Facsimile Machines	1,727	1,738	11
Japanese Market			
Word Processors	1,521	1,566	45
Photocopying Machines	1,015	1,026	11
Facsimile Machines	1,536	1,537	1

Source: JICA Study Team

The ratio of parts and components to total production cost is high for the production of office electronic equipment, and the ratio of local parts and components has a great affect on the profitability of office electronic equipment production. Accordingly, the improvement of the local parts and components ration of parts would directly lead to the improvement of production cost competitiveness of operation in Malaysia.

(6) Evaluation of Promotion Priority by Product Type among Office Electronic Equipment

A priority of promotion by product was evaluated judging from such factors as market attractiveness, the possibility of Japanese manufacturers investing in Malaysia, and value-added in Malaysia for the subject products of this survey: word processors, photocopying machines, and facsimile machines. The top priority as given to word processors, and secondly, facsimile machines, and lastly, photocopying machines. The priority of telex machines for industrial promotion is little because the market potentiality for telex machines is very small.

Table II. 1-5 Attractive Factors for Investment

	Word Processors	Photocopying Machines	Facsimile Machines
Market Size	△	○	○
Market Potential	○	△	◎
Possibility of Japanese Manufacturers Investing in ASEAN Countries	○	△	◎
Profitability of Operation	◎	○	△
Availability of Local Parts and Components	◎	○	△

Relative advantage: ◎ = High ○ = Medium △ = Low

Source: JICA Study Team

(7) Evaluation of Priority of Development of Domestic Parts and Components Industries

Promotion of the parts and components industries is one of the most important problems for the establishment of the development base for the office electronic equipment industry in Malaysia. In other words, the availability of local parts and components is one of the key factors which determines foreign office electronic equipment manufacturers' decisions in investment in Malaysia. The industrial promotion of the parts and components industry is a key subject for the promotion of investments in the office electronic equipment industry and, further, the information equipment industry.

The priority of development by type of part and component for the production of office electronic equipment was evaluated considering the needs of office electronic equipment manufacturers (cost weights, needs of localisation from the viewpoint of physical distribution, and difficulty in in-house production) and the significance for development in Malaysia (existing foundations of production in Malaysia, the degree of general-purpose use, and the development prospects of technologies).

The parts and components of which needs for office electronic equipment manufacturers were evaluated large are CRT, plastics, modems, CCD, thermal heads, and FDD.

(8) Scenario for the Promotion of the Office Electronic Equipment Industry in Malaysia

The scenario for the promotion of the office electronic equipment industry in Malaysia is illustrated in Fig. II.1-1.

1) Importance of the Promotion of the Office Electronic Equipment Industry in Malaysia

The following factors are pointed out as the reasons for the importance of the office electronic equipment industry in Malaysia at present.

a. It is expected to contribute to Malaysian foreign exchange income considering the strong demand in the international market.
b. It is expected to contribute to balancing the Malaysian electronics industry structure which is presently confined to semiconductor subsector.
c. It is expected to contribute toward creating the foundation for the successive growth of the Malaysian electronics industry. It is expected to play an important role in resolving the technology gap in the high-technology field of electronics.
d. It is expected to contribute to the establishment and development of information processing and electronics telecommunication networks system in Malaysia which would upgrade the quality of business activities and enforce the linkage with the world economy.
e. It is expected to contribute toward upgrading the level of Malaysian engineers and promote technology transfer to Malaysia in the field of high-technology for the long term.

2) Developmental Stage of the Office Electronic Equipment Industry in Malaysia

The results of surveys on the present status of the Malaysian electronics industry in overseas countries indicate that the priority subject is the promotion of new investment and major foreign office electronic equipment manufacturers are of essential importance as the target of promotional measures.

The developmental process of the office electronic equipment industry in Malaysia, in which the promotion of new investment is expected to function as the leverage for development, can be divided into the following four stages.

First Stage - Stage of Promotion of Investment:

At this stage, investment would be made for an office electronic equipment plant. The establishment of office electronic equipment plants would create the opportunity of new employment. On the other hand, due to the necessity of importing of up-to-date production facilities, imports of machinery and equipment would take place.

This is the key stage of the promotion of the office electronic equipment industry. The result of promotion of foreign investment would decide the growth pace of the Malaysian office electronic equipment industry.

Second Stage - Expansion of Exports:

At the second stage, the production of office electronic equipment would increase and exports would start to expand. The production of office electronic equipment competitive in price and quality in the international market would be of importance. The expansion of exports would contribute to the foreign exchange position. For parts and components produced in Malaysia, local procurement would stimulate the local parts and component industries. On the other hand, imports of parts and components, which are not produced in Malaysia, would also increase.

Third Stage - Promotion of the Local Parts Industry:

The import substitution of parts and components would advance and the growth of local parts manufacturers would be realised due to the efforts to increase local parts procurement by office electronic equipment manufacturers and their technical guidance to local parts manufacturers and as the result of investments by foreign parts manufacturers.

The value added of office electronic equipment production in Malaysia would increase with the progress of the local parts content ratio.

The improved product level and increase of local parts manufacturers would have an influence on the development of other electronics assemblers.

Fourth Stage - Progress of Technology Transfer:

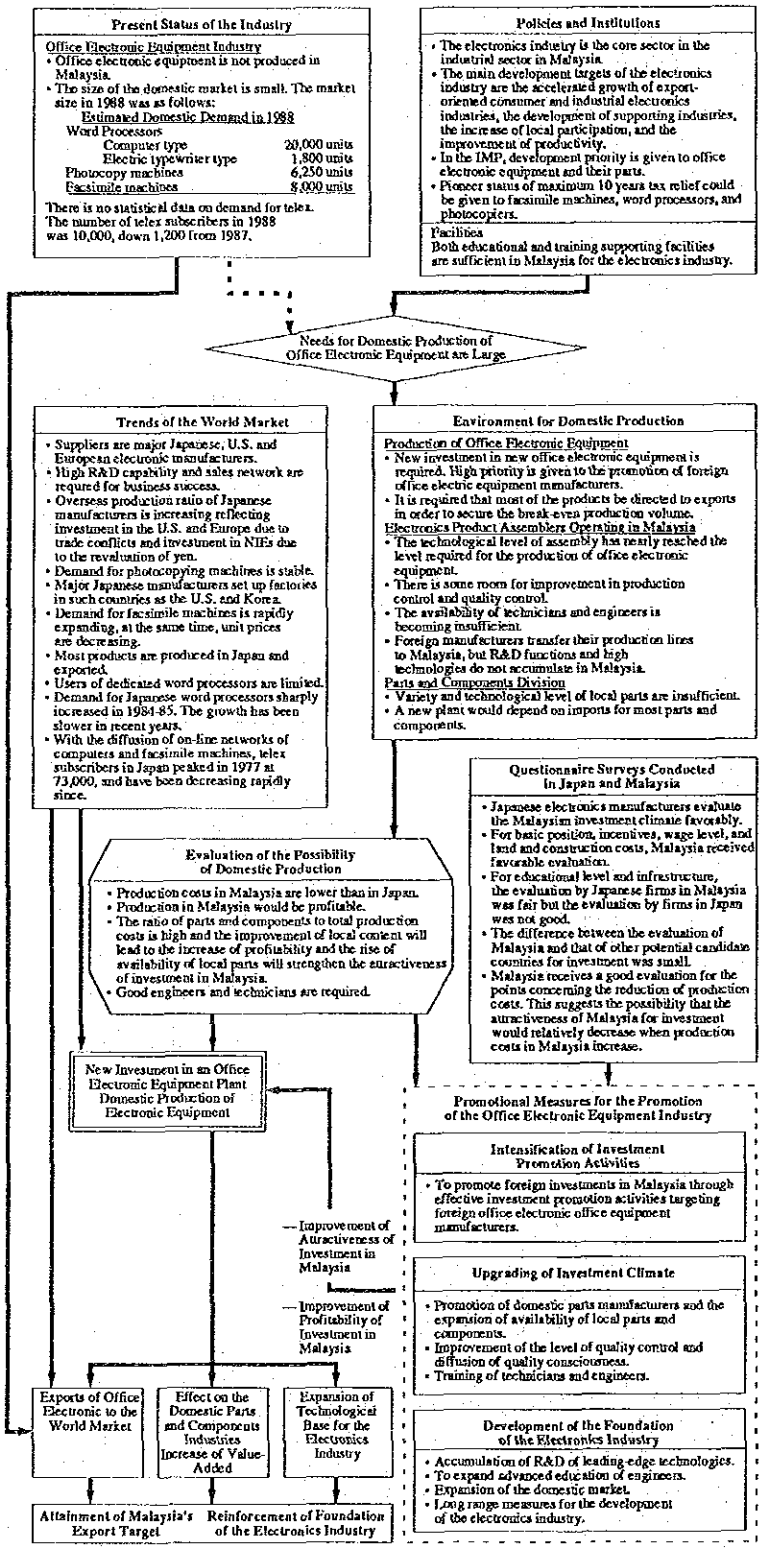
High value added activities such as design and development would be partly transferred to Malaysia as the result of the increase of abilities of Malaysian engineers, and the progress of technological transfer from overseas office electronic manufacturers. Further, the production of higher technology or systematised products might be started.

For the development of the level of technologies related to the office electronic equipment in Malaysia, the accumulation of R&D activities and the upgrading of the R&D capability would be prerequisites.

With the progress of technology transfer, at this stage, it may be possible that local manufacturers would start the production of office electronic equipment and OEM production or production of products for niche markets would be carried out by them.

The developmental stage would not move to the next stage one by one. The stages would overlap to some extent and some elements of the stages would possibly appear at the same time.

Fig. II. 1-1 Scenario for Development of Office Electronic Equipment Industry



(9) Basic Strategies for the Promotion of the Office Electronic Equipment Industry in Malaysia

Measures to be taken for the promotion of the office electronic equipment industry are summarised in Fig. II.1-2. The measures for the first stage (promotion of investment) might be the main part of urgent measures to be taken .

- Investment promotional activities toward foreign office electronic manufacturers would be the core of strategies for the development of the office electronic equipment industry in Malaysia.
  Investments by foreign manufacturers would clear the problems of technological gap between Malaysia and more advanced countries and the access to overseas markets. The development of the office electronic equipment industry would be promoted by the initiative of foreign investment. The effects of foreign investment on the growth of the domestic parts and components industries and on the improvement of technological level should be pursued.

- Direct investment promotional activities should be intensified. Besides keeping office electronic equipment subject to pioneer status, reinforcing investment promotional activities by MIDA and other governmental organisations is of importance.
  Such focussed promotion activities as the preparation of data and materials, invitation of investment missions, should be carried out.

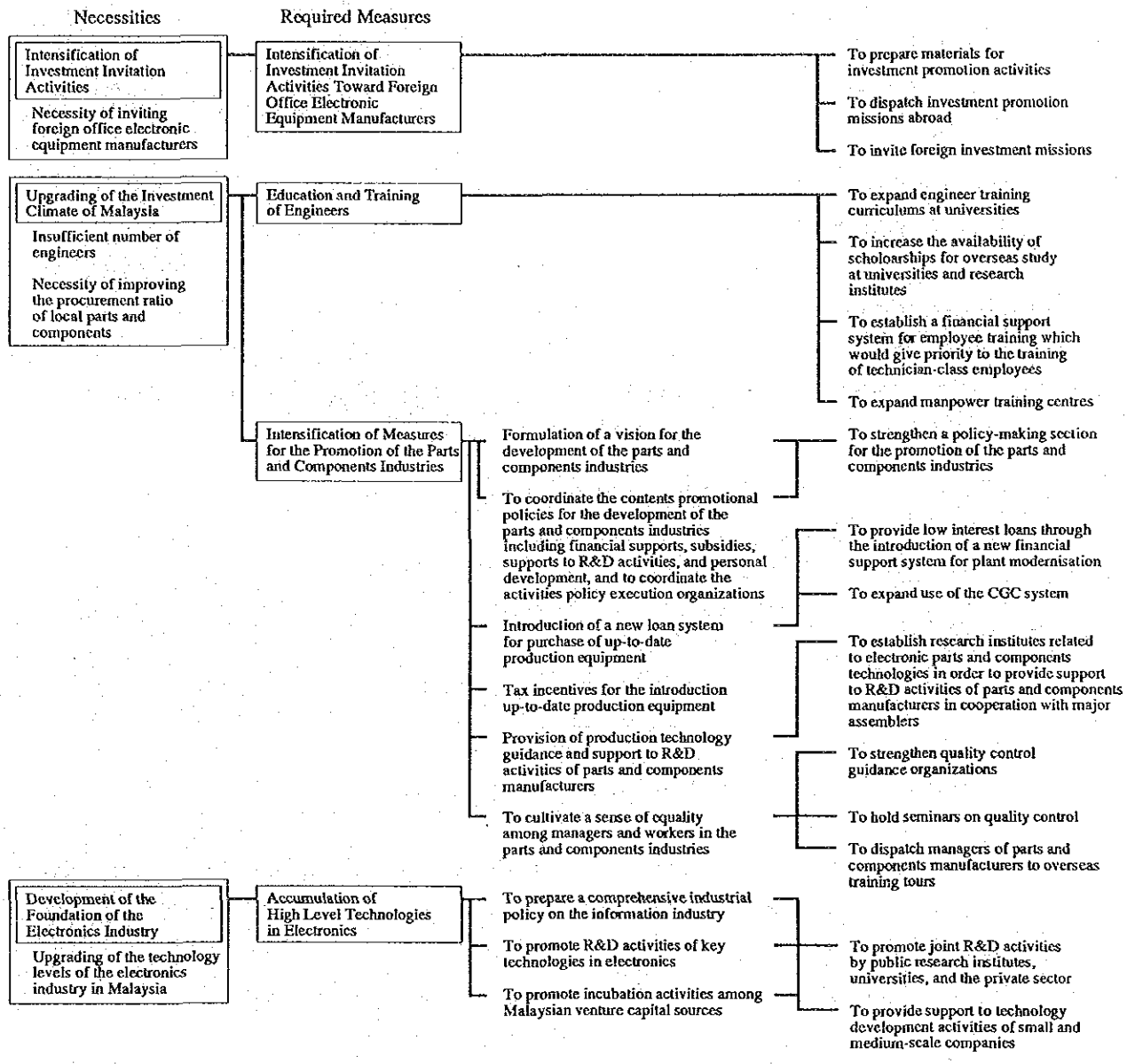
- Various measures to increase the attractiveness of the Malaysian investment environment toward foreign office electronic manufacturers, and measures to establish the foundation of the office electronic equipment industry should be taken as follows.
  a. The main activities for the establishment of the foundation for the office electronic equipment industry will be the promotion of the parts and components industries, and training of such personnel as technicians and engineers. These measures would be important as well from the viewpoint of the overall development of the Malaysian electronics industry.

b. As for the development of the parts and components industries, such measures as the intensification of a government section in charge of policy making, the formulation of a vision for the development of the parts and components industries, and the coordination among policy executing organisations should be taken.

c. It is necessary to establish support measures for the introduction of modern manufacturing machinery in order to promote the parts supply of existing parts and components manufacturers to the office electronic equipment industry.

d. For the development of the parts and components industries and the improvement of the technological level, such measures as the establishment of successive research and development systems at public research institutes, supports to technology improvement, support to employee training, and activities for the diffusion of quality control techniques and up-to-date production technologies,should be carried out.

Fig. II. 1-2 Measures to Achieve the Goal of the Development Scenario of the Office Electronic Equipment Industry



II-I-2. Cathode Ray Tubes (CRT)

(1) Supply and Demand of CRTs in Malaysia

The annual production volume of colour T.V.sets in Malaysia was around 1.2 million in 1987. Since the domestic demand was estimated at around 0.2 million in the same year, most of the production was for export. Due to the rapid increase of investments in Malaysia by T.V.set assemblers since 1988, it is estimated by MIDA that the annual production volume would reach approximately 6.0 million in 1990.

Because there is no production of CRTs in Malaysia, all of the CRTs used for T.V.set assembly are presently imported. The flow of CRT imports in the past 4 years is shown in the following table. Because CRTs are demanded in Malaysia as a part of assembly kits which are all directed to exports, the annual import volume of CRTs is usually higher than the domestic production volume of T.V.sets.

Table II. 1-6 Flow of CRT Imports in Malaysia 1984 - 87

		1984	1985	1986	1987
Volume	(Thousand Pcs)	576.5	665.0	1,285.6	1,441.4
Value	(M$ Million)	52.0	62.0	105.3	164.3
Major Countries/Regions of Origin					
Singapore		303.5	398.5	1,051.3	1,105.0
Japan		260.9	257.1	181.7	164.7
Taiwan		6.9	1.8	45.4	120.3
Korea		1.7	1.4	5.0	39.1

Source : Malaysia Annual Statistics of External Trade

Major exporting countries of CRTs to Malaysia are Singapore, Japan, Taiwan and Korea. Because of both the rapid expansion of the production of T.V.sets in Malaysia and the very tight supply and demand situation in the international market, it is reported that the stable procurement of CRTs has become difficult at present in Malaysia.

(2) Possibility of Domestic Procurement of Parts and Components for CRT Production

The parts for CRTs presently available in Malaysia are only the deflection yokes, and the local procurement ratio of parts would be around 10% in the beginning stage of starting operation. At a relatively early stage of operation, the local procurement rate of parts and components would rise to 20%. In the future, the local procurement rate could be raised to 80%, supposing that the local production of such key components as panels or funnels would be started.

The results of the examination of the possibility of local procurement of major parts and components for CRT production are as follows;

1) Panels and Funnels:

The glass products of panels and funnels occupy a very large portion of over 45% of the total material cost of colour CRTs. At present, the local procurement of panels and funnels is not possible, and they would have to be imported from Japan or Korea. In Singapore, Asahi TV-glass is supplying panels and funnels to Hitachi Electronic Devices (S), but their operation was limited to finishing works up to 1988. At the end of 1988, Asahi Glass started the production of panels from raw materials in Singapore, and is reported to be planning to start production of both panels and funnels in Thailand in 1991.

2) Gun Parts:

Gun parts consist of various kinds of metal working products, for the production of which highly elaborate moulds are needed. Both from the present skill level of mould production in Malaysia and the lack of merits of scale, the local procurement of these parts would be difficult at the early stage of operation.

3) Deflection Yoke:

The deflection yoke occupies around 10% of the total material costs, and is the only one major item locally procured. At present, there are two manufacturers which could supply deflection yokes in Malaysia.

4) Frame:

The frame is a metal punched product. The production of moulds would become the key factor for local procurement.

5) Shadow Mask:

The shadow mask is an etching processed metal sheet. Both from the present skill level and lack of merits of scale, the imports of shadow masks from such countries as Japan, the U.S., Korea or W.Germany would be needed for the time being.

6) Clip-springs:

For the production of clip-springs the import of special stainless steel would be needed. With this imported material the local processing of clip-springs would be possible.

7) Phosphor (green, blue and red):

Phosphor is the major chemical material used for mask screening. They would have to be imported from Japan, the U.S. or Korea. From Korea, only red phosphor could be obtained.

8) Inner Shields:

The local processing of inner shields is expected to become possible in the near future. The sheet metal would have to be imported.

9) Colour Purity Magnets:

Colour purity magnets would have to be imported from Japan. There is presently no other country that can supply the products.

10) Getters/Supports:

The local processing of getters and getter supports is rather difficult at the early stage of operation mainly due to the lack of merits of scale.

11) Wedges:

Wedges are plastic moulding products. With the capability of production of plastic moulds, the local production of wedges would be possible.

12) Flit Glass:

Flit glass would have to be imported either from Japan or Korea.

(3) Possibility of Local Procurement of Auxiliary Facilities

In order to initiate the local production of colour-CRTs, a relatively large scale of auxiliary facilities such as waster water treatment systems, pure water supply systems, special gas supply systems or clean rooms would be necessary. In case the local sub-contractors would not have sufficient technical capability to construct and maintain these facilities, the burden on CRT manufacturers would become very heavy.

With accumulated know-how and experience in such other industries as semiconductors, chemicals, food or timber processing, local contractors in Malaysia are judged to have enough capability to design, assemble, install and maintain these facilities themselves except for a small number of specific items.

(4) Present Status of Overseas Market

1) World Major Market Conditions

Figure II.1-3 shows colour television set production and the expected rate of CRT self-sufficiency in the main countries and regions of the world. The large CRT markets of

more than 10 million units per annual are the U.S., Japan, Korea, China and the total Europe.

In the case of CRT production in Malaysia, domestic demand is expected to exceed about 3 million units in 1989 and a further 6 million units after 1990. Thus, Malaysia has the market size to enable some plants to be operated in order to fill domestic demand alone, assuming they can produce products competitive both in price and quality with those from Singapore and Korea.

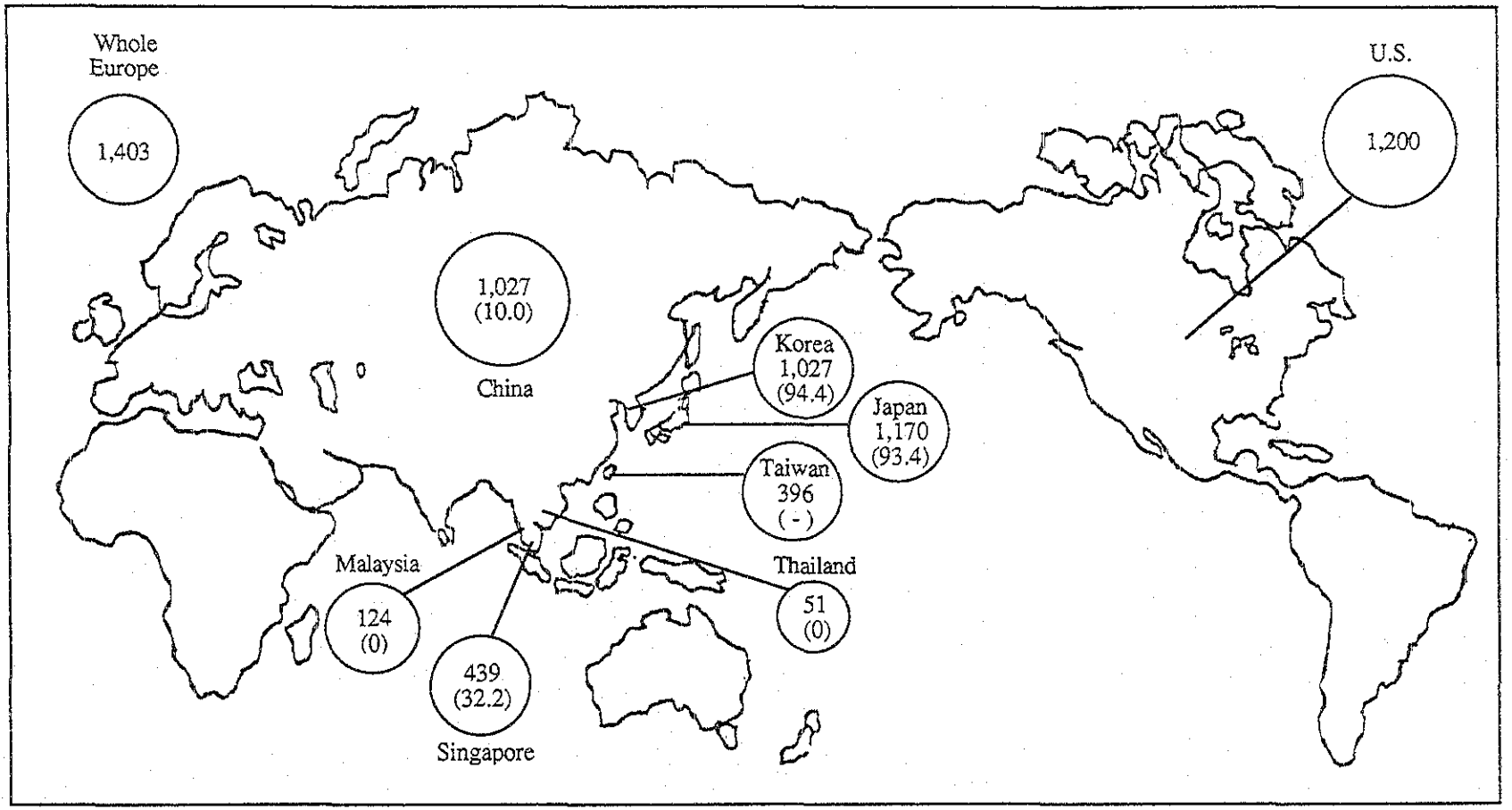
If exort of Malaysian products is considered, the following factors have to be taken into consideration in order to identify the possible export markets for the 14-inch to 20-inch CRTs.

(a) In both the U.S. and Europe, they have the supply capacity to meet 98.9% and 89.8% of the domestic/regional CRT demand on value base respectively.
(b) In both regions, small and medium size TV sets are mostly imported, and there is little use of the above mentioned size of CRTs for domestic assembly.
(c) The import environment in both regions is becoming more unfavourable because of the rise of protectionism. In Europe, local content regulation is becoming increasingly severe in view of the integration of the EC in 1992. It is predicted that replacement of imports will be promoted for CRTs which are key components in TV sets.
(d) In the Japanese market, there is a tendency toward cutting back production of the above mentioned size CRTs and low-end colour TV sets. The demand for Malaysian products is therefore thought to be not very high.

Thus, in future, Asia excluding Japan would become the export market for Malaysian products. Among them Korea, Taiwan and Thailand are considered to be able to meet virtually all demand with domestically-manufactured products. For CRTs made in Malaysia, Singapore and China would be leftt as the possible markets for Malaysian CRTs, taking into consideration the mutual complementarity by type of products.

Fig. II. 1-3 Volume of Color/TV Production in Main Countries and Regions (Year of 1987)

Unit: 10,000



*Figures in ( ) Indicate Ratio of Domestic Self-Supply (Unit: %)
*As for Singapore and China, 1988 Figures are Used
Sources) Statistics of Various Countries and Yearbook of World Electronics

2) Trends in Major Supply Countries

Production of CRTs in leading countries was covered in Section V-3-1, where world supply and demand trends were reviewed. This section will focus on trends in the major producing countries competing in the market for small -to- medium-sized (14- to 21-inch) CRTs which it is assumed to be produced in Malaysia.

However, given factors such as the size of CRTs to be produced, geographical conditions, and trade friction, it is likely that buyers of Malaysian products would be mainly Asian countries, which are simultaneously competitors with Malaysia. At present, the main CRT suppliers to the same area are Japan, Singapore and Korea. Recently, the supply of CRTs are becoming short, because colour TV production in the area is expanding radically. However, it is clear from the number of factories currently in operation and those whose establishment has been announced that Asian CRT production will increase rapidly by 1992. This is indicated in Table II.1-7, based on the information published in April 1989 on the future of CRT production in main supplying countries. Production capacity of the main countries, excluding Japan, will expand rapidly to about 2.6 times the 1987 level in 1992. Most of the newly established CRT plants in Asia are operated by Japanese firms which plays a role in replacing the supply from Japan. As a result, Japanese exports to the area would be reduced.

Table II.1-7 Expansion Plans of CRT Production in Asia

(Unit: 1,000 Sets/Year)

	Production Volume in 1987	Future Production Capacity	Year of Full-Scale Production	Expected Export Volume
Singapore	4,100	5,400	1990	3,500-4,000
Thailand	0	3,000	1992	1,600
Korea	11,890	26,400	-	5,310
China	1,000	8,000-9,000	1992	1,600-1,800
Sub Total	16,990	42,800-43,800	-	12,710
Japan	21,040	21,040	-	-
Total	38,030	64,840	-	-

* As for Korea, estimated figures in 1988 were used both for future production capacity and expected quantity. As for Japan, the actual figures in 1988 were directly used.

(5) Analysis of the Possibility to Start Domestic Production

The examination of the possibility of starting domestic production of CRTs has to be conducted from the viewpoint of the international competitiveness of the products which would be produced in Malaysia in terms of both price and quality. In line with the above, the financial feasibility analysis of a model factory has been conducted, assuming

that a colour-CRT manufacturing plant would be established in Malaysia. The outline of the assumed model plant is as follows:

Table II. 1-8 Outline of the Model C-CRT Factory

Total Land Area		:	60,000m^2
Total Building Area;	Production Area	:	25,300m^2
	Office & Auxiliary Area	:	5,000m^2
Total Initial Investment Costs		:	M$ 445 Million
Number of Employee		:	811
Production Item		:	Colour-CRT
Production Capacity		:	1.4 Million Pcs/Year

Based on various assumptions, the financial viability of the above model plant has been analysed. The results of the long-term profit and loss and cash-flow projection are as shown in the following table.

Table II. 1-9 Projection of Long-Term Profit and Loss Flow

(Unit : M$ Million)

	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year
Sales	20.9	83.7	154.6	202.3	226.7	232.5	232.5
Production Costs	38.0	96.9	145.9	177.2	191.7	193.6	191.8
(Materials)	(14.4)	(56.2)	(101.6)	(130.4)	(143.7)	(145.3)	(143.5)
(Depreciation)	(15.6)	(24.7)	(24.7)	(24.7)	(24.7)	(24.7)	(24.7)
(Others)	(8.0)	(16.0)	(19.6)	(22.1)	(23.3)	(23.6)	(23.6)
Sales & Administration Cost	1.7	4.5	7.6	9.6	10.8	11.0	11.0
Operating Profit	-18.8	-17.6	1.1	15.4	24.2	27.9	29.7
Interest Payment	15.9	17.7	18.5	18.2	16.8	14.6	11.8
Net Profit before Tax	-34.6	-35.3	-17.4	-2.7	7.4	13.3	17.8

It is projected that the payback period of investment would be rather long. This is partly because of the heavy depreciation burden of a large amount of initial investments and partly because of a low level of sales profit induced from the low local procurement rate of parts and components. It is projected that the operating profit would change from a minus to a plus figure in the 3rd year after starting operation. Due to the heavy interest burden associated with the large amount of outside borrowing, however, the net profit could be changed into plus figures only after the 5th year of operation.

(6) Future Direction

A scenario for the development of the CRT industry in Malaysia is shown in Fig.II.1-4. The final goal of the scenario is the achievement of export promotion of Malaysia. One of the key factors to achieve the goal of the scenario would be the successful invitation of the investment of overseas CRT manufacturers in Malaysia.

The measures which would be considered to be effective in order to achieve the objective of the scenario are summarised and shown in Fig.II.1-5. The measures are largely divided into (1) those for the strengthening of investment promotion activities, (2) those for the elimination of bottleneck areas of production and (3) those for the improvement of financial viability.

1) Strengthening of Investment Invitation Activities:

For the start of domestic production of colour CRTs which requires very sophisticated manufacturing know-how, the invitation of overseas CRT manufacturers having such know-how is essential.

- Request for the start of CRT production to companies having both the production know-how of CRTs and existing colour TV set assembly plant in Malaysia
- Intensive approach for other overseas CRT manufacturers

2) Elimination of Bottleneck Areas before Starting Production:

For the successful invitation of CRT manufacturers in Malaysia, the bottleneck areas which would have a bad affect on the production should be eliminated in advance.

- Expansion of educational and training facilities in order to make the supply of necessary engineers and skilled workers sufficient
- Improvement of such infrastructure as waste water discharge systems or industrial sludge disposal systems

3) Improvement of Financial Viability:

Basically, the profitability of the investments has to be improved through the investors' own efforts. However, the following could be considered as indirect supporting measures:

- Support for quality control activities which would lead to higher unit sales prices
- Support for productivity improvement which would lead to upgrade the operating ratio in the initial stage of starting production
- The development of local parts suppliers or the invitation of investments of parts manufacturers, which could lead to lower material cost for CRT manufacturers
- Support for the training costs of employees
- Financial support in order to lower interest payment burden

Fig. II. 1-4 Scenario for Development of CRT Industry in Malaysia

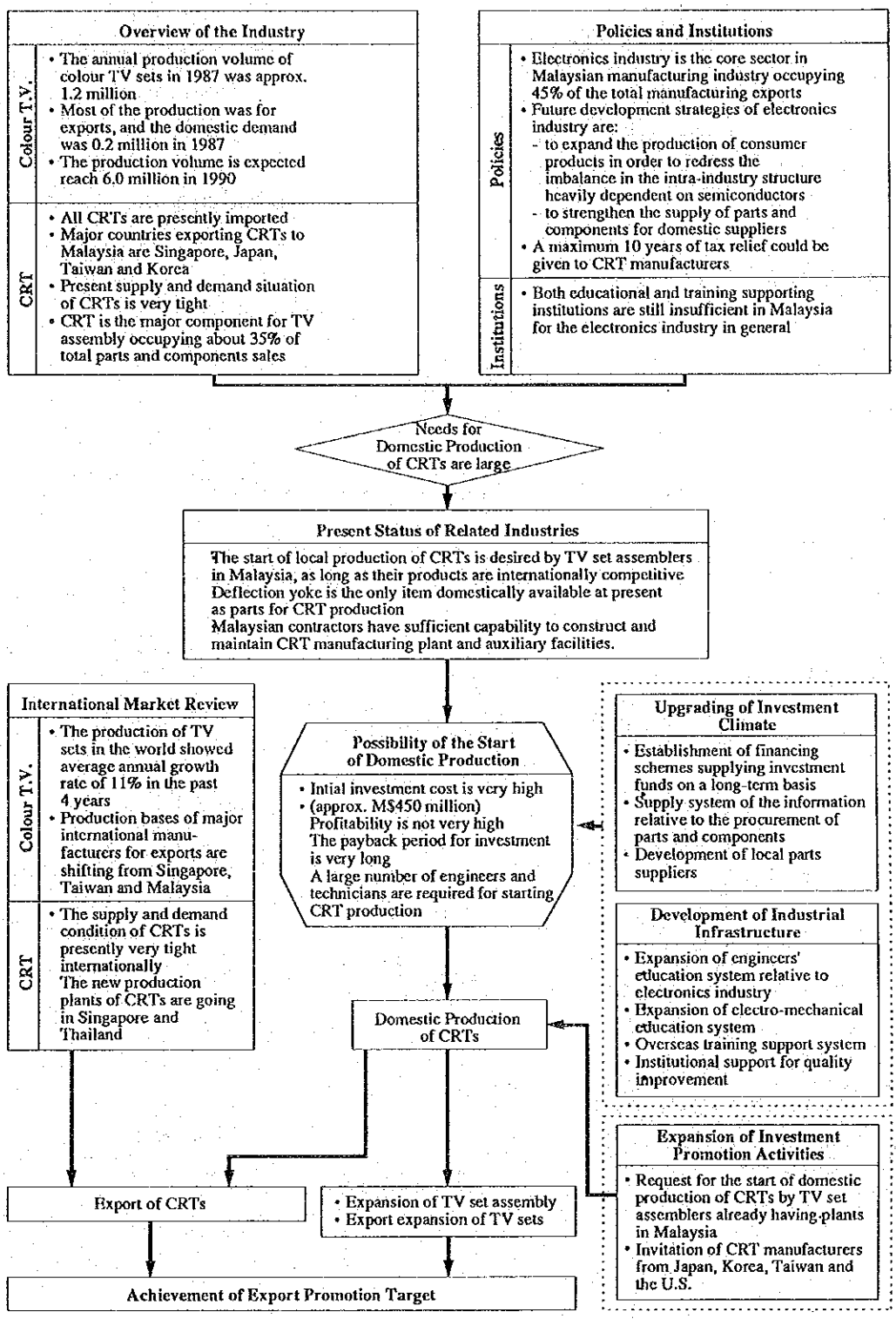
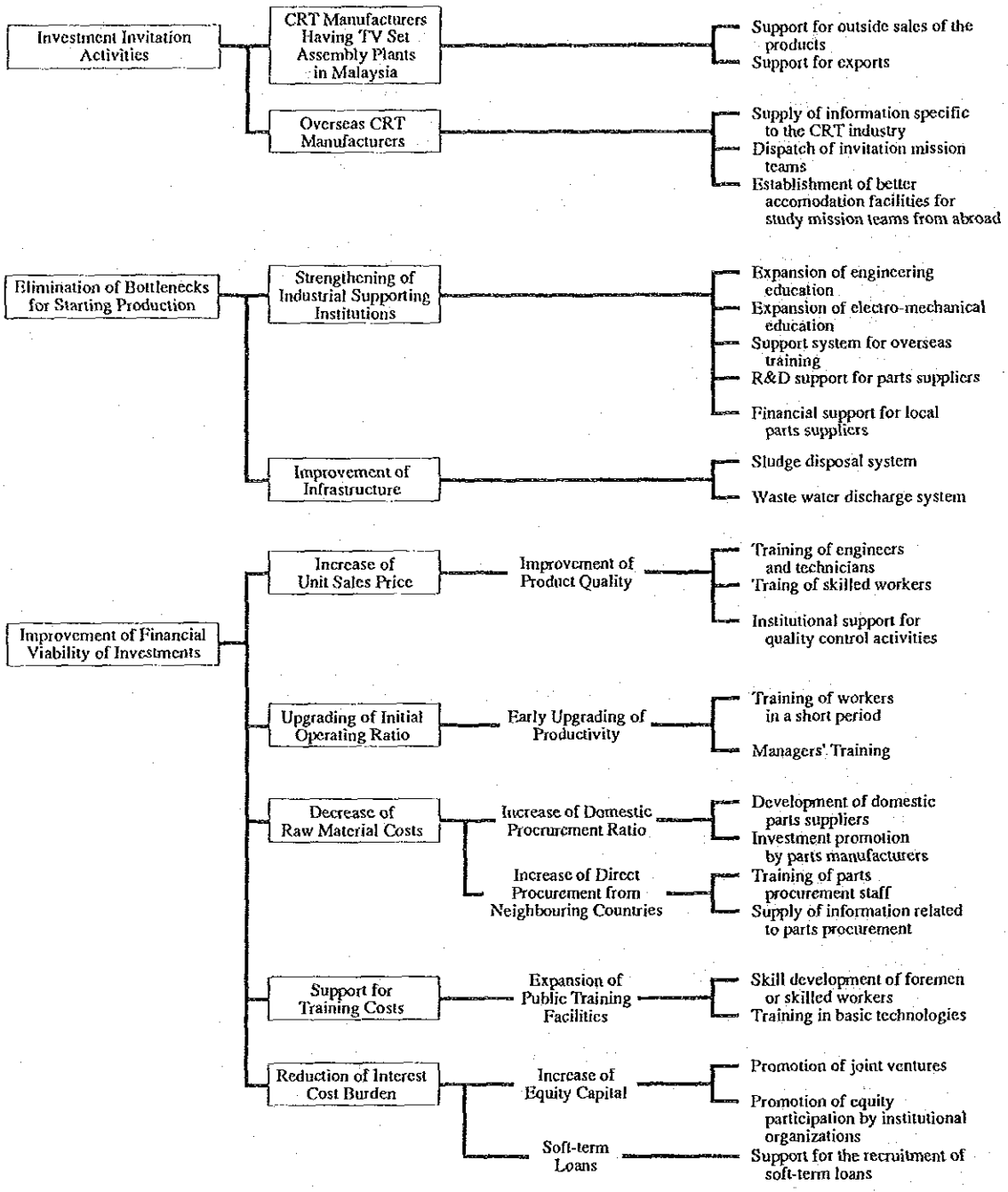


Fig. II. 1-5 Measures to Achieve the Goal of the Development Scenario of the CRT Industry



II-1-3. Ceramic IC Packages/Substrates

(1) Domestic Demand and Requirement of Domestic Production of Ceramic IC Packages/Substrates in Malaysia

As of 1987, there are 12 companies who use ceramic IC packages and only one company which uses substrates in Malaysia. The size of Malaysian domestic demand for ceramic IC packages is assumed to be 142.8 million pieces (M$193.56 million). The production volume of ICs in 1987 is 3,911 million pieces and 3.7% of the domestically produced ICs are for usage in ceramic packages (Cerdip type: 108.0 million pieces and laminate type: 34.8 million pieces). As to substrates, domestic demand is assumed to be 0.375 million pieces (M$0.36 million).

The value of demand for ceramic IC packages and substrates occupies about 5% of the export value of ICs in Malaysia.

Table II. 1-10 Domestic Demand of Ceramic IC Packages/ Substrates (1987)

	Quantity (Million Pcs)	Value (M$ Million)
Ceramic IC Package	142.8	193.2
Cerdip Type	(108.0)	(54.0)
Laminate Type	(34.8)	(139.2)
Substrate	0.375	0.36
Total	-	193.56

Source: Field Survey

At present, ceramic IC packages/substrates are not domestically produced and all of them are imported. They are imported from Japan, Singapore and the U.S., however, most of them are from Japan. Among the users, the requirement for their domestic production is very strong. Quick delivery, cheaper prices, quicker trouble solving and better service are the reasons for their desire for local procurement.

From the point of view of Malaysian industrial policies, the electronics industry is said to be a central sector of Malaysian industries. Viewed from the direction of the Malaysian electronics industry, in IMP there is a clear policy that shows the need for reduction of dependence on imported materials and parts through such means as raising the level of the IC industry, and fostering domestic supply sources. Therefore, the localisation of the production of ceramic IC packages/substrates matches the government policy direction.

Further, ceramic IC packages/substrates are given the first priority among the strategic products selected in IMP, and their importance is pointed out so as to have the classification of pioneer status to be applied for 10 years at the longest.

(2) Present Status of Peripheral Industries Related to the Domestic Production of Ceramic IC Packages/Substrates

In order to manufacture ceramic packages and substrates, many production processes are required. For the manufacturing of punching dies and/or powder press moulds and the process of glass printing, Japanese ceramic package manufacturers utilise sub-contractors in many cases. If such sub-contractors are not available, they would have no choice but in-house manufacturing, in which case, there would be the problem of a big investment burden. Therefore, the survey in Malaysia was conducted from the view point of the availability of domestic moulds and dies and procurement, and the possibility of screen masks for glass printing. The result of the survey is as follows.

1) Moulds and Dies:

As to moulds and dies, the survey conducted this time revealed that there exist some manufacturers who are capable of manufacturing moulds and dies with precision to meet the requirements of ceramic package production judging from the view points of i) Designing, ii) Machinery and equipment and iii) Drawing and working standards.

However, there remain specific problems to be solved as follows.

i) They have no actual experience in manufacturing powder press moulds

ii) They have no experience in manufacturing extremely small punching pins.

It is desirous to improve the technical level of the mould and die industry along with the production development of ceramic IC packages/substrates.

2) Screen Masks:

At present, there is no user for screen masks in Malaysia and the domestic procurement is revealed to be impossible. A similar product called "silk screen masks" is found to be inadequate from such view-points as precision, etc.

Measures to solve the specific problems are as follows.

i) To procure from Singapore

ii) Manufacturers of ceramic IC packages themselves would produce in-house.

iii) The original film manufacturers and/or the silk screen printing companies in Malaysia are to introduce the required equipment to Malaysia and to technically tie-up with foreign manufacturers.

iv) Film manufacturers and/or screen mask manufacturers of the U.S.A. and/or Japan should be invited in Malaysia.

Procurement from Singapore would be assumed as the quickest solution for the start of production.

(3) Overseas Market

World wide demand for ceramic IC packages/substrates is not clear because of the lack of trade statistics. The size of the world market based on the assumption that Japan supplies 90% of worldwide demand is shown as follows.

Table II. 1-11 Size of World Market of Ceramic IC Packages/ Substrates (Estimate)

(Unit: Million Pcs)

		1986	1987	1988(Jan.-July)
Ceramic IC Package		1,904.0	2,455.1	1,297.3
(Annual Growth, %)	*	(-)	(28.9)	(18.7)
Cerdip Type		1,713.4	2,244.0	1,138.5
(Annual Growth, %)	*	(-)	(31.0)	(15.9)
Laminate Type		190.6	211.1	158.8
(Annual Growth, %)	*	(-)	(10.8)	(43.1)
Substrate		2,749.5	3,330.5	582.6
(Annual Growth, %)	*	(-)	(21.1)	(-68.1)

* *Lower figures are annual percentage changes.*
(As to 1988: Compared to the same period of the previous year)
Source: Estimate Based on Fine Ceramc Statistics

It has been said that the rate of share between ceramic IC packages and plastic IC packages is 1:9. Further, the rate of share of ceramic IC packages is decreasing recently due to plastic alternatives, because their quality has been increasingly improved. In spite of the above, owing to the expansion of the IC industry itself, the market for ceramic IC packages is also expanding.

Though there is a slight yearly variation according to product variety of ceramic IC packages, the rate of share between cerdip type and laminate type is said to be 9:1. Future

trend shows that the rate of share of laminate type will increase because of high densification and miniaturisation of IC chips.

As it is impossible to grasp clearly the size of the market for ceramic IC packages by country, the market size for each country is assumed based on the size of IC production share as follows.

1. The U.S. : 38.4%
2. Japan : 33.5%
3. Malaysia : 5.2%
4. Korea : 5.1%

Except for the U.S. and Japan which are extraordinary markets, South East Asia can be said to be a large market (18.1%).

As already stated, Japan is said to occupy 90% of the world supply of ceramic IC packages. Meanwhile, the market size of Japanese demand for ceramic IC packages and substrates is 26.6% and 62.5%, respectively. About 90% of Japanese domestic production of ceramic IC packages/substrates is occupied by three major manufacturers: Kyocera, NTK and Narumi. Other countries such as the U.S. and West Germany also produce the products but the production is mainly for domestic use and the size is limited.

In the South East Asian region, only two countries, Singapore and Korea, produce ceramic IC packages/substrates. In Singapore, a U.S. company produces the products for the South East Asian market, including Singapore, Malaysia, etc. As to Korea, two companies have just begun production through technology introduction from the U.S. and export would start only after the 1990s.

(4) Feasibility Analysis of Investment

In order to evaluate the feasibility of investment of the ceramic IC package/substrate industry in Malaysia, a quite rough analysis of investment feasibility was conducted on the assumption that the following three types of plants are to be newly constructed in Malaysia.

A general outline of each plant and the result of the survey are as follows.

1) Ceramic Substrate Plant I:

Product Item	:	Ceramic Blank Substrate
Production Capacity	:	800,000 pcs/month
Employees	:	153
Land	:	15,000 m^2

Building	:	4,825 m^2
Initial Investment	:	M$25.5 million

Blank substrate is a type of substrate which is of relatively small added value but the demand is larger than other types and a relatively low level of manufacturing technology is required for production. The size of the domestic market in Malaysia for ceramic substrates is quite limited. It is not economically feasible to construct a plant if it is destined only to cover the domestic market. Therefore, the plant should be an export oriented factory. Japan is taken up here as the assumed export market because of its nearness to Malaysia.
The result of the feasibility analysis shows that from the 6th year after the start of production the plant would be economically profitable. The economic feasibility of investment is said to be not negative.

2) Ceramic Substrate Plant II:

Product item	:	Ceramic blank substrate & ceramic glazed substrate
Production capacity	:	Blank substrate; 370,000 pcs/Month Glazed substrate; 30,000 pcs/Month
Employees	:	166
Land	:	15,000 m^2
Building	:	4,100 m^2
Initial investment	:	M$36.6 million

This plant is to produce both blank and glazed substrates.
Compared to blank substrate, glazed substrate requires a relatively higher manufacturing technology and is a more value added product, however, the demand for the glazed substrate is smaller than for the blank one. The result of the feasibility analysis shows that the economic feasibility of investment is negative.

3) Ceramic IC Package Plant:

Production item	:	Cerdip type IC package
Production capacity	:	5,700,000 pcs/month
Employees	:	111
Land	:	16,500 m^2

Building	:	5,500 m^2
Initial investment	:	M$39.7 million

The size of the domestic market in Malaysia for ceramic IC packages of cerdip type is about 9 million pieces per month.

The monthly production size of the plant is assumed from the market size and the production capacity of one firing furnace.

The result of the feasibility analysis shows that from the 2nd year after the start of production, the plant would become profitable. The economic feasibility of investment is most positive among the three types of the plants.

As to investment environment, problems in such areas as constant supply of electricity or disposal of industrial waste are required to be solved.

(5) Future Direction

The scenario for the development of ceramic IC packages/substrates is shown in Fig.II.1-6. The object of the scenario is the commencement of production and the start of export of ceramic IC packages/substrates. As to the feasibility of attaining the object, the following two points are of significant importance.

1. The extent of the requirement for domestic production of ceramic IC packages/substrates in Malaysia.
2. The feasibility of domestic production of ceramic IC packages/substrates.

As a result of the study, it is identified that the requirement for domestic production of ceramic IC packages is very strong from the view points of size of domestic demand and industrial development policy.

As to the economic feasibility of investment, the cerdip type of IC package and the blank substrates can expect good results. However, the glazed substrates would not be feasible.

For the actual start of production, it is indispensable to invite the investment of foreign manufacturers who already have know-how and technology for the production. In order to realise investment, investment invitation activities and improvement of the investment environment such as infrastructure and personnel development are necessary. For the development of the ceramic IC package/substrate industry in Malaysia, support for industrial activities including peripheral industries would be significantly desired.

Various measures for realisation of the scenario for the promotion of the ceramic IC package/substrate industry in Malaysia, from the stage of company establishment to

the stage of completion of self-sufficient plant operation, are investigated and the results are summarized and shown in Fig.II.1-7.

Fig. II. 1-6 Scenario for Development of Ceramic IC Package/ Substrate Industry

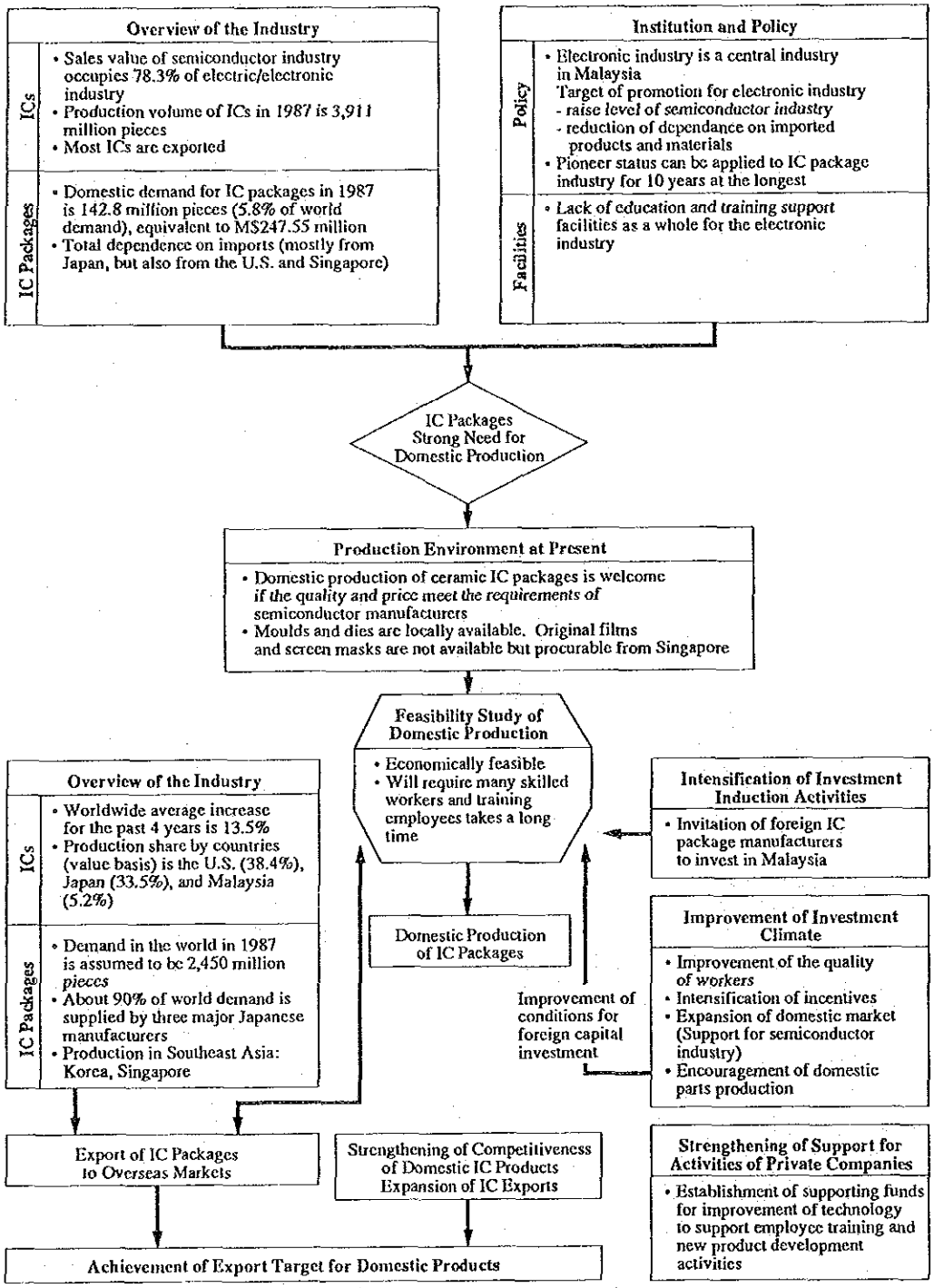


Fig. II. 1-7 Measures to Achieve the Goal of the Development Scenario for Ceramic IC Package/Substrate Industry