No. 59

THE STUDY ON SELECTED INDUSTRIAL PRODUCT DEVELOPMENT IN MALAYSIA

SECOND YEAR FINAL REPORT

(SUMMARY B)

JULY 1989

JAPAN INTERNATIONAL COOPERATION AGENCY

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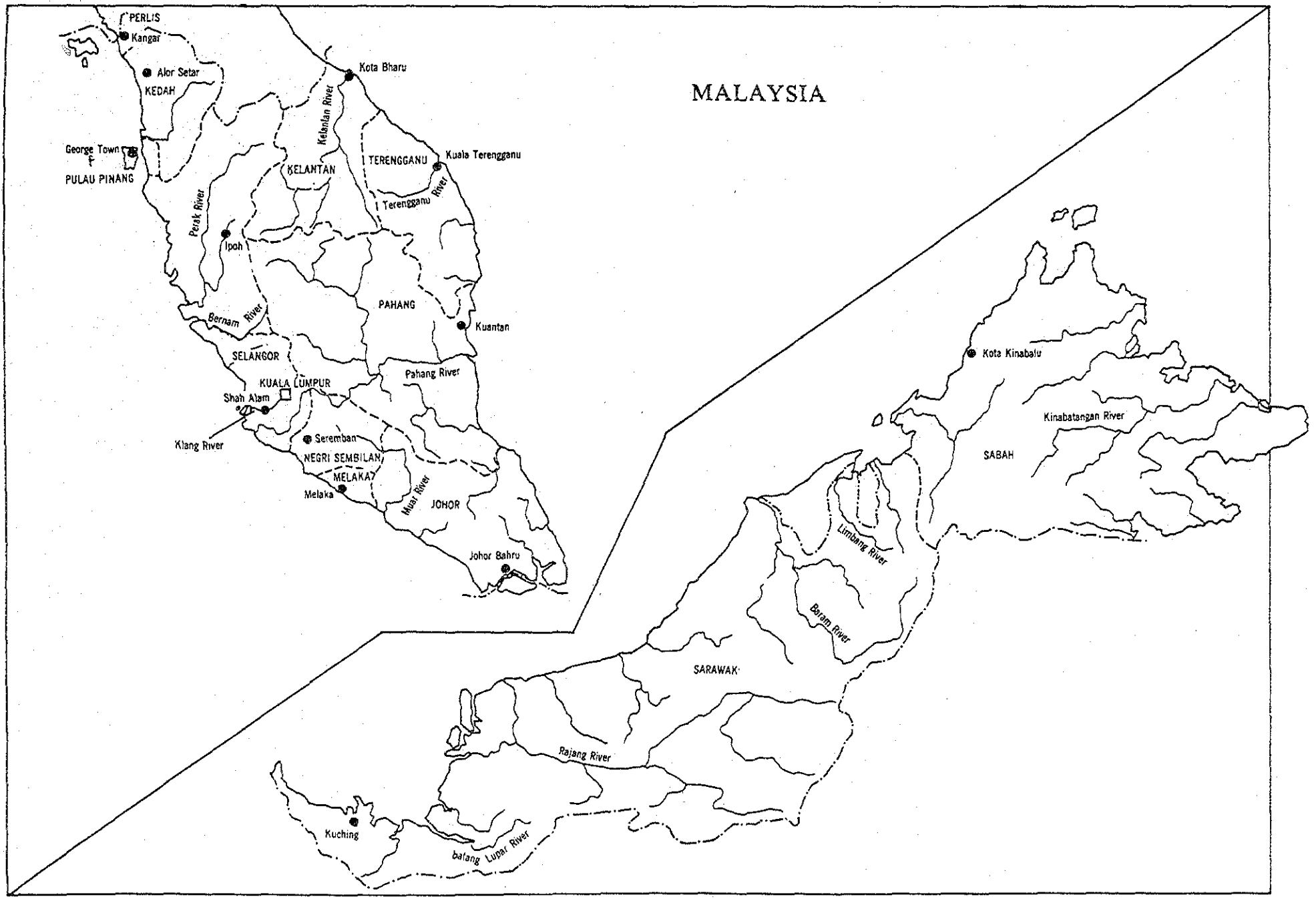

MALAYSIA
PERLIS
Kangar
Alor Setar
KEDAH
George Town
PULAU PINANG
Kota Bharu
Kelantan River
KELANTAN
TERENGGANU
Kuala Terengganu
Terengganu River
Perak River
Ipoh
Bernam River
PAHANG
Kuantan
SELANGOR
KUALA LUMPUR
Shah Alam
Klang River
Pahang River
Seremban
NEGRI SEMBILAN
MELAKA
Melaka
Muar River
JOHOR
Johor Bahru
Kota Kinabalu
Kinabatangan River
SABAH
Limbang River
Baram River
SARAWAK
Rajang River
Kuching
batang Lupar River

CONTENTS

Summary B was compiled from necessary portions of the original report for the reference of those concerned.

I. Office Electronic Equipment Industry

I. Office Electronic Equipment Industry

I-1. Overview of the Industry

I-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 I. 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 I. 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 I. 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 I. 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 I. 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.

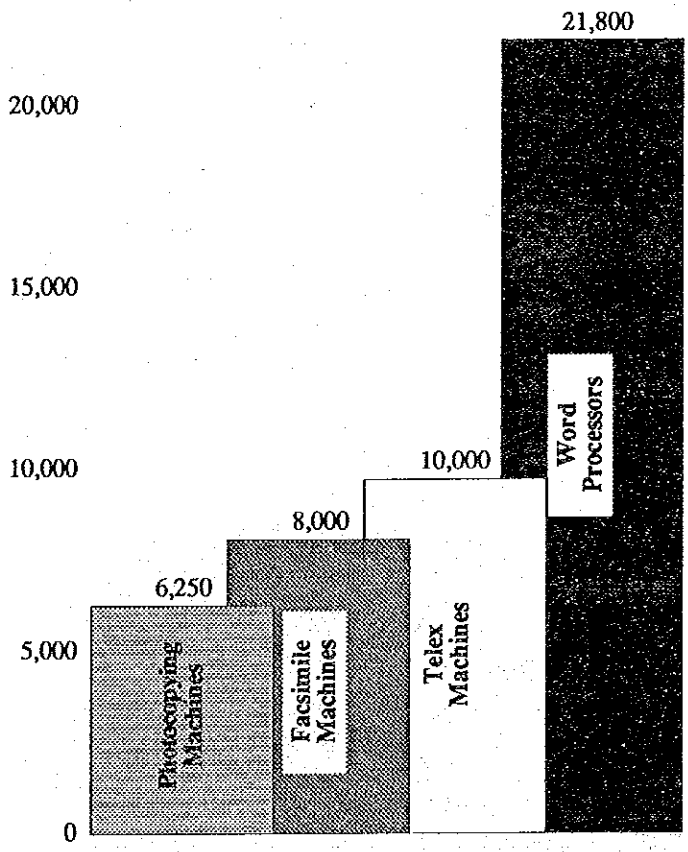
Table I. 1-5 Subscriptions to STM (Telex Machines)

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

Unit: Sets



Source: Field Interview Survey

I-1-2 Sales and Distribution

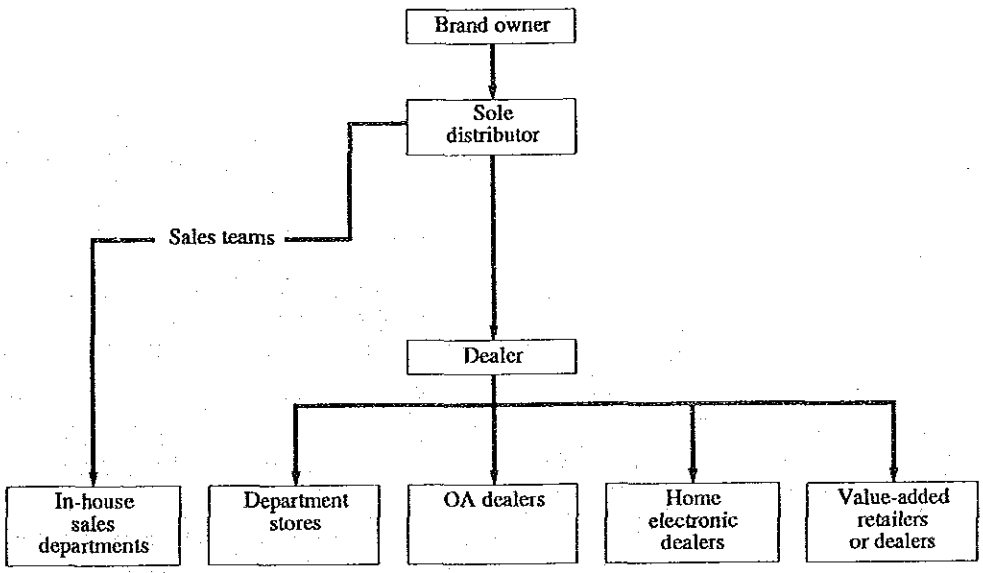
(1) Word Processors

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. I. 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

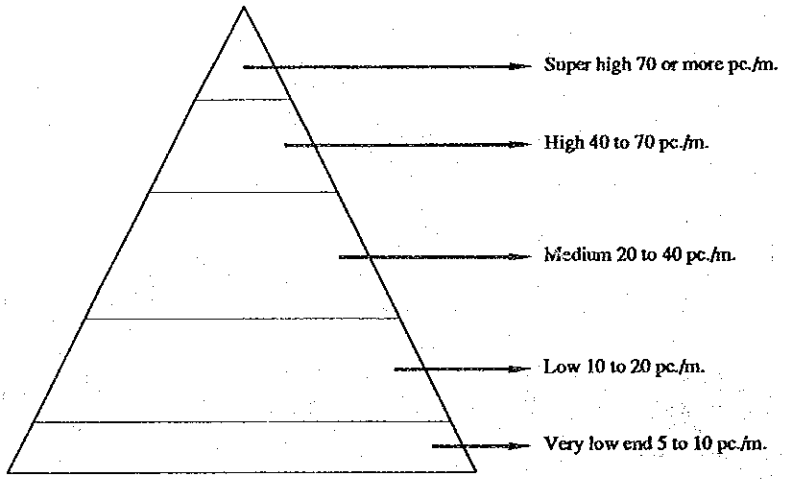
The import duty is 30% and the sales tax 10%.

(2) Photocopying Machines

1) Market Share

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

Fig. I. 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. I. 1-4.

Fig. I. 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

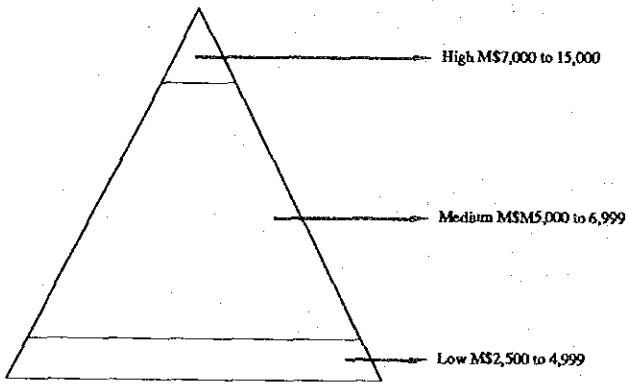
The import tariff is 20% and the sales tax 10% (Imports of colour photocopying machines are banned).

(3) Facsimile Machines

1) Market Share

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

Fig. I. 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%.

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

I-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. I. 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. I. 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. I. 2－1 Process Flow Chart (Photocopying Machines • Facsimiles • Word Processors)

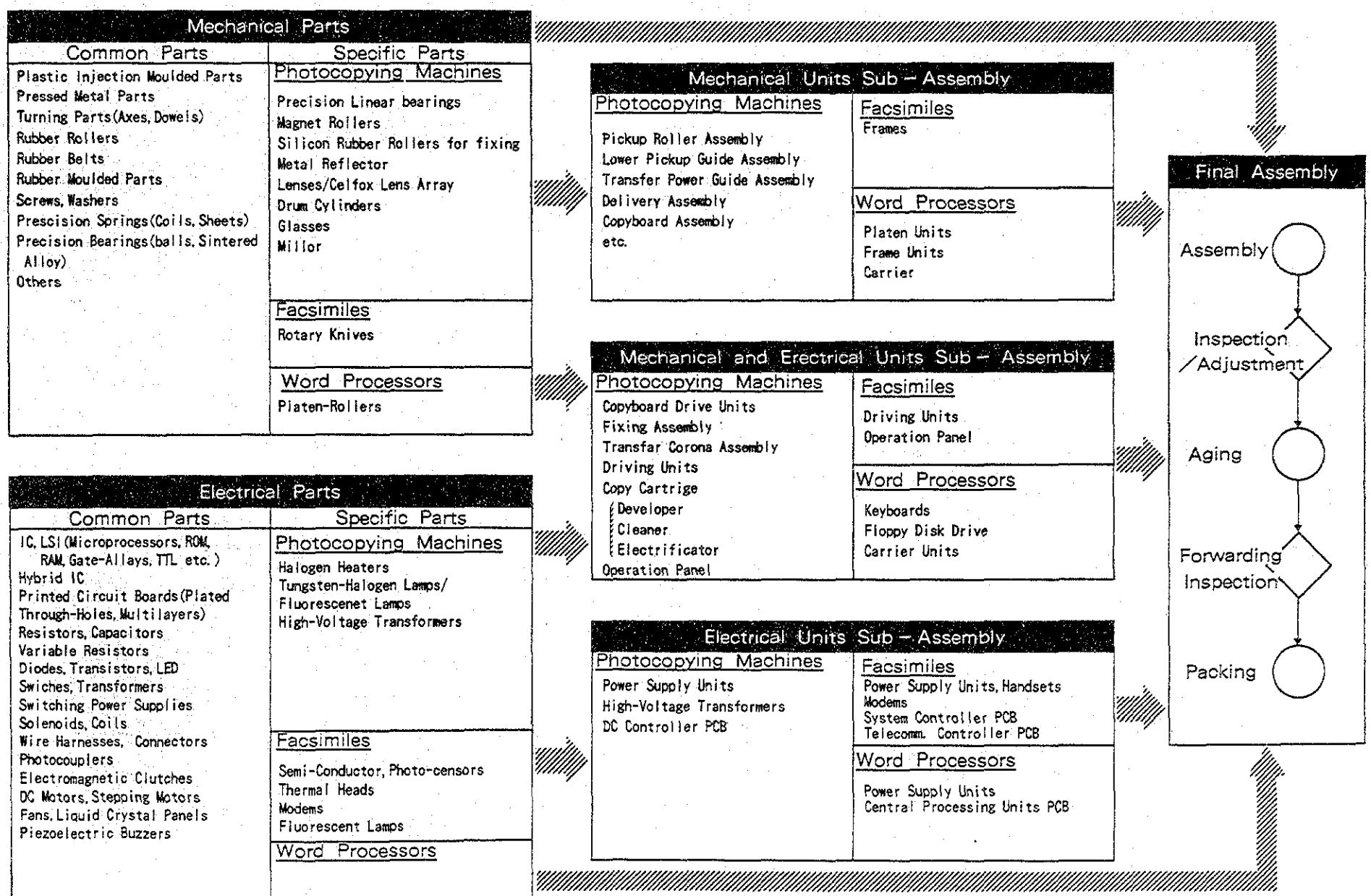


Fig. Ⅰ. 2－2 Major Facilities Used Manufacturing Office Electronic Equipment

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

I-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. I. 2-3 and I. 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:

$$\text{Evaluation points} = \frac{\sum\left(\begin{array}{c}\text{weight of sub-items x} \\ \text{ev. points per sub-item}\end{array}\right)}{\sum\left(\begin{array}{c}\text{weight of sub-items} \\ \text{x 3 point}\end{array}\right)}$$

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. I. 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. I.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. I. 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			

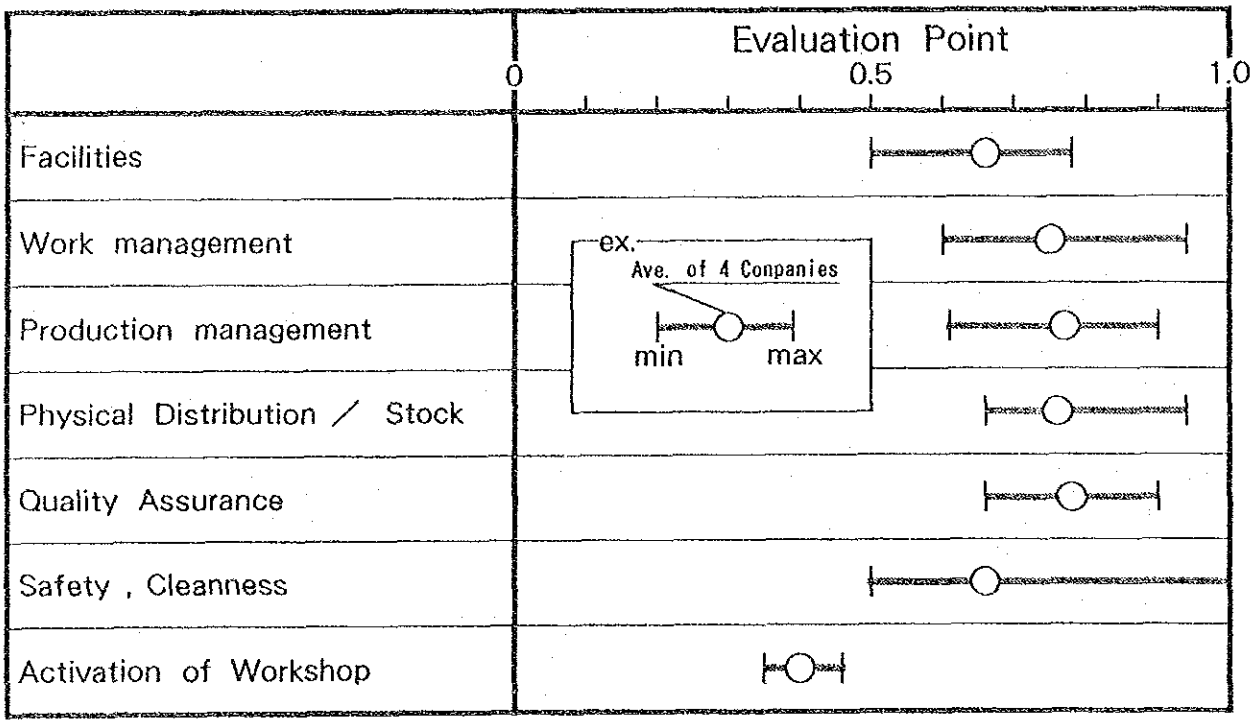
(Note) ( ) indicates results which were not added on the final calculation because of low reliability on data caused by lack of information.

Fig. I. 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		A		A		B		A		B		
	Operation ratio	B	A	0.89	(A)	1.00	B	0.83	A	0.89	B	0.89	A	0.78	0.86
	Maintenance	B	A		(A)		(A)		A		A		B		
Work management	Standard time	B	A		B		(A)		A		B		A		
	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	0.76	B	0.81	B	0.75	A	0.92	B	0.75	B	0.86	0.81
	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		A		A		(B)		A		A		
	Schedule and delivery control	B	A		A		A		B		A		B		
	Order cycle	B	B	0.94	B	0.94	(B)	1.00	B	0.85	(B)	1.00	(B)	0.93	0.94
	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		A		A		B		A		(B)		
	Layout	B	A	0.87	B	0.87	A	0.93	B	0.67	B	0.80	B	0.67	0.80
	Plant location	C	A		A		B		B		B		B		
Quality assurance	Inspection Standards	A	A		A		A		B		A		A		
	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	0.93	A	0.94	A	1.00	A	0.81	B	0.90	B	0.81	0.90
	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, cleanness	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		A		B		B		C		A		
	Suggestion system	B	A	1.00	A	0.89	B	0.67	C	0.67	C	0.44	(B)	1.00	0.78
	Personnel development	B	A		B		(A)		A		B		A		

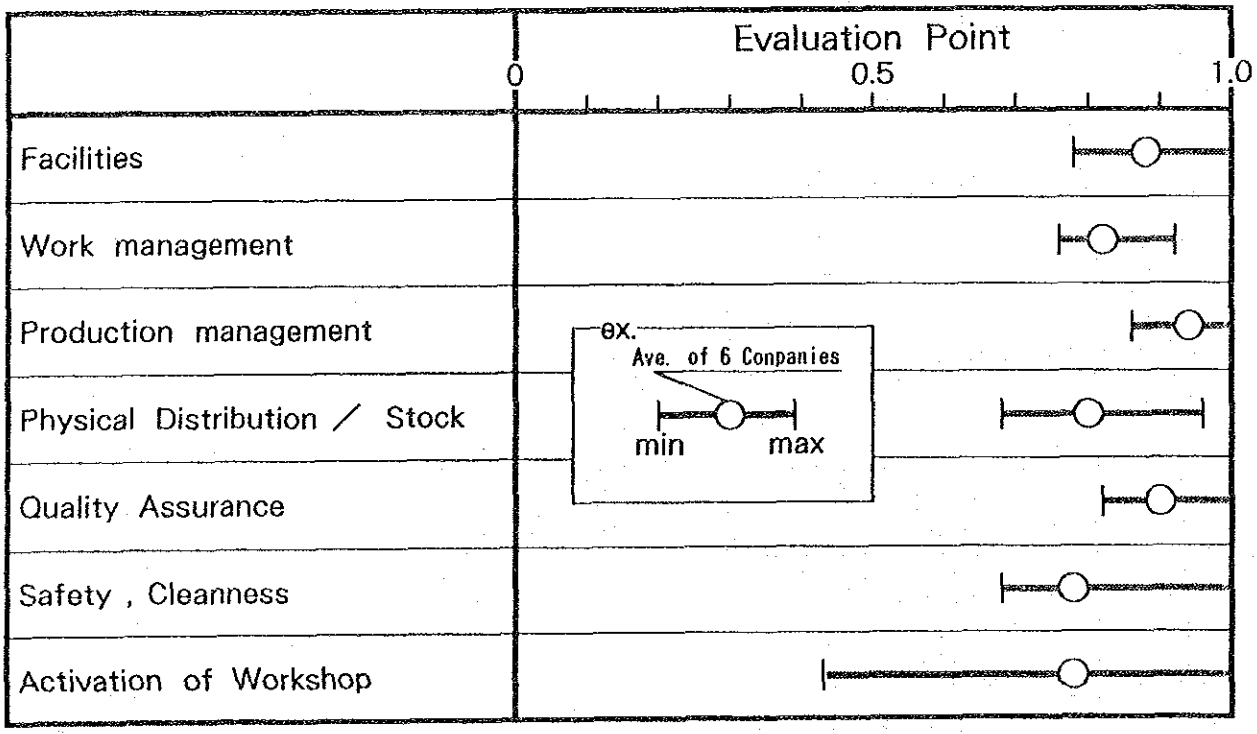
(Note) ( ) indicates results which were not added on the final calculation because of low reliability on data caused by lack of information.

Fig. I. 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. I. 2-5 and I. 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. I. 2-7 and I. 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 I. 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 I. 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.

(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.

I-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. I.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. I.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. I.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. I. 2-9, the following components were selected:

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

The check lists shown in Fig. I. 2-10 through I. 2-12 were used, in addition to the check list shown in Fig. I.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. I. 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. I. 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 toleranceTolerance	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. I. 2 – 11 Factory Survey Checklist : Plastic Injection Moulding

Name of company :

Types of Products
☐Outer appearance and covers
☐Structual parts
☐Transparent parts
☐Gears
☐Others ( )

Types of Materials
☐ABS
☐PC
☐PS
☐PPO
☐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 beside 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. I. 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		Importence 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. I.2-13 and Fig. I.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. I.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

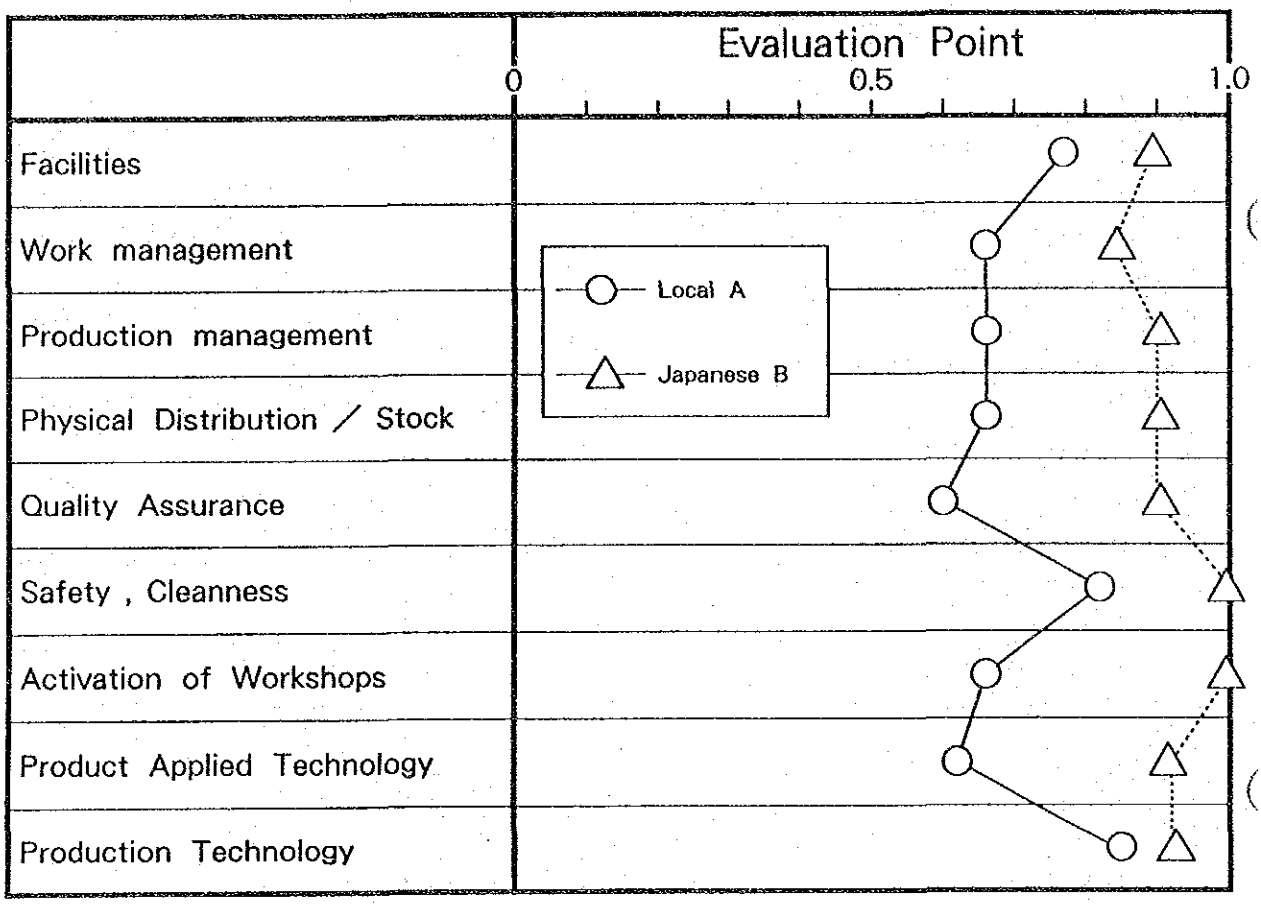
In Japanese affiliated company B the metal pressed parts used for air-conditioners or rotary compressors are produced in-house. The housing parts which hold bearing for the compressors are pressed to a precision in the order of 1/100 mm. With this level of technology the precision requirement from office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

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

Evaluation Items		Importance grade	Local A (Singapore 100K)		Japanese B		Remarks
Facilities	Use of latest equipment	B	B	0.78	B	0.89	
	Operation ratio	B	A		A		
	Maintenance	B	B		A		
Work management	Standard time	B	C	0.67	A	0.83	
	Standard work instructions	B	B		A		
	Efficiency and operation speed	B	A		B		
	Job allocation	B	B		B		
Production management	Production control system	B	C	0.67	A	0.89	
	Schedule and delivery control	B	A		A		
	Order cycle	B	B		B		
Physical distribution / stock	Level of stock	B	B	0.67	B	0.89	
	Layout	B	B		A		
	Plant location	B	B		A		
Quality assurance	Inspection standards	B	B	0.62	A	0.90	
	Defective rate	B	C		A		
	Organization in charge of QA	B	B		A		
	Lot Stratification	B	B		B		
	Controlling measuring instruments	B	B		A		
	Non－defective rate	B	A		A		
	Qualification of industrial standards	B	C		B		
Safety cleannes	5S (Clean－your－workshop activity)	B	A	0.83	A	1.00	
	Safety measures	B	B		A		
Workshop activation	Small group activity	B	(C)	0.67	A	1.00	
	Suggestion system	B	(C)		A		
	Personnel development	B	B		A		
Product applied technology	Hole precision	A	C	0.63	(B)	0.90	
	Dimensional tolerance	A	B		A		
	Bending angle	B	B		B		
	Plane of shear	B	A		A		
Production technology	Automation	B	B	0.85	B	0.93	
	Die manufacturing ability	A	A		A		
	Guide posts	B	A		A		
	Material of die	B	A		(B)		
	Die heat treatment	B	B		(B)		
	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. I. 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. I.2-15 and Fig. I.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 I.2-3 summarises the outline of these firms.

Table I. 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.

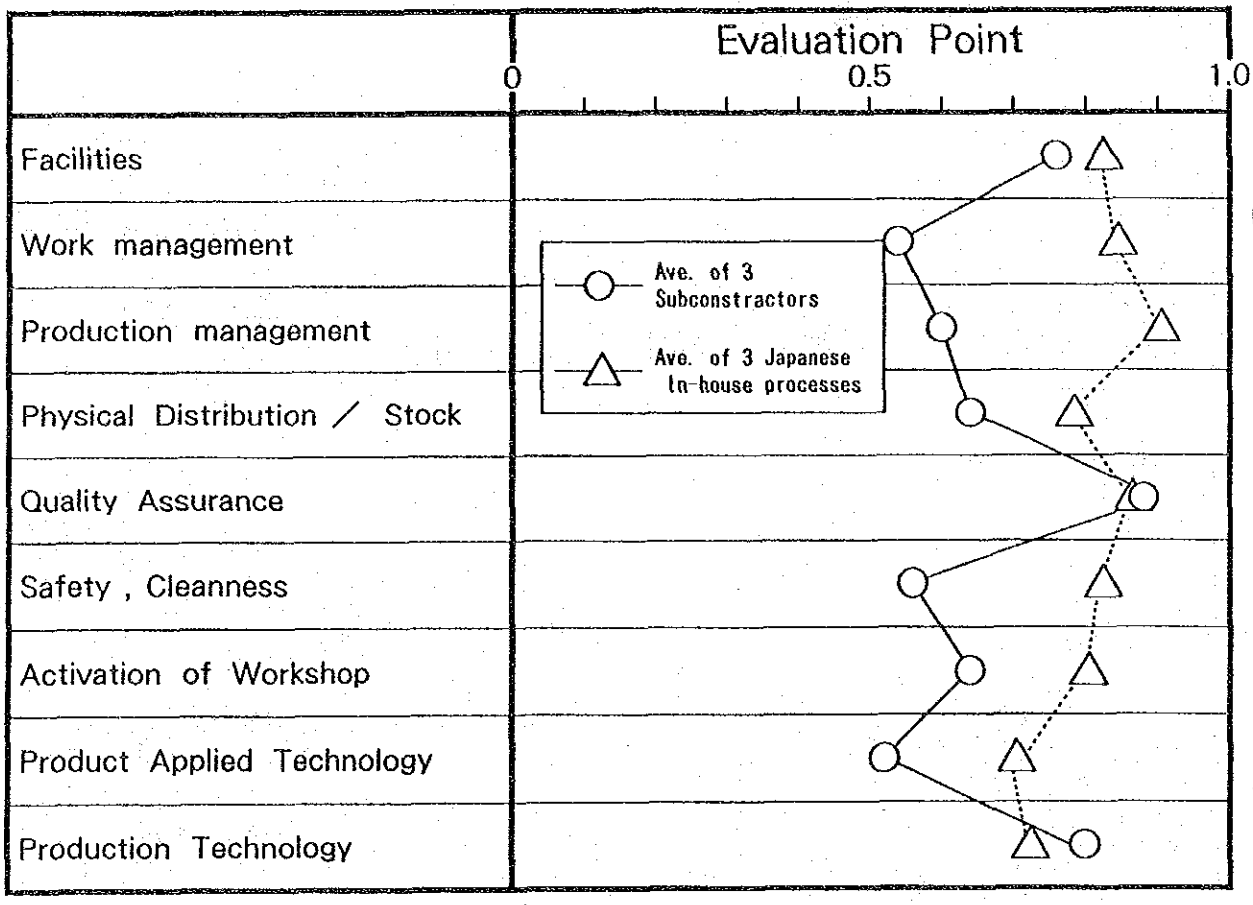
At present, the processing precision would be the problem. A mechanical deck assembly manufacturer visited imports from Japan or Singapore all of the necessary precision parts such as frames, gears, pulleys, and others. All of the three companies presently supply parts sufficient for their current customers' 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 $\pm$0.05mm).

Fig. I. 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. I. 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. I.2-17 and Fig. I.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.

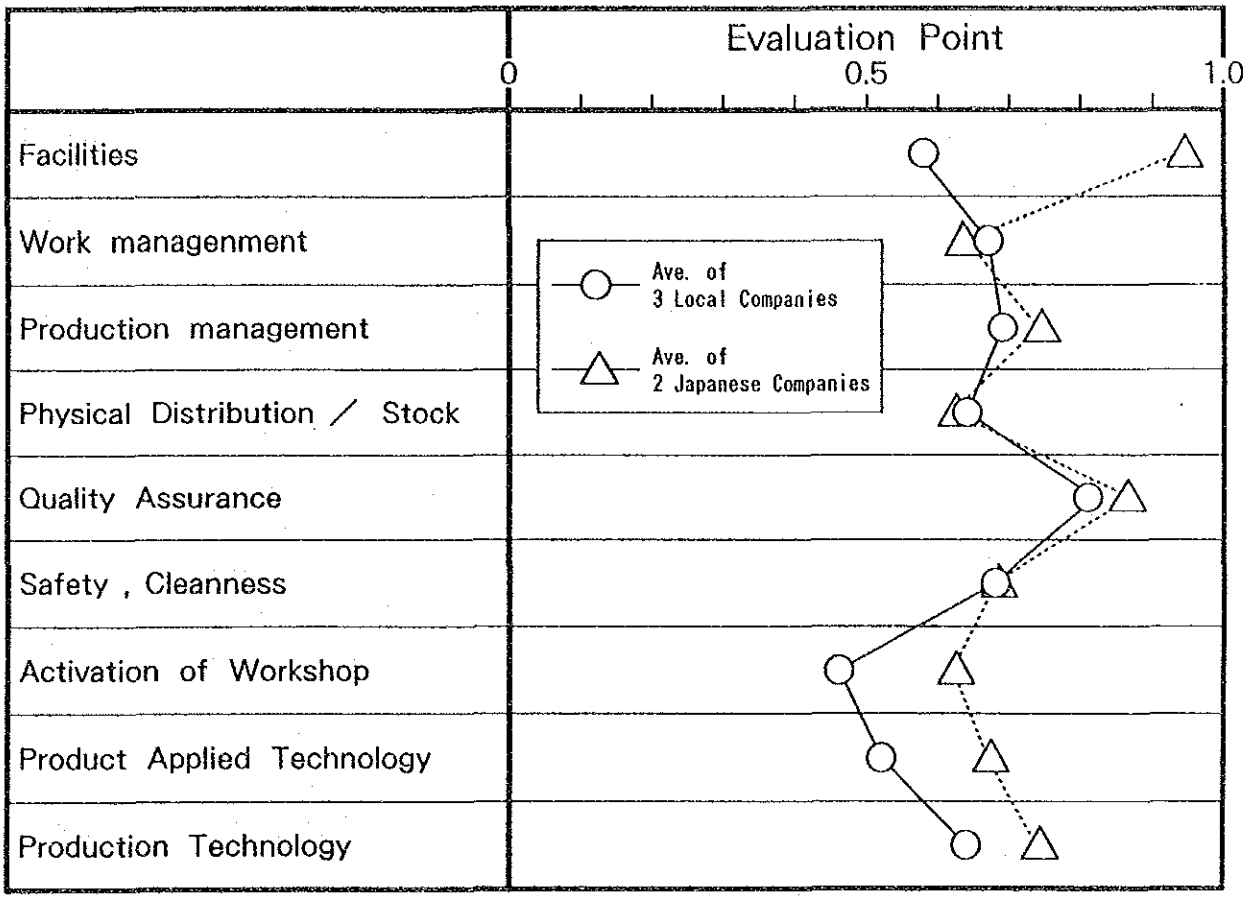
At present only the assembly of analog type circuit boards used for power supply units or high voltage transformers could be undertaken by local sub-contractors.

Fig. I. 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. I. 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. I.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. I.2-19.

Fig. I. 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.

I-3. Feasibility Analysis of Investment

I-3-1. Methodology of Feasibility Analysis

In this section, a quite rough analysis of investment feasibility was conducted on the assumption that office electronic equipment plants are to be newly constructed in Malaysia, and the cost competitiveness of the products manufactured at those plants in the Europe, U.S., and Japan markets was examined.

The feasibility analysis was conducted on the following assumptions.

a) Investment by a Japanese firm
b) Take-over of the production of products for the European and American markets
c) Feasibility analysis of three different factories for three products

Major factors in the assumption were set as follows:

Assumptions for the Feasibility Analysis

Construction period:	1 year
Price:	Fixed price as of 1988
Investment incentives:	Ten year exemption from corporation tax
Exchange rate:	M$1 = ¥46, US$1 = M$2.67

I-3-2. Product Item and Production Capacity

(1) Product Item

For three products, photocopying machines, facsimile machines, and word processors, small-sized and popular product types were selected as subject product items of the analysis. The following product types were selected.

Word processor:	Office-use word processor of letter quality and with CRT
Photocopying machine:	Popular type photocopying machine with copying speed of 6 copies per minute
Facsimile machine:	Popular type facsimile machine of GIII type

The reasons for this selection were as follows:

a) Assembly is technologically easy because they have less value added and are of simple structure.
b) It is easier to raise the local content ratio because these products need fewer special parts and components.
c) Japanese firms tend to select popular-type products for which production costs need to be reduced and for which value added can not be easily increased when they examine production shifts.

(2) Production Capacity

One assembly line was assumed as the minimum production scale for each product. The production capacity of each product was 10 thousand units per month.

I-3-3. Outline of the Plants and Initial Investment Costs

(1) Outline of the Plants

The general outline of the plants assumed in Section I.3-2 is as follows.

1) Word processor factory

Product item:	Office-use word processor of letter quality and with CRT
Production capacity:	10 thousand units per month
Number of employees:	88
Land:	15,300m^2
Building:	3,465m^2
Initial investment:	21.4 million M$

2) Photocopying machine factory

Product item:	Popular-type photocopying machine of 6 copies per minute
Production capacity:	10 thousand units per month
Number of employees:	117
Land:	16,300m^2
Building:	3,665m^2
Initial investment:	74.4 million M$

3) Facsimile machine factory

Product item:	Popular-type facsimile machine of GIII type
Production capacity:	10 thousand units per month
Number of employees:	93
Land:	15,400m^2
Building:	3,515m^2
Initial investment:	21.4 million M$

(2) Initial Investment Cost

1) Assumptions

- Major possible sites are Johor State, the Kuala Lumpur area, and Penang State considering such factors as site availability, easy procurement of parts, and

access to the market. In this study, it was assumed that plants would be constructed at Sha Alam near Kuala Lumpur.

- Manufacturing process would be final assembly, some sub-assembly, inspection, adjustment, packing and shipping.
- All the machinery and equipment would be imported from Japan. It was reported that some belt conveyers are available in Malaysia, but it is assumed that they would also be imported from Japan because it was not clear whether the level of specification satisfies the level required for office electronic equipment production.

2) Word Processor Factory

Initial investment cost for the word processor factory is assumed to be M$ 21.4 million. The breakdown of expenditures is as follows.

Table I. 3-1 Initial Investment Value for Word Processor Factory

(Unit: M$1,000)

Item	Calculation Base	Value
1 Land	M$116.26/$m^2$ x 15,300m^2	1,779
2 Factory Construction		5,857
Factory Building	M$1,120/$m^2$ x 3,465m^2	(3,880)
Incidental Facilities		(1,792)
Guarantee for Outside, Gutter, Water Supply, etc.		(185)
3 Machinery and Equipment		9,815
Assembly Line and Incidental Facilities		(4,239)
Distribution and Warehouse		(3,261)
Others		(2,315)
4 Vehicles and Others		1,170
5 Moulds and Jigs*		2,828
Total		21,449

*Investment for renewal of moulds and jigs would be made every 2 Years.

3) Photocopying Machine Factory

Initial investment cost for the photocopying machine factory is assumed to be M$ 74.4 million. The breakdown of expenditures is as follows.

Table I. 3-2 Initial Investment Value for Photocopying Machine Factory

(Unit: M$1,000)

Item	Calculation Base	Value
1 Land	M$116.26/$m^2$ x 16,300m^2	1,895
2 Factory Construction		6,196
Factory Building	M$1,120/$m^2$ x 3,665m^2	(4,105)
Incidental Facilities		(1,895)
Guarantee for Outside, Gutter, Water Supply, etc.		(196)
3 Machinery and Equipment		40,565
Assembly Line and Incidental Facilities		(5,217)
Distribution and Warehouse		(33,033)
Others		(2,315)
4 Vehicles and Others		1,170
5 Moulds and Jigs*		24,597
Total		74,422

*Investment for renewal of moulds and jigs would be made every 2 years.

4) Facsimile Machine Factory

Initial investment cost for the facsimile machine factory is assumed to be M$ 21.4 million. The breakdown of expenditures is as follows.

Table I. 3-3 Initial Investment Value for Facsimile Machine Factory

(Unit: M$1,000)

Item	Calculation Base	Value
1 Land	M$116.26/$m^2$ x 15,400m^2	1,790
2 Factory Construction		5,942
Factory Building	M$1,120/$m^2$ x 3,515m^2	(3,936)
Incidental Facilities		(1,818)
Guarantee for Outside, Gutter, Water Supply, etc.		(188)
3 Machinery and Equipment		9,815
Assembly Line and Incidental Facilities		(4,239)
Distribution and Warehouse		(3,261)
Others		(2,315)
4 Vehicles and Others		1,170
5 Moulds and Jigs*		2,676
Total		21,393

*Investment for renewal of moulds and jigs would be made every 2 years.

5) Depreciation

The method of depreciation for the above investment is assumed as follows:

Depreciation Method

Item	Method
Building	20 Years Straight Line Depreciation
Incidental Facilities	10 Years Straight Line Depreciation
Machinery and Equipment	10 Years Straight Line Depreciation
Vehicles	5 Years Straight Line Depreciation
Moulds and Jigs	2 Years Straight Line Depreciation

I-3-4.Production and Sales Programmes

Annual production and sales plans and annual turnover of each factory are assumed as follows. For the first year, production volumes are set lower than the capacity considering the start-up nature of the operation.

Table I. 3-4 Production and Sales Programmes

Item	Unit Price	Production Volume in the First Year (Sales in the First Year)	Production Volume since the Second Year (Sales since the Second Year)
1 Word Processor Factory			
Office-Use Word Processor	M$1,426	90,000 Units (M$128,340 Thousand)	120,000 Units (M$171,120 Thousand)
2 Photocopying Machine Factory			
Popular-Type Photocopying Machine	M$1,026	90,000 Units (M$92,340 Thousand)	120,000 Units (M$123,120 Thousand)
3 Facsimile Machine Factory			
Popular-Type Facsimile Machine	M$1,537	90,000 Units (M$138,330 Thousand)	120,000 Units M$184,440 Thousand)

I-3-5. Parts and Materials Costs

Parts and components procurement programmes by source of suppliers (Malaysia; neighbouring Asian countries/areas such as Korea, Taiwan, and Singapore, and Japan) were made up according to the results of the survey on the availability of parts in Malaysia.

Annual cost for purchase of parts and components by source of suppliers of each product is shown in Table I.3-5~7.

Table I. 3-5 Procurement Costs of Parts by Country - Word Processor

(Unit: M$ Per One Word Processor)

	Weight (%)	1st Yr. Malaysia	1st Yr. Other Asia	1st Yr. Japan	After 2nd Yr. Malaysia	After 2nd Yr. Other Asia	After 2nd Yr. Japan
Mechanical Parts							
Pressed Metal Parts	2.7	3.2	17.0	17.9	3.2	17.0	17.9
Plastic Injection Moulded Parts	6.1	6.5	27.5	50.5	19.4	34.3	20.2
Turning Parts	0.6		3.4	5.0		3.4	5.0
Rubber, Rubber Rollers	0.4			6.6			6.6
Precision Springs	0.0			0.0			0.0
Screws, Washers	0.3		3.2	1.0		3.2	1.0
Others	0.5			8.3			8.3
Sub-Total	(10.6)	(9.7)	(51.0)	(89.2)	(22.6)	(57.9)	(58.9)
Electrical Parts							
IC/LSI	18.0	19.1	42.9	208.5	19.1	42.9	208.5
Resistors, Capacitors	2.3	4.9	12.2	11.4	7.3	12.2	7.6
Diodes, Transistors	2.3	6.1	15.2	11.4	9.1	15.2	7.6
Transformers	1.9	5.0	5.0	17.3	10.1	10.1	3.1
Solenoids, Coils	0.3	1.0	0.6	2.5	1.0	0.6	2.5
Printed Circuit Boards	7.8		103.3			103.3	
Motors	1.8	7.1		20.9	7.1		20.9
Power Supply	1.9		12.6	15.7		12.6	15.7
Connectors, Wire Harnesses	1.8	3.3	5.0	14.9	5.0	6.7	8.9
Switches	0.4		2.6	3.3		2.6	3.3
Others	0.1			101.0			101.0
Sub-Total	(44.6)	(46.5)	(199.5)	(406.9)	(58.7)	(206.2)	(379.1)
Specific Parts							
Keyboards	4.4	55.3			55.3		
CRT	19.6		233.5			233.5	
FDD	15.6		196.2			196.2	
Platen-Rollers	1.4			23.2			23.2
Others	0.1			1.7			1.7
Sub-Total	(41.1)	(55.3)	(429.7)	(24.8)	(55.3)	(429.7)	(24.8)
Sub-Assembly							
PCB Mounting	2.2		17.5			17.5	
Units Sub-Assembly	1.5		9.9	12.4		19.9	
Sub-Total	(3.7)	( )	(27.4)	(12.4)	( )	(37.3)	( )
Grand Total	100.0	111.5 (8.2%)	707.6 (52.3%)	533.3 (39.4%)	136.3 (10.3%)	731.1 (54.9%)	462.9 (34.8%)
			1,352.4			1,330.6	
Annual Production			90,000 units			120,000 units	
Total Annual Procurement Costs of Parts			M$ 121.7 Million			M$ 159.7 Million	

Note: Sum of items is not equal to the total because of rounding.

Table I. 3-6 Procurement Costs of Parts by Country - Photocopying Machines

(Unit: M$ Per One Photocopying Machine)

	Weight (%)	1st Yr. Malaysia	1st Yr. Other Asia	1st Yr. Japan	After 2nd Yr. Malaysia	After 2nd Yr. Other Asia	After 2nd Yr. Japan
Mechanical Parts							
Pressed Metal Parts	10.0	3.4	35.5	42.1	3.4	35.5	42.1
Plastic Injection Moulded Parts	21.0	12.6	53.5	98.3	12.6	53.5	98.3
Turning Parts	2.0		5.1	11.2		5.1	11.2
Rubber, Rubber Rollers	7.1			66.5			66.5
Precision Springs	0.7		2.4	3.3		2.4	3.3
Screws, Washers	0.6		2.9	1.1		2.9	1.1
Others	1.3			12.2			12.2
Sub-Total	(42.7)	(16.0)	(99.4)	(234.7)	(16.0)	(99.4)	(234.7)
Electrical Parts							
IC/LSI	3.4	2.0	4.6	22.3	2.0	4.6	22.3
Resistors, Capacitors	1.0	1.2	3.0	2.8	3.0	3.0	
Diodes, Transistors	1.5	2.3	5.6	4.2	5.6	5.6	
Transformers	3.1	4.6	4.6	17.4	4.6	4.6	17.4
Solenoids, Coils	1.4	1.3	1.3	9.2	2.5	2.5	5.2
Printed Circuit Boards	1.6		5.7	7.5		11.4	
Motors	5.8	13.0		38.0	13.0		38.0
Power Supply	8.1		15.1	56.9	15.2	15.2	37.9
Connectors, Wire Harnesses	0.8	0.8	1.4	3.7	2.1	2.4	
Switches	1.7		6.4	8.0		6.4	8.0
Others	5.4			50.6			50.6
Sub-Total	(33.9)	(25.3)	(47.8)	(220.5)	(48.1)	(55.7)	(179.4)
Specific Parts							
Lenses	5.5		41.2			41.2	
Glasses	1.2	9.0			9.0		
Linear Bearings	1.0			9.4			9.4
Drum Cylinders	1.8			16.9			16.9
Silicon Rubber Rollers	0.8			7.5			7.5
Magnet Rollers	0.8			7.5			7.5
Heaters	1.9			17.8			17.8
Sub-Total	(13.0)	(9.0)	(41.2)	(59.1)	(9.0)	(41.2)	(59.1)
Sub-Assembly							
PCB Mounting	4.6		14.1	22.0		28.2	
Units Sub-Assembly	5.8		17.4	27.2		34.8	
Sub-Total	(10.4)	( )	(31.5)	(49.2)	( )	(62.9)	( )
Grand Total	100.0	50.2 (6.0%)	219.8 (26.4%)	563.5 (67.6%)	73.0 (9.1%)	259.1 (32.2%)	473.3 (58.7%)
			833.3			805.2	
Annual Production			90,000 units			120,000 units	
Total Annual Procurement Costs of Parts			M$ 75.0 Million			M$ 96.6 Million	

Note: Sum of items is not equal to the total because of rounding.

Table I. 3-7 Procurement Costs of Parts by Country - Facsimile Machines

(Unit: M$ Per One Facsimile Machine)

	Weight (%)	1st Yr. Malaysia	1st Yr. Other Asia	1st Yr. Japan	After 2nd Yr. Malaysia	After 2nd Yr. Other Asia	After 2nd Yr. Japan
Mechanical Parts							
Pressed Metal Parts	1.1	1.3	6.8	7.2	2.6	6.9	5.4
Plastic Injection Moulded Parts	3.1	6.5	6.5	30.6	6.5	13.0	20.4
Turning Parts	0.2			3.3			3.3
Rubber, Rubber Rollers	1.5			24.6			24.6
Precision Springs	0.0			0.0			0.0
Screws, Washers	0.1		1.1	0.3		1.1	0.3
Others	1.3			21.4			21.4
Sub-Total	(7.3)	(7.8)	(14.4)	(87.4)	(9.1)	(21.1)	(75.4)
Electrical Parts							
IC/LSI	17.5	9.2	41.4	215.6	18.3	41.3	201.4
Resisters, Capacitors	2.5	5.3	13.2	12.3	5.3	13.2	12.3
Diodes, Transistors	1.1	2.3	5.8	5.4	2.3	5.8	5.4
Transformers	0.7	1.8	1.8	6.9	2.8	2.8	4.6
Solenoids, Coils	0.3	0.6	1.0	2.5	1.0	1.0	2.0
Printed Circuit Boards	4.1		53.9			53.9	
Motors	1.6	6.3	14.0		6.3	14.0	
Power Supply	8.2		53.6	67.4		53.9	67.4
Connectors, Wire Harnesses	2.2	4.1	6.1	18.1	6.1	8.1	10.9
Switches	0.4		2.6	3.3		2.6	3.3
Others	6.9			113.4			113.4
Sub-Total	(45.5)	(29.6)	(193.6)	(444.9)	(42.1)	(196.6)	(420.5)
Specific Parts							
Modems	12.7			208.7		167.0	
Invertors	2.0		28.9			28.9	
CCD	16.3			267.9			267.9
Thermal Heads	13.6		187.7			187.7	
Sub-Total	(44.6)	( )	(216.7)	(476.6)	( )	(383.6)	(267.9)
Sub-Assembly							
PCB Mounting	1.2		6.3	9.9		12.6	
Units Sub-Assembly	1.4		8.3	11.5		16.6	
Sub-Total	(2.6)	( )	(14.6)	(21.4)	( )	(29.2)	( )
Grand Total	100.0	37.4 (2.5%)	439.3 (29.1%)	1,030.3 (68.4%)	51.2 (3.5%)	630.4 (43.6%)	763.8 (52.8%)
			1,507.1			1,445.4	
Annual Production			90,000 units			120,000 units	
Total Annual Procurement Costs of Parts			M$ 135.6 Million			M$ 173.4 Million	

Note: Sum of items is not equal to the total because of rounding.

I-3-6. Personnel Programme

(1) Assumptions

The following assumptions of factory operation were set in order to estimate the number of personnel necessary for the operation of the assumed plants.

Assumptions of Operation of Factories

Yearly Working Days:	252	Days/Year
Working Hours:	480	Minutes/Day
Interval:	15	Minutes/Days
Work Attendance Ratio:	95	%

(2) Personnel Expenses

Data on personnel costs (including fringe benefits and bonus) by type of work were obtained through field interviews in Malaysia and various statistics.

The number of necessary personnel, personnel unit cost (monthly wage), and annual personnel expenses calculated according to the above data are shown in Table I.3-8 to Table I.3-10.

(3) Education Level And Required Skill for Engineers and Technicians in Plant Operation

Skills in actual operation could be obtained through on-the-job training, however, it would be better if engineers and technicians in each job category had completed basic education in their various fields and at the level shown generally in Table I.3-8.

Table I. 3-8 Annual Personnel Costs of Word Processor Factory

Section and Type of Personnel	Number	Unit Monthly Cost (M$)	Annual Cost (M$1,000)
Direct Production			
Factory Manager	1	2,000	28
Foremen	2	650	18
Assistant Engineers	2	1,000	28
Clerical Workers	1	500	7
Skilled Workers	2	500	14
Unskilled Workers	48	250	168
Sub-Total	(56)	-	(263)
Production Support (Technology, Production Management, Purchase, Etc.)			
Section Managers	2	2,500	70
Supervisor	1	650	9
Engineers	4	1,500	84
Clerical Chiefs	4	1,500	84
Clerical Workers	2	500	14
Unskilled Workers	5	250	18
Japanese Managers	2	15,000	420
Japanese Engineers	3	13,000	546
Japanese Clerical Chiefs	2	13,000	364
Sub-Total	(25)	-	(1,609)
Administration			
Administration Manager	1	2,500	35
Clerical Chiefs	2	1,500	42
Clerical Workers	2	500	14
Japanese Managers	2	15,000	420
Sub-Total	(7)	-	(511)
Grand Total	93	-	2,383

Table I. 3-9 Annual Personnel Costs of Photocopying Machine Factory

Section and Type of Personnel	Number	Unit Monthly Cost (M$)	Annual Cost After the Second Year (M$1,000)
Direct Production			
Factory Manager	1	2,000	28
Foremen	2	650	18
Assistant Engineers	3	1,000	42
Clerical Workers	2	500	14
Skilled Workers	3	500	21
Unskilled Workers	72	250	252
Sub-Total	(83)	-	(375)
Production Support (Technology, Production Management, Purchase, Etc.)			
Section Managers	2	2,500	70
Supervisor	1	650	9
Engineers	5	1,500	105
Clerical Chiefs	4	1,500	84
Clerical Workers	2	500	14
Unskilled Workers	5	250	18
Japanese Managers	2	15,000	420
Japanese Engineers	4	13,000	728
Japanese Clerical Chiefs	2	13,000	364
Sub-Total	(27)	-	(1,812)
Administration			
Administration Manager	1	2,500	35
Clerical Chiefs	2	1,500	42
Clerical Workers	2	500	14
Japanese Managers	2	15,000	420
Sub-Total	(7)	-	(511)
Grand Total	117	-	2,698

Table I. 3-10 Annual Personnel Costs of Facsimile Machine Factory

Section and Type of Personnel	Number	Unit Monthly Cost (M$)	Annual Cost (M$1,000)
Direct Production			
Factory Manager	1	2,000	28
Foremen	2	650	18
Assistant Engineers	2	1,000	28
Clerical Workers	1	500	7
Skilled Workers	2	500	14
Unskilled Workers	50	250	175
Sub-Total	(58)	-	(270)
Production Support (Technology, Production Management, Purchase, Etc.)			
Section Managers	2	2,500	70
Supervisor	1	650	9
Engineers	6	1,500	126
Clerical Chiefs	4	1,500	84
Clerical Workers	2	500	14
Unskilled Workers	5	250	18
Japanese Managers	2	15,000	420
Japanese Engineers	4	13,000	728
Japanese Clerical Chiefs	2	13,000	364
Sub-Total	(28)	-	(1,833)
Administration			
Administration Manager	1	2,500	35
Clerical Chiefs	2	1,500	42
Clerical Workers	2	500	14
Japanese Managers	2	15,000	420
Sub-Total	(7)	-	(511)
Grand Total	93	-	2,614

I-3-7. Other Expenses

Considering the examples of factories in Japan and the price level of Malaysia, other expenses were set as follows.

Utilities expense:	0.15~0.16% of sales
Indirect material cost:	0.17% of sales
Other expenses:	1.00~1.01% of sales

I-3-8. Financing Programme

Approximately one third of the initial value necessary for the plants was assumed to be procured from paid-up capital and the remaining two thirds from long-term borrowing.

Working capital was assumed to be 1/12 of annual sales, that is, monthly sales, and to be financed by short-term borrowing from financial institutions. Interest rates of both long-term and short-term borrowings were assumed to be 8% per annum.

Table I. 3-11 Financing Programme

Items	Amount (M$ 1,000)	Conditions
Word Processor Factory		
Paid-Up Capital	7,000	
Long-Term borrowing	16,000	10 Years Average Reimbursement. Interest 8%
Short-Term Borrowing	Working Capital	Within One Year Reimbursement. Interest 8%
Photocopying Factory		
Paid-Up Capital	25,000	
Long-Term Borrowing	52,000	10 Years Average Reimbursement. Interest 8%
Short-Term Borrowing	Working Capital	Within One Year Reimbursement. Interest 8%
Facsimile Machine Factory		
Paid-Up Capital	7,000	
Long-Term Borrowing	15,000	10 Years Average Reimbursement. Interest 8%
Short-Term Borrowing	Working Capital	Within One Year Reimbursement. Interest 8%

Table I. 3-12 Long-Term Flow of Profit and Loss Projection (Word Processor Factory)

(Unit: M$ 1,000)

	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	6th Yr.
Sales	128,340	171,120	171,120	171,120	171,120	171,120
Production Cost						
Materials Cost	121,718	159,672	159,672	159,672	159,672	159,672
Indirect Materials Cost	213	284	284	284	284	284
Direct Labour Cost	267	263	263	263	263	263
Indirect Labour Cost	1,609	1,609	1,609	1,609	1,609	1,609
Depreciation Expense	2,660	2,660	2,660	2,660	2,660	2,660
Utilities Expense	205	274	274	274	274	274
Other Expenses	1,194	1,591	1,591	1,591	1,591	1,591
Sub-Total	127,866	166,352	166,352	166,352	166,352	166,352
Administration						
Materials Cost	18	25	25	25	25	25
Labour Cost (Management & Sales	511	511	511	511	511	511
Depreciation Expense)	352	352	352	352	352	352
Utilities Expense	63	84	84	84	84	84
Other Expenses	103	137	137	137	137	137
Sub-Total	1,047	1,109	1,109	1,109	1,109	1,109
Operating Profits	-573	3,659	3,659	3,659	3,659	3,659
Non-Operating Expenses	1,640	1,956	1,832	1,544	1,232	1,012
Net Profit	-2,213	1,703	1,827	2,115	2,427	2,647

Table I. 3-13 Cash Flow Estimates (Word Processor Factory)

(Unit: M$ 1,000)

	Before Operation	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	6th Yr.
Carry-Over from Previous Year		911	15	65	76	3	14
Capital Payment	7,000						
Sales Revenue		128,340	171,120	171,120	171,120	171,120	171,120
Cost of Products		127,866	166,352	166,352	166,352	166,352	166,352
Administration		1,047	1,109	1,109	1,109	1,109	1,109
Total Expenses		128,913	167,461	167,461	167,461	167,461	167,461
Operating Balance	0	-573	3,659	3,659	3,659	3,659	3,659
Working Capital at the Beginning of Year			10,695	14,260	14,260	14,260	14,260
Working Capital at the End of Year		10,695	14,260	14,260	14,260	14,260	14,260
Working Capital Balance	0	-10,695	-3,565	0	0	0	0
Depreciation		3,012	3,012	3,012	3,012	3,012	3,012
Fixed Investment	21,449			2,828		2,828	1,170
Investment Balance	-21,449	3,012	3,012	184	3,012	184	1,842
Long-Term Borrowing	16,000						
Principal Repayment		800	800	800	800	800	800
Investment	640	1,248	1,184	1,120	1,056	992	928
(Amount Borrowed)	(16,000)	(15,200)	(14,400)	(13,600)	(12,800)	(12,000)	(11,200)
Long-Term Borrowing Balance	15,360	-2,084	-1,984	-1,920	-1,856	-1,792	-1,728
Short-Term Borrowing		9,800	9,500	8,300	3,900	2,100	0
Principal Repayment		0	9,800	9,500	8,300	3,900	2,100
Investment		392	772	712	488	240	84
(Amount Borrowed)		9,800	9,500	8,300	3,900	2,100	0
Short-Term Borrowing Balance	0	9,408	-1,072	-1,912	-4,888	-2,040	-2,184
Financing Balance	15,360	7,360	-3,056	-3,832	-6,744	-3,832	-3,912
Total Balance	911	-896	50	11	-73	11	1,589
Carry-Over for Next Year	911	15	65	76	3	14	1,603

Table I. 3-14 Long-Term Flow of Profit and Loss Projection (Photocopying Machine Factory)

(Unit: M$ 1,000)

	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	6th Yr.
Sales	92,340	123,120	123,120	123,120	123,120	123,120
Production Cost						
Materials Cost	74,996	96,626	96,626	96,626	96,626	96,626
Indirect Materials Cost	156	208	208	208	208	208
Direct Labour Cost	388	375	375	375	375	375
Indirect Labour Cost	1,812	1,812	1,812	1,812	1,812	1,812
Depreciation Expense	16,625	16,625	16,625	16,625	16,625	16,625
Utilities Expense	139	185	185	185	185	185
Other Expenses	869	1,158	1,158	1,158	1,158	1,158
Sub-Total	94,984	116,988	116,988	116,988	116,988	116,988
Administration Expenses						
Materials Cost	10	13	13	13	13	13
Labour Cost (Management & Sales	511	511	511	511	511	511
Depreciation Expense)	369	369	369	369	369	369
Utilities Expense	46	61	61	61	61	61
Other Expenses	54	74	74	74	74	74
Sub-Total	990	1,028	1,028	1,028	1,028	1,028
Operating Profit	-3,634	5,104	5,104	5,104	5,104	5,104
Non-Operating Expenses	4,080	3,872	3,640	3,432	3,224	3,016
Net Profit	-7,714	1,232	1,464	1,672	1,880	2,088

I-3-9. Projection of Long-Term Profit and Loss

Projection of long-term profit and loss for each plant based on the estimated sales volume and costs was assumed. The profit and loss projection is shown in Table I.3-12~14.

I-3-10. Cost Analysis

In order to compare the cost competitiveness in the major markets in the world, the European market, the U.S. market, and the Japan market, the product costs at the markets were calculated and compared. Product costs were calculated by adding freight, insurance fees, and import duty to the production costs at a factory in Japan and a factory in Malaysia.

The comparison of costs in the major markets is shown in Fig. I.3-1~3. The costs are composed of material cost, factory fixed cost, freight, insurance fees, and import duty. For the exact comparison of costs, such factors as development expense, and other headquarters' expenses are not excluded from consideration.

The major findings of the comparison are as follows.

1) The ratios of product costs of Malaysian products to those of Japanese products, assuming that product costs of Japanese products were 1.000, were as shown in Table I. 3-15.

Table I. 3-15 Ratio of Product Costs of Malaysian Products to Those of Japanese Products

	Japan Market	U.S. Market	European Market
Word Processor	0.971	0.904	0.903
Photocopying Machine	0.989	0.985	0.982
Facsimile Machine	0.999	0.996	0.994

The cost of word processors manufactured in Malaysia would be lower than those of Japan by 2.9~9.7%. But the cost of photocopying machines and facsimile machines manufactured in Malaysia would be cheaper than the cost of products made in Japan by just 0.1~1.8% and the cost competitiveness is not large.

2) Malaysia products would have the largest cost competitiveness in the Europe market against Japanese products, secondly in the North American market, and lowest in the Japanese market due to the influence of freight, insurance fees, and import duty.

3) The application of the GSP would increase the cost competitiveness by 4.2~10.4%.

Import tax rates of the markets are as follows:

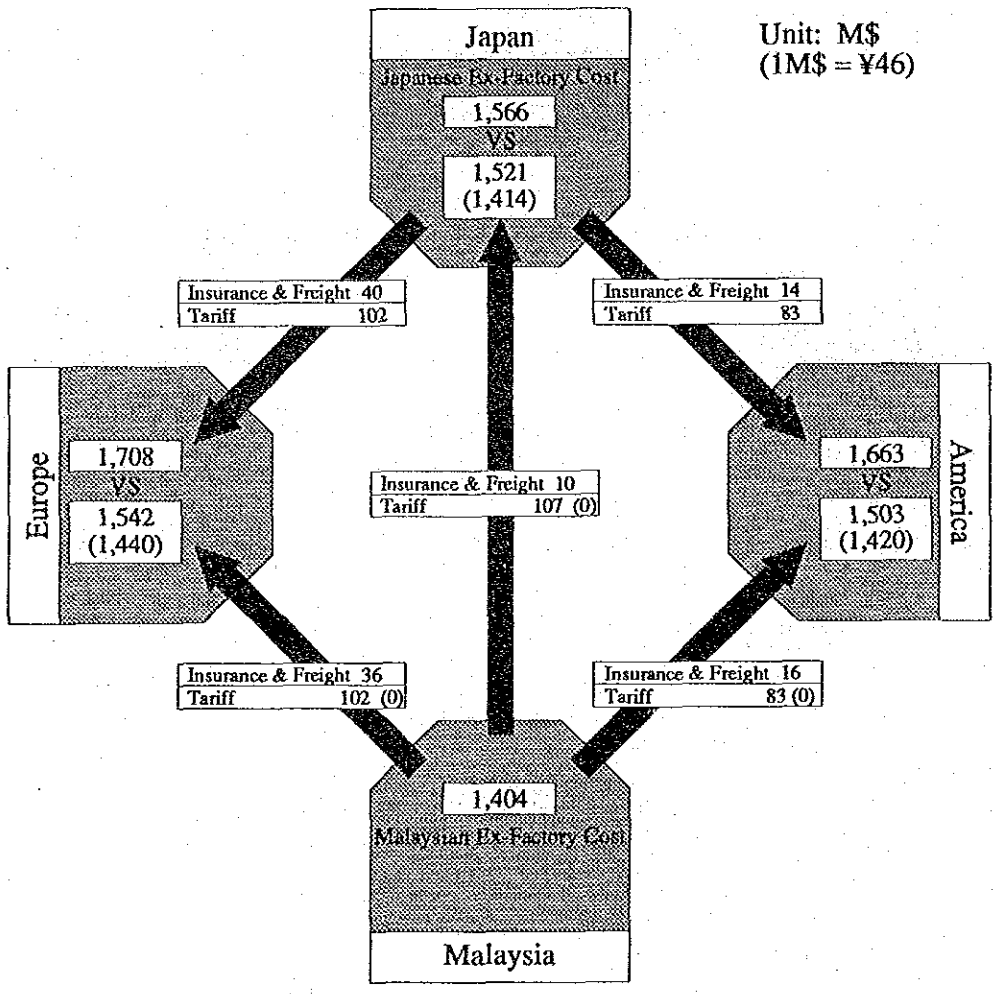
Table I. 3-16 Import Tariff Rates

CIF, ( ) Preferential

	Europe	North America	Japan
Word Processor	4.6% (0%)	3.9% (0%)* 3.7% (0%)**	4.9%
Photocopying Machine	7.2% (0%)	3.7% (0%)	0%
Facsimile Machine	7.5% (0%)	4.7% (0%)	0%

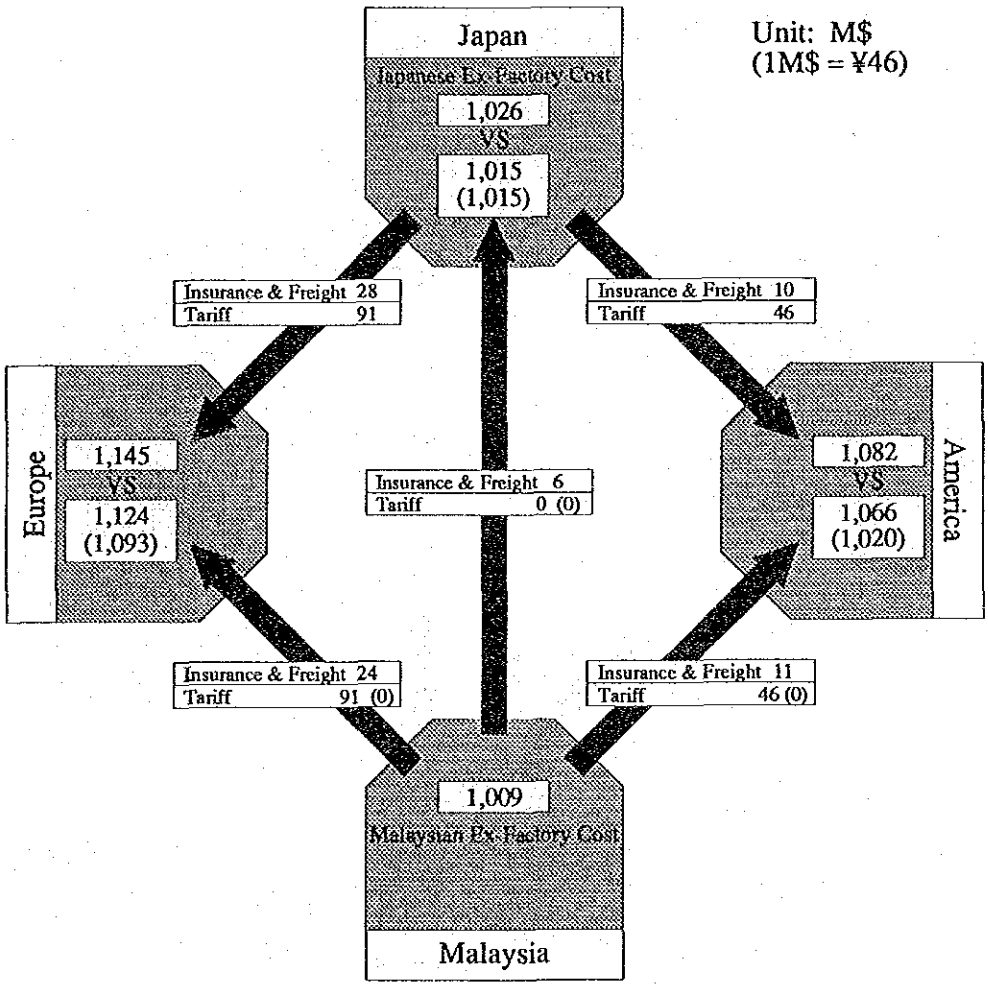
* Main Body
** Printer Part

Fig. I. 3-1 Cost Competitiveness in the Word Processor Market



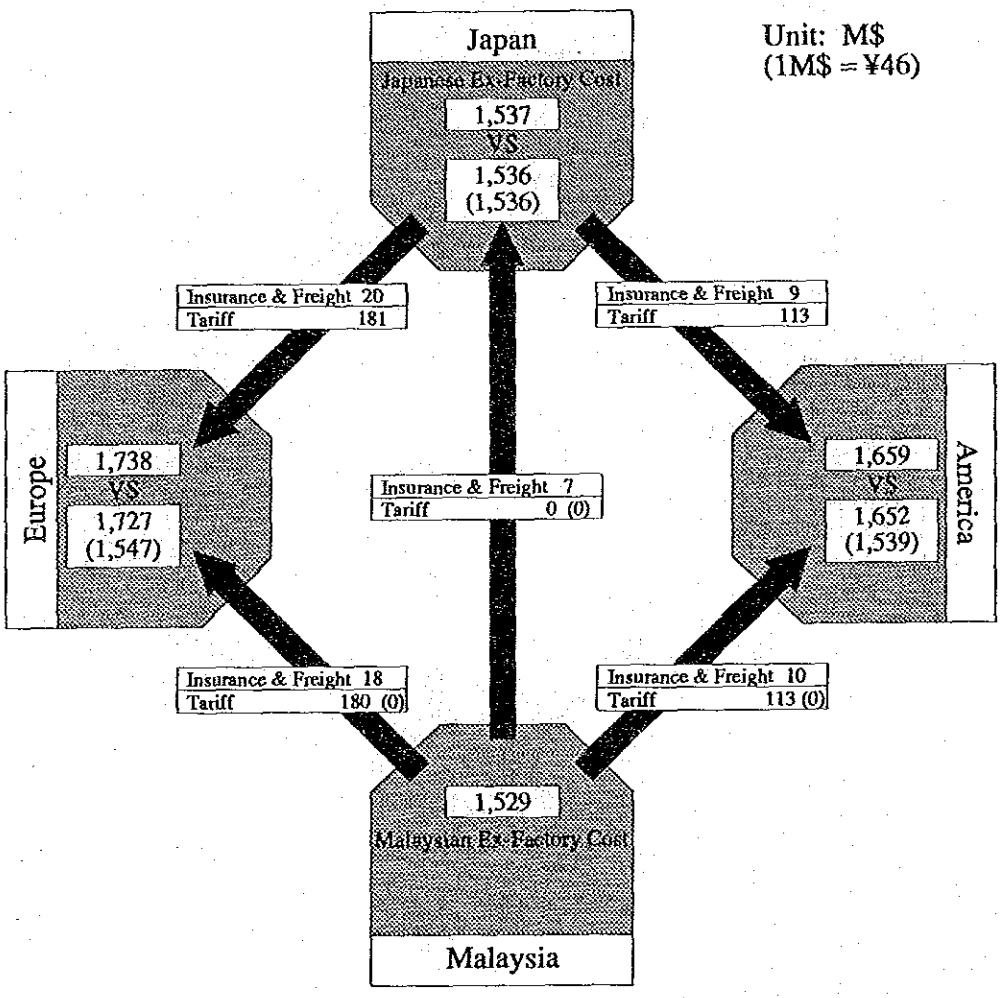
Notes: Numbers in parentheses indicate preferential tariff rates.
These costs do not include R&D costs or head office expenses.

Fig. I. 3-2 Cost Competitiveness in the Photocopying Machine Market



Notes: Numbers in parentheses indicate preferential tariff rates.
These costs do not include R&D costs or head office expenses.

Fig. I. 3-3 Cost Competitiveness in the Facsimile Machine Market



Notes: Numbers in parentheses indicate preferential tariff rates.
These costs do not include R&D costs or head office expenses.

II. Cathode Ray Tube (CRT) Industry

II. Cathode Ray Tube (CRT)

II-1. Overview of the Industry

II-1-1. Outline of the Television Industry

(1) Production

There has been a striking increase in the production of T.V. sets in Malaysia in recent years (refer to Table II.1-1).
In particular, in 1986 and 1987, there were annual increases of 51.8% and 43.8% compared with the previous years. This was largely due to the increased production of Sharp-Roxy Electronics, Malaysia's largest export television manufacturer. In the future too, due to the 1988 start of production by large factories of Silver Electronics and Sony TV and the 1989 start of production by Matsushita TV, on a scale comparable to that of Sharp-Roxy Electronics, T.V. sets production in Malaysia is expected to increase dramatically.

Table II. 1-1 Production of TV Sets in Malaysia

Year	Volume (Set)	Annual Increase (%)
1983	382,766	-
1984	443,025	15.7
1985	568,384	28.3
1986	862,573	51.8
1987	1,240,125	43.8
1988 (Jan.-Aug.)	881,815	13.4

Source: Monthly Industrial Statistics

(2) Export and Import

Along with the increase in production, exports of T.V. sets from Malaysia have also risen. Table II.1-2 shows the exports and imports of T.V. sets in the past five years. Imports have continued to fall, while exports have risen about 6.2 fold in the past five years.

The export destinations of T.V. sets in 1987 were as follows:

C.T.V. Sets mains operated with Screen of 41.6cm & below

1. USA (share : 75.2%)
2. Germany (share : 6.9%)
3. Australia (share : 6.9%)

C.T.V. Set mains operated others

1. USA (share : 77.9%)
2. Singapore (share : 4.5%)
3. France (share : 4.0%)

Table II. 1-2 Exports and Imports of TV Sets

(Unit: M$ Million)

		1983	1984	1985	1986	1987
TV Receivers	Export	65.24	85.66	132.74	227.76	402.96
(SITC 761)	Import	84.73	80.47	64.88	51.40	53.04
CTV 1	Export	58.21	70.47	129.33	211.25	263.27
(SITC 761110)	Import	46.30	49.80	35.59	30.51	33.18
CTV 2	Export	0.23	0.83	3.25	15.86	132.47
(SITC 761120)	Import	29.51	24.94	25.66	16.41	17.04

Notes: 1. CTV Receivers Mains Operated with Screen of 41.6cm & Below.
2. CTV Receivers Mains Operated, Others.
Source: Malaysia Annual Statistics of External Trade

(3) Domestic Demand

The household holding rate of T.V. sets in Malaysia is high with 80% of the electricity supplied households (65%) reportedly already owning colour T.V.sets.

Domestic demand estimates made by seven sales companies in Malaysia were as follows:

1983: 230,000 to 240,000 units
1984: 230,000 to 240,000 units
1985: 180,000 units
1986: 180,000 units
1987: 200,000 units
1988: 250,000 units

The import duties on T.V. sets leaps from 30% to 50% for sets of over 16 inches, so 14 inch and 16 inch T.V. sets, which are rather cheaper sets, are popular. However, along with the rise in income, it is expected that demand will rise for 20 inch, and other larger models, so the production companies are studying manufacturing of larger sizes.

(4) Outline of T.V. Set Manufacturers

At present, there are 10 companies engaged in T.V. set production in Malaysia. Table II.1-3 gives a summary of these companies. In the table the information on Siong, which could not be visited, was based on "A Study on the Promotion of the Supporting Services Industry in the Manufacturing of Television", made by MIDA in June to July 1988, and the information on Sony TV, was obtained from the results of a questionnaire survey.

1) Domestic Sales-Oriented Manufacturers

Among those domestic sales-oriented manufacturers, Matsushita Electric and Sharp-Roxy Appliances are general home electric appliance manufacturers oriented toward the domestic market and produce T.V. sets as part of their line. Further, East Coast Electronics and Setron are also oriented to the domestic market. East Coast Electronics engages in assembly and sale of products under the NEC brand and Sanyo, Thomson, ITT, Normandie and Gold Star brands, while Setron does so under the Setron brand (kits purchased from NEC).

Syarikat Hitec has a high export ratio. They have taken over the production of Toshiba, which ceased production in 1986, and Maltronics, which ceased production in 1988 (brand name of Philips), and currently engage in domestic sales under the four brands of Mitsubishi, JVC, Toshiba, and Philips.

2) Export-Oriented Manufacturers

All of the five manufacturers specialising in exports entered the country in the 1980s. The oldest and the largest in production scale is Sharp-Roxy Electronics. This company functions as the centre for overseas production of compact televisions (14 inch) in the group and further produces chassises and kits for Sharp's U.S. factory: 1,114,000 units in 1987 and 485,000 units in 1988.

Further, three Japanese affiliated companies established operations in Malaysia in 1988, of which two are already in production. In 1988, Silver Electronics produced

80,000 units and Sony 35,000 units. In the future, Silver Electronics will produce in the order of 300,000 to 350,000 units a year, and Sony TV will produce 900,000 units a year. Japanese affiliated companies are given an important position as their group's overseas production centres due to the past rapid appreciation of the yen, and as a result are pursuing cost merits through production intensification (in the case of Sharp) or moving to locate closer to the markets (Matsushita TV and Sony).

Siong Export Industries is engaged in the production of T.V. sets as a subcontractor for Samsung, but it said that, Samsung is considering establishing its own operation in Malaysia and thus Siong will commence production for Gold Star from next year.

Table II. 1-3 Outline of TV Manufacturers in Malaysia

		Year of Establishment	Location	Number of Employees	Market (88)			Production Share by Size (88)		
1	Matsushita Electric	1965	Shah Alam Selangor	1,430	Domestic Australia New Zealand	: : :	85.7% 8.6% 1.8%	14" 16" 20" 21"	: : : :	46.9% 26.0% 22.0% 4.8%
2	Matsushita TV (Production starts from April 1989)	1988	Shah Alam Selangor	-	-Singapore Middle East Japan (in Future)			14" 16" 20" 21"	: : : :	- - - -
3	Sharp-Roxy Appliances	1985	Petaling Jaya Selangor	320	Domestic	:	100%	14" 16" 20" 21"	: : : :	22.0% 43.0% 25.0% 0.1%
4	Sharp-Roxy Electronics	1980	Batu Pahat Johor	1,500	USA EC	: :	48.7% 51.3%	14" 20" 21"	: : :	72.0% 15.0% 13.0%
5	Silver Electronics	1988	Shah Alam Selangor	290	USA & Canada	:	100%	6" 0" 14" 20"	: : : :	10.0% 5.0% 45.0% 40.0%
6	Syarikat Hitec.	1973	Kluang Johor	700	Domestic Singapore USA & Canada	: :	13% 87%	14" 16" 18" 20" 21"	: : : : :	25.9% 25.9% 5.2% 34.5% 8.6%
7	Setron	1971	J. Bharu Johor	130	Domestic Australia	: :	80-90% 10-20%	14" 16" 20"	: : :	30% 20% 50%

Table II. 1-3 Outline of TV Manufacturers in Malaysia
(Continued)

		Year of Establishment	Location	Number of Employees	Market (88)			Production Share by Size (88)		
8	East Coast Electronics	1973	Semambu Kuantan	79	Domestic	:	100%	14" 16" 20"	: : :	43.3% 28.2% 28.5%
9	Siong Export Industries	1984	Klang		Export	:	100%		-	
10	Sony TV	1988	Bangi Selangor	333	Singapore	:	90%		-	

* Figures in Brackets are Volume of Chasis.

II-1-2. Supply and Demand Trends of CRTs in Malaysia

(1) Demand

At present, CRTs are not being produced in Malaysia, so all CRTs have to be imported.

Table II.1-4 shows the imports of CRTs in the past four years. The largest country of origin is Singapore, which rose in share on a volume basis from 52.6% in 1984 to 76.7% in 1987. Imports from Japan have fallen from 45.3% to 11.4%, so the rise in Singapore's share takes the form of coverage of this decline. Since 1986, further, imports from Taiwan have risen considerably.

Compiling the results of the field survey, the demand for CRTs, by size, in 1988 is estimated and shown in Table II.1-5. The total share of CRTs by size is largely affected by the demand from Sharp-Roxy Electronics, which has a large production scale. In the demand from domestic market-oriented manufacturers, however, the shares of 14 inch and 16 inch are very high. As for future projections, it is estimated that CRT demand will exceed 2.5 million units in 1989 due to the commencement of full scale production by Silver Electronics and Sony TV and the start of production by Matsushita TV.

Table II. 1-4 Import of CRTs (SITC 776100)

	1983	1984	1985	1986	1987
Total Value (M$ Million)	41.36	51.96	61.96	105.27	164.25
Total Volume (1,000 Units)	1,865.4	576.5	665.0	1,285.6	1,441.4
Of Which					
Japan	302.5	260.9	257.1	181.7	164.7
Singapore	1,537.2	303.5	398.5	1,051.3	1,105.0
Korea	2.0	1.7	1.4	5.0	39.1
Taiwan	19.2	6.9	1.8	45.4	120.3

Source: Malaysia Annual Statistics of External Trades

Table II. 1-5 CRT Demand by Size (1988)

(1,000 Units)

Company	6"	10"	14"	16"	20"	21"	29"	Total
A	-	-	47.9	26.6	22.5	4.9	0.2	102.1
B	-	-	14.3	28.0	16.3	6.5	-	65.1
C	-	-	775.4	-	161.6	140.0	-	1,077.0
D	7.2	7.2	36.0	-	29.6	-	-	80.0
E	-	-	18.0	18.0	3.6~ 6.0	24.0	6.0~ 8.4	69.6~ 74.4
F	-	-	10.8	7.2	18.0	-	-	36.0
G	-	-	2.9	4.4	2.9	-	-	10.2
Total	7.2	7.2	905.3	84.2	254.5~ 256.9	175.4	6.2~ 8.6	1,440.0~ 1,442.4

(2) Supply

Not all of the companies would reveal the breakdown of their purchases by sources, so clear figures are not available. However, Hitachi Singapore, which is the main place of purchase for Sharp-Roxy Electronics, accounts for an overwhelmingly large shares. In addition, South Korea's Gold Star, Samsung and Orion, Taiwan's CPT and Philips were named. However, there were many complaints that South Korean makes have become difficult to obtain due to the increase in supply to China.

TV production in Singapore is also expanding, so Hitachi Singapore tends to be short on supplies as well.

The supply of CRTs in Asia is thus becoming tight. Hitachi Singapore has a production scale of 350,000 units/months (4 million units/year) and produces 14, 20, and 21 inches of CRTs.

(3) Purchasing Situation

Regarding purchases of CRTs, OEM manufacturers such as Syarikat Hitec or Setron are supplied CRTs by OEM parts suppliers and do not select vendors by themselves. As for the others, one has a regional purchasing centre and their parts are supplied from the centre. But aside from this, most T.V. set manufacturers wish to purchase CRTs and other parts from closer suppliers if approval of the head offices could be obtained. At present, the supply of CRTs is tight and due in part to this, all the companies indicated their desire for the purchase of local-made CRTs in the case of establishment of domestic production.