do product development work in the country. The electric appliance industry in Malaysia has a high level of technology. But this is the case only with regard to foreign-owned manufacturers and group companies. Although improvement has been rapid recently the level of technology in local companies is often found to be insufficient. It is of great urgency that the metal processing industry be further developed so that it can better function as a supporting industry.

On the other hand, other countries are attracting the attention of international manufacturers seeking a low-labor-cost base for production. The shortage of labor in Malaysia and increase in wages there has made it difficult to maintain international competitiveness on the strength of labor cost. In order to counter that it is essential to shift to production that uses higher levels of technology than at present. In order to achieve that, it is necessary to improve technology, improve productivity, and be thorough in undertaking quality control.

In progressing toward export-oriented industrialization, moreover, there will be demands raised to eliminate protective barriers within Malaysia from overseas. In anticipation of this it is necessary to improve the competitiveness of local companies. It is thus important from this viewpoint to improve local industries so that they can function as supporting industries.

Increases in production of electrical appliances in Malaysia will create increased demand for imports of parts made by non-Malaysian companies in other countries such as Singapore and Thailand, where production plants have been constructed as part of those companies' international strategies. It may be said that this cannot be avoided, as the scale of the domestic market is small and cost increases resulting from producing such parts in Malaysia will hurt international competitiveness. It is desirable, of course, for Malaysia to concentrate on those parts and products that it can export to other countries, thereby attaining greater economies for all concerned. From this viewpoint, it is necessary to work to promote AFTA (ASEAN Free Trade Area).

3.2 Needs in Promoting Standardization

3.2.1 Standards in the Electrical Engineering Industry, and Present Status of Standardization in Malaysia

Japanese Industrial Standards (JIS) dealing with electrical equipment and electrical machinery (within Section C) 792 standards have been registered as of the end of 1991. Work is proceeding on harmonization of JIS with IEC standards, as a matter

of Japanese participation in the international standardization effort, and also to make the domestic market more accessible to other nations. The present status of standardization in this industry in Malaysia cannot be said to be adequate, whether in regard to the number of registered standards or the range that the standards cover. According to the 1991 edition of the Malaysian Standards Catalog, there are fewer than 80 standards for this industry. Most of them, moreover, are for irons, kettles and ovens using heating elements, electric fans and simple electric appliances for home use, wire and related products, lamps and lighting equipment, power transformers, switch gears, dry cells and batteries. Product standards that include testing methods are common. But there are also many standards that are concerned only with testing methods, glossary and symbols. It is also characteristic of this area that standards related to safety and handling are many.

3.2.2 Use of Standards in Individual Companies

Where applicable MS standards exist, they are in use as product standards, for wire and cable, lamps and lighting fixtures, fans, irons, rice cookers, water heaters and other home electric appliances that perform heating. For products that do not have MS standards, such as refrigerators, socket outlets, enamel-coated wire and others, BS, JIS and IEC standards are used as product standards.

The Japanese-owned companies that account for a major share of electric appliance production in general, use their own company standards in manufacturing stage, based on MS and JIS where MS standards exist, and JIS where there are none. Manufacturers of distribution transformers are using BS for products to be sold to Tenaga Nasional but recently have begun to change over to use of IEC standards. In purchasing, IEC is used for square shaped cable and JIS is used for magnetic steel sheets.

Thus, for products for the domestic market, MS and BS taken to be equivalent to MS are in use, but for export goods, the standard of the country the goods are destined for is used. JIS is used for products such as air conditioners and irons that are destined for Japan. At present, the basic standards for measurement and testing equipment, and materials, are not adequate. At the very least it is essential that these be improved. When making improvement, it would be advisable to try for harmonization with IEC standards.

3.2.3 Inspection Systems

3.2.3.1 In-house systems

At multi-national companies, there are quality control departments, or quality assurance departments, and staff whose work is solely in connection with quality control. They use inspection manuals and checklists that are based on the company's standards, perform incoming inspection of purchased products and materials, in-process inspection, and outgoing inspections. In small-scale plants, however, there are some that have no QC department or staff dedicated to QC work only.

3.2.3.2 Outside systems

Inspection services by an external body can be obtained from SIRIM's Electrotechnical Engineering Unit. This unit has in it 1) Industrial Appliances and Accessory Laboratory, 2) Domestic Appliance and Accessory Laboratory, 3) Electronic Appliance and Accessory Laboratory, and 4) Lamp and Accessory Laboratory units. They undertake evaluation of performance, quality, safety and reliability. Their work is based on MS, BS, IEC and other standards. However, for measurement of electromagnetic wave obstacle and for calibration of impact hammer, they have no equipment and at present products to be tested are sent either to the parent companies in Japan or to SISIR in Singapore.

The position of SIRIM as an external testing agency is very important. However, the electrical engineering industry is in the midst of ongoing technological innovation on a large scale and localization of production is rapidly increasing in Malaysia. It is extremely important for SIRIM to respond to the needs of various technological changes in the industry. It is highly necessary for SIRIM to consider a grade up of existing facilities, and level up of testing and inspection capabilities by emphasizing stability of job occupation among SIRIM staff. In Penang and Johor Bahru areas where many electric companies are located, enhancement of the inspection system of SIRIM is necessary.

3.2.4 Certification Systems

The national certification systems that are related to this industry are the voluntary 1) MS mark, 2) certified mark systems and 3) safety mark and the mandatory 4) control label system.

Among them, 1) and 2) are quality marks that indicate that the products bearing the marks conform to certain standards of specified quality, performance, or meet other criteria. Use of the MS mark is approved for products passing Malaysian Standards requirements, and those bearing the certified mark pass foreign standards' requirements. The safety mark system guarantees only that the product bearing it meets minimum safety standards. At present, for electrical products subject to MS 72 and MS 472 Series requirements, it is applied to those that are manufactured in Malaysia. Authority to give final approval for use of marks under the mandatory systems resides with the competent government agency that is responsible for regulation and oversight of the pertinent law, but the validation that the imported, domestically-manufactured, or domestically sold product meets the quality, performance or other standards is performed for that agency by SIRIM. The control label system indicates recognition that the products bearing the labels meet performance or quality standards other than safety requirements. It is used for 28 types of electrical products. Products that are approved can be sold bearing labels that are purchased from SIRIM.

Another system is ARQS, for approval of quality control systems. Only one company in the electrical engineering industry has ARQS certification. As is explained elsewhere in this report, many of the companies in this industry are owned by Japanese interests, and are now at the initial stage of getting approval for meeting ISO 9000 Series standards.

3.2.5 Promotion of Quality Control

3.2.5.1 Quality control systems

Quality control systems in the electrical engineering industry can be said to be in relatively good order, because this industry intrinsically has high safety standards, but in general there is a wide gap between the larger multi-national companies and the smaller local independent companies. At those companies that have invested in Malaysia with the purpose of exporting products, quality control is particularly rigorously enforced. Those that possess the most advanced systems have Total Quality Control or Company-Wide Quality Control (CWQC) systems, and provide guidance and support for improvement of quality control systems at their vendors.

Companies at the next level have a QC or QA Department, a large number of QC personnel and have increased the number of gates for inspection, including those in the manufacturing process, by way of increasing the number of opportunities provided by the system for discovering defects. In small local companies, howev-

er, there are some instances where there are no QC specialists. Further, it can be said that one barrier to introduction of CWQC is that operators have relatively simple functions and there is a sharp distinction between production staff and inspection staff.

3.2.5.2 Personnel education

The approach taken by multi-national companies and local independent companies regarding the education of personnel is markedly different. At the former, and Japanese-owned companies in particular, there is a high level of interest in employee education. At the top-level companies QC education is given to all employees, in order to promote CWQC.

In contrast to this, although top management at local independent companies is interested in this subject, the companies cannot be said to be earnestly interested in education because job-hopping is common. It is common for the managers themselves to attend seminars, rather than QC staff or employees. The importance of having staff dedicated exclusively to QC work is recognized, however, and it is hoped that improvement of the education of QC personnel will be carried out in the future.

Many companies have a problem in keeping staff and operators who have been educated or trained in the company. It is difficult to hire and then to keep good personnel in Johor Bahru and Penang, and cities such as Kuala Lumpur. This is particularly true among small local companies.

3.2.5.3 Company standards

In general, company standards are in good order at the multi-national companies. At Japanese-owned companies, company standards are based on JIS, but stricter, and there are well-developed standards for inspection of parts and materials purchased from vendors, and working standards used in the manufacturing process. Diagrammatic explanations are used to make other multi-national working standards perfectly clear to employees. Also, at the other multi-national companies, high importance is given, with the context of company standards, to inspection manuals, and some companies have developed manuals for incoming goods inspection, in-processes inspection, and outgoing inspections.

The status of company standards at local, small companies cannot be said to be adequate.

Further, at the operator level, often English is not spoken and it is increasingly becoming necessary that the working standards be shown in diagrams with not only English text but also Malay and Chinese texts.

The educational level of operators at local companies is low, and there is not sufficient knowledge of the use of basic measuring equipment. For example, because of lack of knowledge of how to use a micrometer or caliper and how to interpret measurement results, the instrument is often dropped out of carelessness and damaged, requiring repair of many of them.

Table A1-3-1 NUMBER OF COMPANIES REGISTERED TO MIDA BY SUB-SECTOR, 1991

Sub-sector	No. of Companies
a) Electric Appliances Sub-sector (incl. Parts Manufacturers)	32
b) Electric Industrial Machinery and Equipment Sub-sector	20
c) Dry Cells and Batteries Sub-sector	10
d) Incandescent and Fluorescent Lamps Sub-sector	23
e) Wire and Cable Sub-sector	26

Source: MIDA

Table A1-3-2 NUMBER OF ELECTRICAL PRODUCT MANUFACTURERS BY STATE

	No. of Companies
Selangor (incl. Kuala Lumpur)	66
Johor	23
Penang	16
Perak	8
Kedah	3
Sarawak	3
Kelantan	2
Negeri Sembilan	2
Melaka	2
Total	125

Source: MIDA, "Directory of existing electrical products manufacturers as at March 1991"

Table A1-3-3 EXPORTS OF ELECTRIC MACHINERY AND EQUIPMENT, MALAYSIA, 1991

	Value (million M$)
Air Conditioners	542.0
Electrical Home Appliances	123.0
Vacuum Cleaners	(29.0)
Immersion Heaters	(9.4)
Electric Irons	(22.0)
Electric Rice Cookers	(12.4)
Microwave Ovens	(12.5)
Others	(37.7)
Wires & Cables	302.0
Dry Cells, Batteries, and their Parts	36.5

Source: MIDA

Chapter 4 Electronics Equipment and Components Industry

4.1 Trends of International Development

4.1.1 Characteristics of Production and the Scope of Electronics Equipment and Components Industry

There are generally three classifications of production for the electronics component industry. These are 1) consumer electronics equipment, 2) industrial electronics equipment, 3) electronics components (in this instance, the definitions of the U.S. Electronics Industry Association,"EIA") (see Table A1-4-1). Below, the electronics equipment and components industry will be analyzed from the viewpoint of industrial development. However, not only the electronics industry, but the manufacturing industries of related components used within the industry will, to some extent, be dealt with as well.

The features may vary among manufactures of the electronics equipment and components industry depending on the items being produced. In the case of manufacturers of electronics equipment end products, the focus of the production process is the assembly process. They are limited only to the production of some components. The remaining components are purchased from other component manufactures.

Of course, the component producers manufacturing features also differ depending on the type of components produced, whether the components be active components, passive components, functional components, mechanical parts and components, among others.

For active components, much capital is required for the production equipment, thus, the bigger the scale of production, the more advantageous it is. For this reason, the business enterprise within the company that has a large demand, is likely to have a strong competitive advantage. The performance of electronics products is controlled by the performance of active components, so a high level of technical skill is necessary during production. It is with this concern in mind that most electronics equipment manufacturers prefer to have active components produced in-house or by their subsidiary companies.

In addition,there are other factors why there has been a gradual movement lately toward such a trend, 1) the proportion of the active components to the cost of the electronics equipment, together with the intensifying market competition, has

increased and 2) the increased sophistication of the insert machine has resulted in the progressive automation of the labor intensive process involved in the production of active components. This development has enabled companies to cope with the labor shortage.

Passive components consist from many basic components and in general, specific parts are produced by speciality producers. Before the expansion of demand for electronics products, many of these speciality manufacturers, in the process of developing new products, cooperated with electronics equipment manufacturers in the development of new techniques to cut costs and improve quality. As a result, there have been many cases wherein sophisticated techniques were accumulated by the respective component producers. Therefore, there is now technical stability in the production of passive components.

The passive component is also one important element that has a significant impact on the quality, efficiency and cost of electronics end products. The effort of speciality parts manufacturers to rationalize and automate the production process is an outcome also of the labor shortage and the resultant spiraling labor costs. Moreover, to strengthen the research and development system, the production of passive components rapidly changed to one that is capital-intensive in nature. There was also a remarkable shift to overseas production. At the same time, procurement from foreign sources and the shift to overseas production by subcontracting companies are actively being carried out.

The production of the other general components is less specialized. There are many small and medium size component producers and the trend is to choose and procure the necessary components from them. In the case of a changeover to overseas production, the components can easily be shifted to the supplies from local industries.

The overseas production of the electronics industry from industrialized countries was at first to secure a foothold in the foreign market. Gradually, however, this evolved into the international trend to develop overseas production bases. The items to be produced are decided based on that country's relationship with major export markets (such as availability of preferential duties, and so forth), and the state of its support industries, among others.

In the case of Japan's electronics industry's overseas production bases, over 50% produce passive components, about 25% functional components and around 15% produce mechanical parts and components while the bases producing active

components do not exceed 10%. However, this figure varies depending on the region, as there is a great deal of production of active components in the overseas production bases in Europe and North America. In these regions, many countries have import regulations on integrated circuits, semi-conductors and CRTs, among others. Thus, the nature of production there is to secure the local markets. At the same time, support industries are already in place making possible the production of active components in these countries. On the other hand, in Central America, South Korea and Malaysia, among others, where a large part of the production process of many passive components is labor-intensive, the materials are imported.

It is also possible to attribute special characteristics to the production bases overseas from the point of the number of items produced per base. Countries with large domestic markets like Taiwan and South Korea where not only components but also, equipment is exported, in many cases the number of items produced per base is 1.5-1.6 items, Compared to this, in Singapore and Malaysia, where the production of components for export is the special characteristic, the figure are small, 1.1-1.3 items per base.

The international development of the electronics equipment and component industry, as shown below can be seen in terms of two trends. These are 1) the development of overseas production of electronics equipment and the parallel development of the production of components and 2) the development of overseas production of semi-conductors.

4.1.2 Development of Overseas Production of Electronics Equipment

The overseas production of electronics equipment began sometime go, a large part was aimed at the production of consumer electronics equipment for local domestic demand. At first it began with the local assembly of components sent by the parent company and the final products were sold in the local market. Thereafter, the demands in each country to localize production became stronger. In response to this, each manufacturer moved towards the procurement of necessary components within the country. In many cases, however, the items produced depend on the demands of that country.

Towards the latter half of the 1970's, another trend emerged wherein overseas production was seen as a way to avoid trade friction. In the beginning the focus was the production of color TVs. The production of color TVs in Japan was transferred overseas, sharply decreasing domestic production.

The production system in Japan was reformed to cope with the decline in production due to the transfer overseas and as a result, the development of VTRs advanced rapidly. Of course the component manufacturing companies also changed their products to match this shift.

The main factors for the promotion of overseas production during this period were 1) the worsening trade friction, 2) the rise of the electronics equipment manufacturers in NIEs, 3) the shift of demand in the industrialized countries' domestic markets from equipment for consumer use to industrial use equipment, 4) the necessity to reform the production system as a result of the opening of China's market, among others.

The strengthening of the Yen from 1985 onwards again encouraged overseas production. As for each type of electronics equipment, there was a rise in the number of production plants built for the purpose of exporting from the overseas production bases to a third country or to the home market. In such cases, products are specialized to specific items, and the scale of production is large to match the export market.

Since then, the manufacturers aimed for the horizontal international specialization. That is, the strategy was to move the production of low and medium quality products to ASEAN & NIEs and the high quality goods were manufactured in Japan.

For example, in the case of audio equipment, in Japan the focus of items being produced was changed from radio cassettes, to new types of products, such as car audio equipment, digital audio disk players, etc. As a result many radio cassettes are imports. Also, in the case of Taiwan, the production of radio cassettes has gradually decreased, but on the other hand, the proportion of stereo record players and CD players produced has grown. In contrast, the production of radio cassettes in Singapore and Malaysia have increased while the production of radios has declined. Even in the case of color TVs, in Japan, 19 inch models or less are produced overseas and there is a trend to produce large types or value-added products within the country.

In Japan and other industrialized countries, because of severe market competition, the life cycle of electronics products is becoming shorter. In response to this, however, the system is steadily being established. It can be said that one of indicator is the international change of items produced. As a countermeasure, first, there was an effort to shorten the lead time for product development. Through this, in

response to trends in the market, it became possible for new products to be development in a shorter period and then delivered to the market. For the formation of such a system, other than technical solution by means of introduction of CAD, an important role was played by a joint development work of manufacturers of electronics equipment and components. They also utilized, from the initial stage, the capability of their surrounding industries for research and development.

In other words, the existence of components manufacturers with the research development capability made the system viable. At the same time, it is understood that the overseas production is not appropriate for products which need to respond to kaleidoscopic changes of demand.

Also, advance in insertion technology was an important factor in the system as it contributed to the automation of the labor intensive printed circuit board assembly process. This is resulted in a countermeasure to the strong yen and the hike in labor costs. Meanwhile, effort was also made to bring cost down shifting production of technologically stabilized products overseas. Initially overseas production of middle level items commenced with a system to carry out the final stage of production in low-labor cost countries having kit components exported. However, within Japan, the cost of labor rose and from 1985 with the advancement of the rise of the yen, the cost of the kit components increased. Due to this, local production companies pursued measure to bring cost down increasing the percentage of local procurement.

In order to support this, an expansion of parts makers overseas took place together with the shift of production overseas of the electronics equipment manufacturers. this supplemented the shortage of local supporting industries.

As further once of the policy to develop overseas production bases, a measure is pursued to procure, as much as possible, from overseas sources for necessary parts for the domestic production in Japan or the production in the country than Japan, instead of exports from Japan.

4.1.3 Development Overseas Production of Semiconductors

In the case of semiconductors, the situation is slightly different from the cases of electric and electronics equipment. A production process of semiconductors companies the wafer fabrication process which processes silicon wafers to silicon chips for semiconductors and the assembly process. Once the semiconductors production enterprises concentrated in the Silicon Valley in the USA. They moved

overseas where low cost labor was available for a labor intensive assembly process as a result of a hike of labor cost in 1970s.

Though the assembly process is said to be labor intensive, the work force at a certain high standard is essential in order to secure a yield and raise the productivity since the assembly process contains fabrication and inspection steps which need to be more microscopic and precise than the assembly work of automobiles and consumer electronics appliances. Moreover, preferential measures on the investment, import and export were also needed as all the necessary materials were brought in and the produced parts were taken back to the USA. Eventually, production developed concentrating in such specific countries as Malaysia where these conditions were fulfilled. Recently, a part of the wafer fabrication process has also been shifted overseas.

Meanwhile, in the case of Japan, most of the semiconductor production enterprises remain in Japan as their production lines have been automated to cope with the rise of labor costs. However, there are a few cases of the shift of production to the present export markets where trade friction is anticipated.

4.1.4 Trends in the International Development of the Electronics Equipment and Components Industries

As indicated above, the production development of electronics equipment and components in the developing countries shows the following particularities.

1) importance is given to using these production sites in the developing countries as export bases. In particular, the active transfer of technically reliable and stable products is promoted.
2) there is an expansion of local components production. Enhancement of production by indigenous local industry in addition to the enhancement of local in-house production by equipment manufacturers or production by affiliate components manufactures.
3) there is an expansion of components imported by the parent company from its overseas production bases, and an expansion in the OEM supplies directed to the NIEs. There is also an expansion of imports of NIEs origin to the mother country. These trends further the international division of labor and result in a reorganization of the domestic industrial structures.

In the context of the above evolution, the countries besides Singapore and Taiwan which are given most emphasis as export production bases in the Asian region are Thailand and Malaysia.

However, the system of international supply of components aims at achieving a supply system which has long term reliability, and so necessary preconditions of the system include the reduction of delivery periods, the maintenance of product quality and an overall relation of mutual trust and reliability operating between the supplier and user. In countries where such a reliability nexus is not possible the local production of parts is limited to be carried out by foreign affiliates and the indigenous local firms remain outside of the components supply network.

4.2 Present Situation and Developmental Tasks of the Malaysian Electronics Equipment and Components Industries

4.2.1 Situation of the Industry

4.2.1.1 Production

The same three types of development which have been observed in the international development of the electronics equipment and components industries also occur with the stages of development of the Malaysian electronics equipment and components industries. The first type of development is that relating to the evolution of companies which begin production of domestic electrical equipment in response to the domestic demand in Malaysia for household electrical goods. In order to benefit from the preferential incentives accorded to exporting firms these companies also produce output for export but their basic focus is on the domestic market. Such companies are basically committed to a policy of continuing their development in Malaysia over the years to come and so actively aim to increase the ratio of locally produced components in their products. Such companies are dealt with in greater detail in Chapter 3 in the main report.

The second type is represented by the electronics companies and in particular the semiconductor manufacturers. In the early 1970s electronics companies worldwide, and especially in the USA, were faced by the problem of the upsurge in labor costs involved in the production of the massive number of transistors which constituted the mainstay of electronics components production and which were vital in particular for second generation computer production. As a countermeasure to this upsurge overseas production bases where production could be achieved at low cost were sought. As already mentioned, essential conditions for overseas production bases

included the possibility of assuring cheap superior quality labor capable of carrying out the delicate precision processing and inspection work required, the existence of incentives for overseas investments, and the existence of preferential export-import procedures. Malaysia was equipped with a system affording particular incentives to the electronics industry for 10 years since this was designated with pioneer status, provided support for the securing of plentiful, good quality labor, and promoted a preferential export import system through the establishment of the FTZ (Free Trade Zone) and LMW (Licensed Manufacturing Warehouse). As a result of these provisions and measures Malaysia was successful in attracting investments from the semiconductor industries.

The third type of development is represented by the electronics companies set up with the main aim of export, and these tend to specialize in the production of TV sets, portable telephones, computer peripherals and other lines of electronics devices destined for export. Many of these companies are located in the LMWs and FTZs. Their entry into Malaysia is largely a result of their appreciation of the availability of suitable infrastructural conditions, such as the availability of good quality labor, preferential import-export systems, provision of measures to facilitate and promote the entry of foreign capital, etc.

Thus from the establishment of the first semiconductor assembling plant at Penang in 1972 the electronics equipment and components industry has continued to develop and been regarded as one of the most important industrial sectors. Table A1-4-2 indicates that the expansion of this industry in recent years has achieved the remarkable level of an annual 28% growth in both production and export levels. Moreover, the continuing vigor of the sector can be seen from the fact that 418 companies obtained licenses for electronics devices and components production in 1991 alone.

The products of electronics equipment and components manufactured in Malaysia have changed considerably as can be seen from Table A1-4-3 which compares product lines for 1980 and 1990. The share of electronics components has decreased and the share of production accounted for by consumer appliances and industrial equipment has increased. The production of consumer appliances increased from 12% in 1980 to 23% in 1990. The expansion in production of industrial equipment has also been remarkable, increasing from 6% to 19% over the same period. This is the result of the appreciation of the policies favoring investment which were adopted by the Malaysian Government. Companies which initially carried out only parts production to re-import to their home country for assembly production increasingly decided to undertake an actual shift of assembly lines

over to Malaysia, and this in turn promoted the increasing value added of finished products. The targets for percentage distribution set initially in the IMP (Industrial Master Plan 1986–1995) were 24% for consumer appliances, 15% for industrial equipment, and 61% for electronics components, but these targets have already been achieved.

Table A1–4–4 indicates the proposed capital investment of projects for electronics equipment and components industries over the last three years. These figures reveal the marked trend towards investment in manufacturing projects for industrial electronics and components.

4.2.1.2 Exports

The electronics equipment and components industries are very important as export industries. The export of electronics equipment and components in 1986 accounted for M$7.1 billion which represents 46% of the M$15.4 billion recorded for the total export value of Malaysia industry as a whole for the same year. Further, in 1990 the export value of electronics equipment and components more than tripled the level reached in 1986 to attain a figure of M$22.1 billion representing 47% of the total national export value. Table A1–4–5 indicating the sector–wise breakdown of exports shows that the shares accounted for by consumer appliances and of industrial equipment increased, while the share of electronics components shrank accordingly.

The markets for exports are the end users in the case of finished goods, but in the case of components the export deliveries are made to parent company manufacturing units in home countries, in–house production lines located overseas, or the production lines of other companies in the case of OEM supplies. Further, some FTZ and LMW companies also carry out domestic sales though direct exports are the rule. Export marketing relies directly and indirectly on the marketing services of MNCs. Consequently the main export markets are in the main consumer countries of Japan, the USA, Europe, etc. or where the parent companies are also located. However, the MNCs have moved into Malaysia since they recognize an increased potential for new markets to be opened up and this change has resulted in an increasing delivery of products to new markets, and since the components being manufactured are used by almost all computer manufacturers worldwide the export markets served continues to expand some cases.

4.2.1.3 Structure of production

The electronics equipment and components industries in Malaysia can be classified in the following three categories in terms of their managerial, technological and marketing characteristics.

(1)MNCs and joint venture MNCs

These are electronics equipment and components companies of the USA, Europe or Japan which set up locally incorporated companies or established joint venture companies in conjunction with local industries. These are almost all in the manufacturing sectors. Some of the companies are located in the FTZ and are large size companies employing between 1,000 to 3,000 personnel established with the aim of exporting output. These rarely deliver to the domestic market. However, some of the middling to small size companies are established as components suppliers and as well as carrying out direct exports in many cases these also supply domestic assembly manufacturers. There are a large number of production lines on a big scale equaling or even surpassing the scale of their counterparts in home countries.

(2)Local large companies

The number of local companies is extremely small but their scale, paid up capital and the number of personnel are relatively large. Personnel numbers vary between 500 and 5,000 employees and so there is a considerable gap between the extreme cases. These companies focus on the production of devices and parts which do not require a high level of precision.

(3) Local SMIs

Many of the companies are of a home industry type, and personnel number range from a few operators at one end of the scale up to about 100 at maximum. The product items manufactured are not of a sophisticated type and are limited to those items which can be produced with relatively simple processing in most cases.

4.2.1.4 Industrial categories and product lines

As can be seen from Table A1-4-6 the MNC and J/V companies are engaged in the production of a very wide range of electronics equipment and components.

The products manufactured can be classified into those for consumer use, those for industrial use and production of electronics components. The main items of goods for consumer use are TV sets, video equipment, and video cameras followed by audio equipment. Representative electronics components are integrated circuits, followed by monolithic ICs such as transistors, diodes, etc. In addition to the above product lines the importance of computer related items like magnetic heads for floppy disks, hard disks, floppy disk drives, etc. is increasing.

The production of the local industries of the SMI category is limited to peripherals for electronics products. Representative items include electric socket plugs, electric cable, etc., and output is restricted to those items which can be produced with a relatively small scale of production facilities.

There is a large technological gap separating the level of production technology in the large local industries from that of the multinationals. For example, while it is possible for the large local companies to produce single layer printed circuit boards the manufacture of multi-layer printed circuit boards is not possible. Further, in the case of silicon base ICs, companies do not possess the production technology for the wafer fabrication or for the assembly process which make possible the integrated production of such ICs.

4.2.1.5 Distribution of local industries

Local industries are by and large concentrated in the western part of Peninsular Malaysia around Selangor, Melaka, Penang and Johor. According to the MIDA Directory of Existing Electrical Product Manufacturers (March, 1991) and the Directory of the Electrical and Electronic Products Group of FMM the regional distribution of electronics parts and appliance industries can be summarized as follows. (Both are slightly different each other.)

	MIDA	FMM
Johor	22	25
Kedah	1	4
Kelantan	1	–
Melaka	2	9
Sembilan	1	–
Pahang	–	–
Penang	20	15
Perak	5	6
Perlis	–	–
Selangor	57	57
K.L.	13	20

Sabah	–	–
Sarawak	3	–
Total	125	136

The areas where these industries are concentrated have the following characteristics.

1) They are regions of relatively dense population. Much of the production processing is not easily automated (e.g. transistor assembly, the assembly processing stages for semi conductors, etc.) and so plentiful labor is needed.
2) There are well furnished industrial estates, FTZ and LMW in these areas.
3) The areas are well provided with infrastructures and in particular of transport facilities such as convenient location of airports, etc. for the transport of finished products overseas.
4) These areas are close to markets. In particular, Johor has easy access to the market of the neighboring country of Singapore.

4.2.2 Development Tasks

The main task facing the electronics equipment and components industries of Malaysia in their efforts to continue developing is the maintenance of the competing power of their exports. To present the supply of relatively cheap and good quality manpower together with the continuing improvement of infrastructure provisions such as communications and transport networks, and utility provision, have meant that most of the conditions required have been satisfactorily met, and this has placed Malaysia at an advantage over other countries in attracting the investment of the electronics equipment and components manufactures. However, in the future it is anticipated that neighboring countries and China to be joined by Vietnam and its neighboring countries in the more remote future will be able to develop and provide similar conditions. In any case, Malaysia has already lost its advantage in terms of providing a supply of cheap labor.

The basis for maintaining future competing power must be achieved through a shift away from simply processing imported components towards the domestic production of basic materials and components in Malaysia itself so as to enhance the overall competing power of the industry. Since cost, quality and production/delivery management are all fundamental elements of competitive power it is necessary to integrate these aspects to achieve their optimum competitive level at all stages of components/materials production and assembly. The following examines the main tasks facing the electronics equipment and components industries in achieving future development keeping these factors in mind.

4.2.2.1 Localization of electronics industries

Linkage with other industrial sectors is vital for the electronics equipment and components industries. Thus when a MNC moves into Malaysia a large number of equipment and components suppliers needed to support the entry of the MNC also undertake entry. For example in the case of IC/LSI production the following components/material suppliers will be involved:

- silicon manufacturers
- manufacturers of the plastic or ceramic packaging material
- die and mold manufacturers
- manufacturers of the gold and aluminum wire used for wire bonding
- lead frame manufacturers

Moreover the entry of companies which carry out the supply and maintenance of production equipment will also take place and so manufacturers of semiconductor production equipment, clean room suppliers, companies supplying pure water equipment will enter the region.

However, to date all of the supporting companies have been foreign affiliates and links with local industries have not taken place.

4.2.2.2 Technical levels and sources

In the case of the MNCs product specifications and production technology are basically transferred from the home country. There is no cooperation with local industries to carry out research and development when applying technology for the local development and production of sophisticated products. In the vast majority of cases the important work is all done on an in-house basis or the technology already developed at the parent company is simply transferred as it is. As a result there is almost no opportunity given to the local industries to carry out projects which require an advanced level of product development or production and orders for finished products are rarely received from the MNCs, and orders are limited almost entirely to appliances and parts of a relatively low technical nature. Consequently the opportunities open to local industries for technological development are very small and technological capacity is not developed.

As a result of the above situation the ratio of equipment and components supplied to the MNCs by local industries has remained at a very low level. It is estimated

that in Malaysia the percentage of parts delivered from genuine local companies (that is leaving aside the companies which are foreign affiliates) is on average about 10% of product content in the case of the electronics equipment and components industries. However since this estimate includes the packaging of finished products the actual locally supplied content of the finished product itself would probably only be between 6 and 8%. In the case of some product items there is virtually no local content if one leaves aside packaging materials.

The Government of Malaysia is committed to the further promotion and expansion of locally delivered content in the form of components or basic materials. For government approved projects in the electronics equipment and components industries which have a local content over 50% special tax incentives are available after three years of commercial operation. On the other hand the incentives and preferential measures accorded to parts supplies coming from Singapore and other NIEs which have been in force formerly have been done away with. Table A1-4-7 indicates those items which are targeted for future local production.

4.3 Systems for the Promotion of Standardization and Quality Control and their Requirements

4.3.1 Quality Control

4.3.1.1 Actual situation of quality control

The performance and reliability of electronics components has a vital influence on the performance of the electronics devices using these parts. In Malaysia the final stages of production of both electronics equipment and components is carried out by MNC, joint ventures with MNC and also by local large industries. Consequently, rigorous quality inspections are carried out by the MNC etc. when purchasing parts supplied by the local indigenous parts manufacturers even though these are usually only plastic parts and not actual electronics items. Company guidelines for such quality control methods have already been established on an in-house basis by the MNC, etc. and parts suppliers are required to meet the same levels of quality control.

In actual practice the level of quality control which is demanded of a component manufacturer will vary considerably according to the performance levels which the components concerned are expected to meet. Since active, passive and functional components exert a considerable influence on the total performance of electronics equipment these are produced in conditions of strict quality control either by the

local affiliate of the MNC itself, by foreign affiliate components manufacturers or in J/V companies. Consequently the defect rate for parts is extremely low. On the other hand, in the case of single parts of a component or mechanical type, such as cables, plugs, simple switch connections, etc. production is often carried out by local SMIs, and quality control is not always completely reliable. Consequently there is a relatively high defect rate, and such defective parts are eliminated at the purchasing stage by the electronics appliance manufacturers.

There are considerable differences in the situation for quality control application existing between the indigenous SMIs and the MNCs or their J/Vs. Some of the local SMIs have their own independent quality control systems, have established a quality control department who carry out quality control using a manual for incoming, in-process, and outgoing process. However, in general quality control is limited in many cases to a simple visual inspection of finished products when these are leaving the factory. Even in the case of those factories which divide operations according to the incoming, in-process, outgoing system mentioned above often only carry out these control operations through visual inspections.

Many of the MNCs or their J/Vs have introduced the same quality control systems developed in the parent company, and so methods and QC organization are highly sophisticated. This is a result of the policy of such companies to produce the same product in all factories throughout the world using the same production methods and the same quality control systems.

4.3.1.2 Organization of quality control

As can be seen from Figure A1-4-1 a large difference existing between the organization of quality control in the MNCs and their J/Vs on the one hand and the local indigenous industries on the other is that while the former usually have an independent Quality Control Division or Quality Assurance Department (or Group), who are in direct contact with company CEO or Executive Vice President level management concerning operations and data, the highest level of feedback in the latter companies is the head of the Quality Control Division. These organizational differences in turn result in considerable difference in a company's ability to assure personnel for quality control. In the local SMIs it is almost impossible to secure personnel to take charge of quality control. Specialist staff are absorbed by the MNCs. Therefore the local SMIs are obliged to call in specialist consultants from outside in cases where it is necessary to apply the ISO 9000 Series for example.

In many cases quality control is implemented in response to demands made by clients. However, when the clients are themselves SMIs the required quality parameters tend to be of a low level and when the clients concerned are large scale industries the orders for parts to be supplied are either only for small lots or else are for relatively unimportant parts so that again the required level of quality control is not placed very high. This situation forms an obstacle to the promotion of quality control among the local SMIs.

4.3.1.3 Inspection and testing equipment

A similar gap between the MNCs and their J/Vs on the one hand and the local SMIs on the other is also observed with regard to the inspection and testing equipment available. The former are equipped with their own in-house facilities since they are world giants among the semi conductor and electronics appliance manufacturers. Rigorous testing and inspection is carried out before the finished products leave the factory. Further, in cases where necessary equipment is not available in the company the facilities of another company are employed to carry out the inspection and testing. The testing equipment of the local SMIs is confined to simple testing devices, oscilloscopes, etc. As a result components which can be ordered to the local SMIs have to be limited to those which can be tested using such simple inspection and testing devices.

4.3.1.4 Personnel training

Almost none of the local SMIs carry out training to form quality control personnel. In the MNCs quality control training is thorough and training courses are conducted by in-house or external lecturers who are specialists in quality control and incentives are given to encourage employees to complete such courses. Such incentives include special allowances, special training programs at company head offices for trainees achieving excellent results, placement as lecturer for in-house seminars and training programs, etc.

However the MNCs are also faced with a number of problems in the forming of personnel resources. One problem encountered is the difficulty of communication resulting from linguistic differences. In particular, communication between the foreign managers and local operators is rendered difficult because English ability among the younger generation seems to be in decline. Further, even among the local operators themselves communication problems sometimes arise with operators from differing linguistic groups. Also insufficient education is another reason besides the linguistic barriers which impedes the diffusion of quality control princi-

ples. In particular the mathematical knowledge needed to grasp the basic concepts underlying quality control is wanting.

4.3.1.5 Need for correct understanding of QC

Generally speaking there is a strong interest among the electronics equipment and components industries of Malaysia in quality control. However, there is still insufficient understanding of some of the basic points and concepts of QC. For example, phrases such as TQC or the 5S are widely known but the actual application of these principles is very rare. Further, management of the SMIs are often convinced that quality control costs too much money, involves more time than its benefits justify, and that it is quite sufficient if finished products pass the tests carried out at the time of dispatch. The necessity of the ISO 9000 is recognized, but its observance is largely to meet the demands of clients and so emphasis is placed on organizing the minimum documentation necessary, and quality control is not thoroughly applied in many cases.

4.3.2 Standardization

4.3.2.1 International trends in standardization

There is a trend to bring together and coordinate the international standards applying to products of the electronics manufacturers (including equipment and components) as IEC standards. The IEC standards cover all of the standards relating to products with electrical characteristics. Of course individual countries have their own particular national standards but there is a trend to bring these into line with the IEC standards.

4.3.2.2 Standardization trends in Japan

The JIS standards for electronics products are regulated by the JIS C Series of comprehensive standards for electronics and electrical engineering. The C Series covers about 210 different standards which are classified into a number of sub series relating to communications, electronics equipment and components. Transmission control protocols and interface mode standards for communications systems have been transferred to the information processing section constituting an independent system of standards called the X Series. After the separation of the X Series there remain 121 standards divided among the sub series of communications, electrical appliances and parts of the JIS C Series.

Basic standards	4
Resistors	23
Condensers	20
Quartz crystal oscillators	6
Convertors	8
Connectors	14
Printed circuit boards	14
Flanges	2
Cathode ray tubes	2
Semiconductors	5
Reliability standards	23

Both the JIS and EIAJ (Electronics Industry Association of Japan) define the standards for reliability tests on electronics components. The most representative of these standards are shown in Table A1-4-8.

Rapid technological advances continue to be made in electronics components with the miniaturization of electronics chips, higher density of circuit, insertion technology for printed circuit boards, as well as revolutionary advances of the development technology for new generation components such as three dimensional type LSI. A strong awareness exists of the need to promote standardization in these new areas. In particular the establishment of standardized testing methods for reliability, performance evaluation, environmental aspects, and life cycles are being furthered at present.

4.3.2.3 Standardization activities in Malaysia

In order to assure the safety of electric equipment and products delivered to domestic markets in Malaysia a number of compulsory regulations have been established. According to the MS catalog at the present time of December 31, 1991 there are 219 MS which relate to the electronics and electric industries. There are 36 standards relating to the electronics equipment and components industries which are included in the MS 400 Series. Almost all of these establish the glossary of terms relating to the electronics equipment and components industries, while some of the items regulate the testing methods for finished products. Moreover almost all of these standards were based on the IEC standards.

Since production of electric equipment and components is often carried out with the aim of exporting output, the standards of the country issuing orders are often used. For example, in cases where the client is a Japanese firm either the company standards of the client or the JIS are used. In many cases the standards of the Electronics Industry Association of Japan (EIAJ) are used for testing methods. If the end user is a Canadian client then the CSA are employed, and for American clients the SIA or NIST are employed.

4.3.3 Future Trends in Standardization and Quality Control

The electronics equipment and components industries of Malaysia are almost entirely composed of MNCs originating mostly from Japan, the USA or European countries. Moreover the markets of these MNCs are almost all outside of Malaysia. This background is important to keep in mind when considering the future direction which standardization and quality control are likely to take.

4.3.3.1 Standardization trends

In order to respond to the expansion in local production of electronics components it is increasingly necessary to establish standards for reliability and testing methods for individual parts. For example among the C Series of JIS standards there are more than 30 types of standard concerning the rules and methods for reliability and testing methods used in the case of the sub series of communications devices, and electronics equipment and components. These 30 standards cover a wide range of items from electronics components in general down to particular single parts such as individual printed circuit boards, condensers, quartz crystal oscillators, connec-tors, convertors, etc.

Further, it is necessary to establish standards in line with the IEC standards in order to respond to the international nature of the electronics equipment and components industries of Malaysia. In the case of the JIS standards of the 210 standards of the sub series relating to communications devices, electronics equipment and compo-nents about half (95 items) were established along the lines of the IEC standards. This fact illustrates the acceptance and employment of standards conforming to the IEC standards by Japanese electronics equipment and components industries in their actual production and distribution activities.

4.3.3.2 Reinforcement of public testing and inspections

Precision is a necessary requirement of inspection equipment for representative electronics equipment such as semiconductors. In the case of the electronics equipment and components industries in Malaysia which are MNCs, the equipment and components required for inspections and measurement are well provided for within the company. In particular, the manufacturers of integrated circuits which demand the most delicate processing among electronics components, are equipped with inspection and measurements equipment virtually on a par with those to be found in the parent company in the home country. Such companies have fully

integrated in-house systems for all processing stages from production down to final inspections and measurements. Companies in Malaysia which are not equipped with their own inspection and measuring equipment or some of the MNCs which lack equipment for specific inspection functions often make use of other factories in their company network which are located in neighboring countries beginning with Singapore.

Generally speaking the links between the electronics equipment and components industries in Malaysia and the SIRIM are not very close. This is taken to be for the following reasons.

1) The lack of testing and calibration equipment, the shortage of personnel resources and the general insufficiency of SIRIM's capability.
2) The extreme concentration in Shah Alam. The insufficient installation of equipment and facilities in Penang, Johor and Kuching.
3) Since the electronics equipment and components industries and the MNCs of these are export orientated, the standards used for products are either those of the companies in export markets or their national standards, and so the MS standards are only applied to finished products in rare cases.
4) Since the MNCs are well provided with in-house testing and inspection equipment it is possible to meet company needs without resorting to the assistance of SIRIM.

In view of the historical development of the electronics equipment and components industries in Malaysia to date the above situation is perhaps inevitable. However, hereafter as the local content of parts production increases in the future the participation of local indigenous companies in the industry will increase and there will be an increasing need for well equipped public testing and inspection systems. It is possible to carry out services for the calibration of measuring devices and equipment to some extent using the current system but sophisticated performance testing is largely beyond the scope of the present system. Such inadequacies are also evident in the Kuala Lumpur and Selangor districts but they are especially marked in the Johor and Penang districts where the greatest concentration of electronics equipment and components industries are located.

Table A1-4-1 INDUSTRY CLASSIFICATION OF ELECTRONICS INDUSTRY

Classification (1)	Classification (2)	Classification (3)	Products (Examples)
Consumer electronics	TV		
	VTR		
	Video camera		
	Radio		
	Audio component & equipment		
	CB Radio		
Industry electronics	Communication and its application equipment	Wired communication equipment	
		Radio communication equipment	
		Others	
	Electronics application equipment	Computer and its application equipment	
		Other computer application systems	Wordprocessor, high-grade typewriter, electronic calculator
Electronics components	General use	Active components	Resistor, Condenser, Coil, Capacitor
		Functional parts	Speaker, Small mortor, Magnetic head
		Mechanical parts	Connector, Switch, PCB
		Others	Magnetic tape
	Active components	Electronic tubes	
		Semiconductors	
		ICs	
	LCDs		

Table A1-4-2 PERFORMANCE OF THE ELECTRONICS INDUSTRY IN MALAYSIA

Year	Output		Employment		Export	
	(M$ Bil.)	Growth Rate (%)	(No.)	Growth Rate (%)	(M$ Bil.)	Growth Rate (%)
1986	6.5	–	57,000	–	7.1	–
1987	8.9	36.9	89,000	56.1	9.2	29.6
1988	12.2	37.1	106,000	19.1	12.4	34.8
1989	15.9	30.3	123,000	16.0	17.2	38.7
1990	20.3	27.7	144,000	17.1	22.1	28.5

Source: MIDA

Table A1-4-3 PRODUCTION RATIO BY TYPE OF APPLICATION IN MALAYSIA

(Unit: %)

	1980	1990
Consumer Electronics	12.3	23.2
Industrial Electronics	6.2	19.2
Electronics Components	81.5	57.6
Total	100.0	100.0

Source: MIDA

Table A1-4-4 CHANGE IN PROPOSED CAPITAL INVESTMENT IN MALAYSIA

	Proposed Capital Investments (M$ million)	No. of Manufacturing Company Approved (No.)
1988	1,039.4	61
1989	2,023.1	110
1990	4,521.8	245

Note: Total number of companies approved and in production was 420 at the of 1990(Consumer electronics 81, Industrial electronics 85, and Electronics components 267 with double counting 13).

Source: MIDA

Table A1-4-5 EXPORT OF ELECTRONICS BY TYPE IN MALAYSIA

(Unit: billion M$)

	1986	1990
Consumer Electronics	0.9	5.5
Industrial Electronics	0.4	4.9
Electronics Components	5.8	11.7

Source: MIDA

Table A1-4-6 MAJOR PRODUCTS OF ELECTRONICS INDUSTRY IN MALAYSIA

Electronics Components (Semiconductor and Assembly Products)	ICs/Semiconductros	Linear ICs
		Digital ICs
		Memory
		Microprocessor
	Optical Conversion Devices	Optoelectronics Components (Cables, Couplers, Repeaters)
		Diodes
	Others	Hibrid ICs
		Capacitor
		Relay
		Switch
		Connector
		Coil
		Transformer
		Resistor
		PCBs
		Casette Componets
Electronics Equipment for Consumer and Industry Applications		Audio, Video Equipment (TV, VCR, Video Camera)
		Audio Equipment (Radio, Taperecorder, Car Stereo)
		Paging Equipment
		Mobile Telephone
		Key Telephone
		PBX
		Computer and Peripherals
		I/O Devices
		Others (Socket Plague, Cords)

Source: MIDA

Table A1-4-7 FUTURE TARGET OF ELECTRONICS PRODUCTS IN MALAYSIA

Wafer Fabrication	
Components for Computers	
Lead Frames	
CRT	
Micro-Motor	
Switches	
Connector	
Bonding Wire	Gold Aluminum
Packaging Products	Ceramics Plastics
Component for PCBs	
Component for Disk Drive	
Magnetic Head	I/O Device Control Arm
Other Components	

Source: MIDA

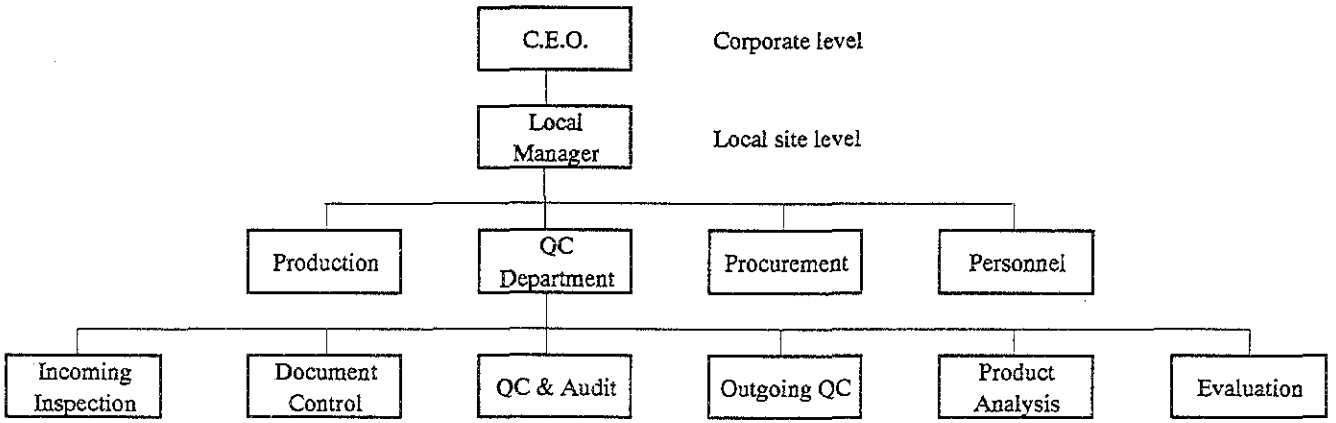
Table A1-4-8 GENERAL TEST PROCEDURE BY JIS AND EIAJ IN JAPAN

Kind of Standards	Standard No.	Contents
JIS Standards	JIS C5003	General Test Procedure of Failure Rate for Electronic Component
	JIS C5020	General Rules for Test Procedure of Durability and Mechanically Strength for Electronic Component
	JIS C5700	General Rules for Reliability Assured Electronic Component
	JIS C7021	Environmental Testing Methods and Endurance Testing Method for Discrete Semiconductor Device
EIAJ Standard	EIAJ SD-121	Environmental and Endurance Testing Method for Discrete Semiconductor Device
	EIAJ IC-121	General Rules for Reliability Assured Integrated Circuit

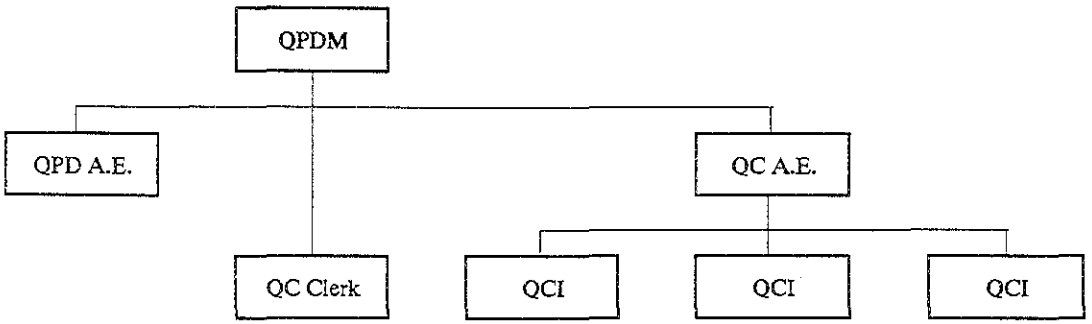
Source: JIS

Figure A1-4-1 ORGANIZATION STRUCTURE AND QC ACTIVITIES IN THE ELECTRONICS INDUSTRY IN MALAYSIA (EXAMPLES)

(1) Typical QC Organization of Multi-National Companies



(2) Typical QC Organization of Local Companies



Notes: QPDM: Quality Product Department Manager
QPD A.E.: Quality Product Department Assistant Engineer
AC A.E.: Quality Control Assistant Engineer
ACI: Quality Control Inspection

Chapter 5 Plastics Industry

5.1 Situation of International Development

5.1.1 Expansion of the Functions of Plastic Materials and of Their Uses

The plastics industry in industrially advanced countries has grown with the support of increases in demand for plastics for use in the electric and electronics, automobile, machinery and equipment, and other industries. Of these, the automobile industry accounts for 63% of demand for plastics and has particularly strong influence. Following this industry in share of demand is the electric and electronics products industry, which is the source of 31% of demand (refer to Table A1-5-1).

There has been remarkable consumption of plastics by the automobile industry where plastics have been used for weight reduction as a means of improving fuel efficiency, and as a replacement for metal to eliminate the problem of rusting. For example, in Japan the share of automobile (compact and sub-compact passenger cars) demand for plastic materials, as shown in Table A1-5-2, rose from 2.9% in 1973 to 7.3% in 1992. It has been forecast that the Japanese automobile industry in the future will provide about 20% of national domestic demand.

The composition of products of the electric and electronics manufacturing industry, by type of material, varies greatly according to product type. Washing machines, for example, as shown in Table A1-5-3, have shown a 48% increase for plastics during a recent 10-year period.

Factors such as an increase in weight per unit product and the volume of total consumption, being added to the effects of the increase in use of plastics in terms of their share of materials consumption, have resulted in amazing growth of demand for plastics. It is expected that this will continue unchanged as a trend in the future.

Resins presently used are mostly general-purpose resins; in the case of the automobile industry, for example, the three most heavily used resins account for 60% of demand for resins. Similar ratios are even higher in other industries: about 71% in electrical equipment, 76% in electronics equipment, 76% in precision and optical equipment, 82% in railroad cars, and 86% for housing equipment.

As a future trend of consumption, however, in keeping with the above-mentioned trend of greater consumption of resins as materials, use will increase for making parts that have special, new functions, so growth of resin consumption will show a

shift from general-purpose to high-performance resins. This shift is already evident.

At the same time, requirements tend to be more sophisticated in the area of molding. Special, specific designs have been common in the case of electronics and electrical products, but as need increases for lighter products, reduction of noise, and ease of assembly, there will be stronger requirements of forming structural parts in one piece, of making parts with integrated wiring, and of eliminating painting, printing and attachment processes, resulting in greater demand for complicated, high-precision forms. In the automobile parts field, in addition to increases in uses of parts that are small yet strong, durable, and of high precision, in the case of larger forms more and more will have to be such as to permit easy disposal after the vehicles are scrapped, and there will be more instances of combining parts that had been separate and thereby reducing the total number of parts needed.

5.1.2 Development of the Plastics Industry in Developing Countries in Consequence of Shift of Parts Industry to Those Countries

As is pointed out in the chapter devoted to the automobile industry, there is an ongoing transfer to shift production capacity from the already industrialized countries to other countries. There is at the same time an increase in local procurement of materials and parts. There are two types of local parts procurement. One type is when a parts maker of an industrialized country expands overseas (in some cases by means of a joint venture) in conjunction with expansion by a company that uses its products. The second type is when the parts company identifies a company abroad that has potential and decides to cooperate with it so as to develop the relationship into one of buyer-supplier. This kind of behavior has been evident in the plastic processing industry, member companies of which having expanded overseas after major users of their products, such as companies in the electrical and electronics industries or the automobile industry expanded overseas.

In this case, as stated below, there is a strong tendency among non-Malaysian user companies to rely on non-Malaysian plastic forming companies for high-precision parts. Further, almost all forming by Malaysian firms is done with molds provided by the user and the user may even instruct the former as to what specific resin to order. This is done in order to assure that the precision of the products will be maintained. Domestically-produced molds are usable only for forming products for ordinary daily use, or products that are not required to have high precision. This situation poses a problem for user industries that might otherwise prefer to procure plastic parts in-country, and is one of the reasons for the existing dependen-

cy on imports for certain parts. In order to achieve technical improvement of local supply capability it is thought to be an urgent matter for the growth of the plastics processing industry.

5.2 Present Situation and Issues of the Plastic Processing Industry in Malaysia

5.2.1 Outline

The plastics industry in Malaysia was at the cottage industry level when it began to supply daily-use sundries and packaging materials for the domestic market early in the 1950s. In 1968 it was comprised of 68 companies, and in 1973 of about 300.

From the latter half of the 1970s to the first half of the 1980s, a large number of multinational electronics and electric equipment manufacturers began to expand to Malaysia, and this process accelerated thereafter. Many companies from Japan, America and Europe established a presence in Malaysia. More recently, expansion in Malaysia by companies from South Korea, Taiwan, Hong Kong and Singapore has been evident. In accordance with this, there has been a swift increase in the number of companies engaged in producing plastic parts for the electrical and electronics industry. They include not simply some of the existing plastics processing companies but new entrants from overseas as well, some of which have set up joint ventures, as well as some created by companies that are seeking to diversify and had never done plastics processing before, so that now there is a total of about 800 companies, that have annual value of production of M$18 million and employ 60,000 persons. This growth, as shown in Table A1-5-4, has been especially pronounced during the past four years.

5.2.2 Industrial Structure

5.2.2.1 Output by use

The share of production, by product, is shown in Table A1-5-5. Comparison of the shares of output by user industries with the shares in other countries is provided in Table A1-5-6. The shares of packaging and materials demand, and demand from the electrical and electronics sector, are high relative to those of the others. The packaging material industry's products are not only consumed in Malaysia but also are exported in considerable quantity to the United States, in contrast to demand from the electrical and electronics sector, where the products are used by foreign-owned or foreign-affiliated companies for production of goods that in-

clude some that are destined for export markets. Demand from the automobile industry, the special case of Japan aside, is already at a considerably high level. Nevertheless, it is thought that there is still room for further growth.

5.2.2.2 Types of company

The following three types of plastic processing companies can be seen in Malaysia.

1) Group No. 1: Foreign-affiliated companies that have expanded to Malaysia because companies that they sell to have moved to Malaysia or adjacent countries are often present in joint ventures. They can make use of technology from the parent company, and rely on it for R&D. There are many companies in the electric and electronics, or automobile parts industries, but there are also some that are in the packaging materials business where specialized technology is used.

2) Group No. 2: In keeping with the growth of demand, and especially demand in user areas such as electrical and electronics, and automobile parts industries where a relatively high level of technology is required, some existing plastic processing companies, or new entrants, have expanded existing plants with the cooperation of user companies. They are dependent on their users for technology and the bulk of market demand, and there has been a considerable amount of transfer of technology. In the case of these companies, however, in general there is no development of products or materials, or research on production technology, as they are almost totally dependent on the user firms. These users are for the most part foreign-owned or foreign-affiliated companies, and in the event that they do not have their own technology, they achieve a transfer by means of the cooperation of the parent company, that obtains the necessary technology from a plastic resin company, or a machinery maker, or from a plastic processing company. Moreover, the resins to be used are specified by the users, and in almost all cases the molds are provided by the users. Most of these companies simultaneously continue to manufacture with their own technology the products they had previously made for sale to the general market, but in general there is a gap in quality between these companies and the first-mentioned type.

3) Group No. 3: There are also local companies having no relationship with foreign-owned plastics processing firms or users that have established themselves in this industry by their own efforts. In many instances, these companies make packaging materials or items for home use. The makers of packaging materials

produce shopping bags and do not have the specialized technology needed to make plastic materials for food packaging. There are many companies in this group that have made their own efforts at technological development, and export their products, or have developed new uses for their products. The sources of their technology are limited to resin makers and machinery makers or the like, and they do not have sources for expertise such as printing technology.

5.2.2.3 Number of companies by processing type, and company scale

The number of companies in the injection molding and film/sheet extrusion business are extremely numerous, as shown in Table A1-5-7, a situation that reflects the composition of demand as described above. Injection molding companies comprise the No. 1 and No. 2 groups that have relatively advanced technology, having the electric and electronics industries and the automobile parts industries as their major users, and No. 3 group, that makes household goods. Film/sheet extrusion companies, however, are mostly of the No. 3 group.

Regarding company scale, about a third of all companies have 50 or more employees, but only about one in ten has 200 or more. As stated above, the companies in groups Nos. 1 and 2 are large or medium in scale, and in No. 3 the companies are small or very small.

5.2.2.4 Regional dispersion of companies

The regional dispersion of companies is as shown in Table A1-5-8. Plastic processing companies tend to concentrate in Penang, Selangor/Kuala Lumpur and Johor, where there are many electric and electronics companies. This is particularly the case for injection molding companies.

5.2.3 Supply of Resins

Consumption of resins has increased in keeping with development and expansion of the plastic processing industry and reached the level of 325,000 tons in 1990 (Table A1-5-9). At present supply is totally dependent on imports except for PVC and polystyrene. However, there are plans for additional polystyrene capacity, as well as initiation of production of polyethylene, polypropylene, ABS and other resins; some of the projects are under construction and others have reached the phase of startup of commercial production. If all projects that have been planned are realized, in 1995 not only will it be possible to satisfy domestic demand for many plastics but there also will be a possibility for there to be export capacity.

5.2.4 Future of the Industry

The major areas of growth in the plastics industry for the next few years will be:

(1) Supplying parts and components and packaging and insulation material for electrical and electronics industries

The electrical and electronics industry will continue to play an important role in the manufacturing sector based on the number of electrical and electronics projects being approved by the government recently. This trend will lead to greater demand from locally made plastic parts and components as well as packaging and insulating materials. The government's local content policy whereby companies granted tax incentives must achieve a minimum of 50% local content by the third year of operation goes a long way to help boost the consumption of plastics manufacturing.

(2) Supplying engineering parts and components for automotive industry

The government's new policy which takes effect from January, 1992 and which requires all locally assembled cars to have at least 30% of their components manufactured locally is a definite boost to greater local sourcing of plastic components and parts such as dashboards, bumper protectors, etc.

(3) Export of packaging materials like films, bags and sacks

With the on-coming local production of plastic raw materials such as polypropylene and polyethylene, it is expected that there will be abundant supply of raw materials and if local raw materials are available at competitive prices, this will surely encourage more and more of the local plastics manufacturers to export, especially those who are involved in the film extrusion sector.

According to the Malaysian Plastic Manufacturers Association (MPMA), during the five-year period of 1990-1995, polypropylene demand will increase at an average annual rate of more than 15% (Table A1-5-10).

5.2.5 Issues in the Industry

There have been two major reasons for rapid development of the Malaysian plastics industry, namely:

1) As a result of many years of seeking to attract foreign investment, and improvement of the infrastructure, whereby the environment for investment was improved, many foreign companies have invested in Malaysia, and one result thereof has been the development of the electrical and electronics industry; and

2) Foreign-affiliated companies have increased their local content ratios, as a result of incentives and regulations concerning local procurement of parts and materials.

However the following points must be considered.

1) In order for there to be further progress in local procurement of parts, materials, etc., there must be another step forward in the production of parts that they may have higher quality than those now being made in Malaysia.

2) Improvement of the competitiveness to secure domestic users must be sought, in preparation for liberalization of markets following the realization of the ASEAN Free Trade Area (AFTA) and the implementation of the ASEAN Common Effective Preferential Tariff Scheme (ACEPT).

3) Competitiveness must be improved further so as to develop as export industries in the future.

Further, the following are needs to be originated from outside the existing plastics sector, that are needed to support further development of the plastics industry.

1) Review of protective measures for domestically produced resins (including those which will be produced domestically in the future).

2) Support for production of high precision molds in Malaysia.

3) Support through tax measures and credit policy so that investment may be made in rationalization including relocation of production facilities.

4) Strengthening of systems in support of implementation of quality control.

5) A system for finding solutions to support of production technology problems of small and very small companies having no source of appropriate technology.

5.3 Needs and Approach for Standardization and Quality Control Promotion

5.3.1 Status of Standardization and Quality Control

5.3.1.1 Market types from viewpoint of level of quality required

(1) Molded plastic products

Regarding molded plastic products, there are three types of markets, 1) electrical products, 2) automobile parts, and 3) general goods. The products are produced according to the customers' specifications in the case of the first two, whereas in the case of the third market, the products are their original ones.

Quality requirements for the first two markets are high, and vendors not only must satisfy the buyer's specifications, but often is requested to sign a Quality Agreement or Inspection Agreement. Moreover, the vendor must consent to periodic and unscheduled inspections by the user who is to confirm that quality control methods are properly in use. There is further a difference in the methods of quality control required by different user industries, although some methods are used in common. Almost all the users are foreign-affiliated companies that expect quality control to conform to the standards and procedures adopted by the parent companies.

At present it is common for users to require their in-house quality control methods although the producers have acquired the quality control certification based on ISO 9000 Series.

(2) Plastic packaging materials

There is a difference in the quality required of makers producing plastic shopping bags and those making packaging material for foodstuffs. Standards are lower for the former which are produced mostly by small and very-small local firms, and it is simple to check on the raw materials used, or product quality. The quality of food packaging materials is high as these are made by foreign-affiliated companies that use advanced technology.

5.3.1.2 Company response to the market's quality requirements

Buyers are doing many things to insure that they can acquire the quality they require in purchased items. They indicate to the suppliers what resins to use. In

addition to imported resins themselves, they import them through domestic agents or dealers. In such a case, the supplier of the resins, that is, the buyer of the products, knows that the resins meet specifications. This eliminates the need for acceptance inspection, and all they have to do is to check the product code and lot number, and determine whether there is enough weight, after dissolving, for the manufacturing process. A sample of resin is retained and if it turns out that there is a quality problem, the sample can be tested. Because imported resins are used, and the quality of those resins is high, this arrangement presents few problems, but it is thought that if diversification of sourcing is done in the future, and resins are bought from domestic suppliers, there will be need for third-party testing and acceptance inspections.

The supply of molds, which are crucial for determining the quality of the product, is also made by the users in order to maintain the quality.

In many instances producers maintain separate production lines for different buyers, because of differences in quality control methods required by the buyers, but this creates much difficulty in terms of efficient use of capacity.

Products produced on companies own initiatives are made from resins the companies themselves select and buy in the market, but at present they are using imported materials. For such production, molds are generally made domestically, and this influences final product quality.

5.3.2 Activities in Standardization and Quality Control

The important change to note in connection with standardization and quality control activities is the introduction of quality control certification on the basis of ISO 9000 Series.

Standards for plastics comprise those related to products and those related to the inspection methods to evaluate them. American Society for Testing Materials (ASTM) standards are widely used for the latter.

In the case of Japan, because in the past most consumption was in the domestic market (about 12% was exported), there was little attention given to internationalization of standards. However, the standards for inspection used by the plastics industry in Japan are almost identical to those of the ASTM. This is a reflection of the plastics industry having been founded primarily on foreign technology. In recent years, however, even though most of the industry's output has been shipped

to domestic buyers, their finished products are exported. In keeping with internationalization of users' standards, the industry also has tended toward internationalization. Because of this, it was decided to make JIS conform more or less to ISO and whereas JIS and ISO standards had been reviewed separately in the past, since 1991 the ISO and JIS standards for plastics are being reviewed together.

In the U.S., both ASTM standards (for domestic use) and ISO standards (for exports) are used. International companies therefore are using ISO standards.

In Malaysia, the quality control system used for products and materials depends on the requirements of the buyers, and awareness of national and international standards is low.

5.3.3 Needs in Promoting Quality Control

As stated above, the outlook is for greater use of plastics worldwide. Certainly there is much growth ahead for this industry, through development of new materials and identification of new users for existing materials.

At the same time, local procurement of parts is being promoted internationally for the electric and electronics, automobile and other industries, and this will increase demand for local procurement of plastic parts while at the same time it is accompanied by demand for more precise and stronger parts as well.

Two aspects therefore can be anticipated regarding quality control promotion in the future. First there is need for promotion of the adoption of effective systems that assure actual control of quality, and second there is need for measures to insure that outsiders recognize that the system has been implemented.

5.3.4 Directions of Standardization and Quality Control

5.3.4.1 Quality control criteria

(1) Direction of standardization in the plastics industry

It is necessary to consider separately 1) product standardization and 2) quality control system standardization.

The foundation of standardization of plastic products is standardization of the inspection methods for determining whether the products meet specifications

employed by the user of the product. In addition, there are standards for the parts in question that are adopted by the user industry, and standards applicable to the products on the basis of safety, health, and consumer protection. Regarding the latter, there is need to anticipate that contrary to the prevailing flow of requirements, it may come to pass that the plastics industry requests users to adopt specifications and standards that enable the plastics makers to attain greater rationality in production.

(2) Direction to be taken in Malaysia

Even though most products of the Malaysian plastics industry are destined for the domestic market, because the major buyers of those products are foreign-affiliated companies, it has been necessary for vendors to give attention to international standards and methods of quality control. There now is a very strong process of internationalization evident in the standardization and quality control certification activities in the industrially advanced countries, and studies are being made for extending this to the foreign-affiliated companies in Malaysia, or at least to their parent companies. As a result, it is certain that parts and materials suppliers in the plastics industry to move closer to the international mainstream than in the past.

5.3.4.2 Certification of quality control systems

As one direction, there is necessity to establish quality control systems based on ISO 9000 Series. Although users are now employing their own quality control systems, it is conceivable that they will shift in the direction of using ISO 9000. In accordance with this, it is to be expected that companies that are now encouraging use of their own methods will shift to encouraging use of ISO-based methods.

In general, users require quite high levels of quality control methods, and it is thought that it will not be very difficult for plastics makers who are accustomed to those methods to adopt methods based on ISO 9000.

The problem that will be encountered is whether users will be content with quality control based on ISO 9000.

The background reasons for why users may not be content with ISO 9000 based methods at the present time, is partly that they do not have confidence that those methods will provide the quality assurance they themselves believe is necessary. Also they may feel that promotion of quality systems based on ISO 9000 tend to be a matter mostly of form. Plastic makers at the present time do not undertake ac-

ceptance inspection of specifications of materials, and do not inspect the same products made from the same material. That is, they do not check for dispersion in quality during the production process and lack a means for analyzing the causes of dispersion.

Hereafter it will be necessary to introduce Computer Aided Engineering (CAE) and the like in order to attain higher quality, and for this basic data will need to be collected and a foundation for analysis will also be necessary. For that, there is need for introducing recordkeeping systems, and also acquiring inspection equipment and formulation of technical standards.

5.3.4.3 Need for improvement of inspection and testing systems

What the plastics industry needs today with regard to external inspection and testing is 1) testing of the properties of products, and 2) analysis of resins to determine whether they conform to specifications.

Product testing is primarily strength and durability testing. The only place this can be done by a third party is the Plastics Technology Centre of SIRIM. They have no facilities, however, for strength tests for large products, and when such tests are needed they ask foreign-affiliated companies to have the work done. It is expected, however, that demand for testing of large products will increase, in keeping with the growth of domestic production of automobile parts.

Each maker requests inspection and tests by a third party only when a problem arises with the materials that have been provided by the vendor, who has supplied a statement as to the nature of the materials. In general, the specifications for materials are not changed frequently and unless there is a problem in the production equipment, products pass. But when there is a problem with a product, it is necessary to determine whether or not the cause is in the materials used to make it. SIRIM is the sole agency that performs tests in such cases.

Regarding the capabilities of SIRIM to do inspection and testing work, one problem is that such work requires a long time. Table A1-5-11 shows the number of jobs undertaken by SIRIM's Plastics Technology Centre. According to the Centre, there was a 64% increase in requests from outside the organization in 1991. As of July, 1992, the number of tests appears to have increased 20%. From this viewpoint there is some danger that in the future, longer, rather than shorter waits will be required of those needing SIRIM work, and study of this should be made.

Table A1-5-1 PLASTICS CONSUMPTION BY INDUSTRY IN JAPAN, 1992

(Unit: %)

Sector	% of Total Consumption
Electric & Electronics	31
Automobile	63
Office Equipment	2
Others	4

Source: JETI (Japan Energy & Technology Intelligence)

Table A1-5-2 CHANGE IN RAW MATERIALS USED FOR COMPACT AND SUB-COMPACT PASSENGER CARS PRODUCTION IN JAPAN

(Unit: %)

	1973	1977	1980	1983	1986	1989	1992
Pig Iron	3.2	3.2	2.8	2.2	1.7	1.7	2.1
Ordinary Steel	60.4	61.6	60.5	59.5	57.7	56.9	54.9
Special Steel	17.5	16.1	14.7	14.3	15.0	15.1	15.3
Non-Ferrous Metal	5.0	4.7	5.6	5.6	6.1	7.4	8.0
Non-Metal	13.9	14.4	16.4	18.4	19.5	18.9	19.7
Synthetic Plasitics	2.9	3.5	4.7	5.7	7.3	7.5	7.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Weight Trend	100.0	106.5	105.9	102.7	106.8	115.1	136.8

Source: Automobile Industry, P.35, Vol.26 (August 1992)

Table A1-5-3 CHANGE IN MATERIAL USED IN PRODUCTION OF WASHING MACHINE IN JAPAN, 1980 AND 1990

(Unit: kg)

	1980	1990	1990/80 (%)
Change in:			
Washing Capacity	2.80	5.00	179
Average Weight of a Washing Machine	30.00	35.00	117
Change in Material Used:			
Metal	21.50	20.30	81
Iron	20.40	19.00	
Copper	0.70	0.60	
Aluminium	0.40	0.70	
Plastics	8.50	14.65	148
Glass	0.00	0.05	

Source: JETI (Japan Energy & Technology Intelligence) P.81, No.4, Vol.39 (April 1991)

Table A1-5-4 ESTIMATED ANNUAL TURNOVER OF PLASTICS INDUSTRY IN MALAYSIA

Year	Turnover (million M$)	Growth Rate (% p.a.)
1987	700	
1988	900	129
1989	1,150	128
1990	1,500	130
1991	1,800	120

Source: MPMA

Table A1-5-5 PERCENT SHARE BY PLASTICS PRODUCTS IN MALAYSIA, 1991

Product	% of Total
Packaging	40
Electrical & Electronics	20
Furniture/Household	10
Construction	10
Automotive	5
Agriculture	5
Others	10
Total	100

Source: MPMA

Table A1-5-6 COMPOSITION OF DEMAND FOR PLASTIC MATERIALS BY DEMAND SECTOR IN THE SELECTED COUNTRIES

(Unit: %)

	Construction	Packaging	Electrical & Electronics	Automotive	Furniture/ Houseware	Agriculture	Others	Total
Malaysia	10.0	40.0	20.0	5.0	10.0	5.0	10.0	100.0
U.S.A.	22.0	31.0	6.0	4.0	14.0	0.0	23.0	100.0
Japan	10.6	27.6	13.1	9.2	9.4	2.3	27.8	100.0
U.K.	24.0	35.0	10.0	6.0	8.0	2.0	15.0	100.0
Netherlands	27.0	30.0	1.0	3.0	10.0	1.0	28.0	100.0
Spain	10.1	35.4	4.9	6.2	11.4	5.7	26.3	100.0
Average *)	18.7	31.8	7.0	5.7	10.6	2.2	24.0	100.0

Note: *) Average of 5 countries other than Malaysia.

Source: "Plastics" (June 1990 issue), and others

Table A1-5-7 DISTRIBUTION OF PLASTICS MANUFACTURERS BY JOB FIELD

Job Fields	Number of Firms	
	1992/93*1)	1990/91*2)
Injection Molding	234	190
Film Extrusion	175	120
Blow Molding	70	11
Pipe & Profile Extrusion	38	23
PVC Compounding	22	17
Sheet Extrusion	21	2
Other Extrusions	27	22
Thermoforming/Vacuum Forming	13	1
Compression Molding	9	
Lamination	9	6
Calendering	4	
Casting	3	
Rotational Molding	3	
Plastics Resin Manufacturing	4	
Fiber Glass Reinforced Plastics Products	10	
Woven Bags	12	9
EPS Foam Molding	13	6
Others	12	17
Total	679	424

Notes: *1) Including double counting of 181 firms engaged in more than one fields (498 firms in total).
*2) "Injection molding" includes 46 firms in "Injection & molding", and 13 firms in "Injection & general extrusion". "Film extrusion" includes 13 firms in "Film and sheet extrusion". "Other extrusion" was categorized under "General extrusion". "Others" includes 12 firms in"Recycling".

Sources: *1) 1992/93 Members Directory, MPMA
*2) 1990/91 Members Directory, MPMA

Table A1-5-8 REGIONAL DISTRIBUTION OF PLASTICS MANUFACTURING FIRMS IN MALAYSIA (1990/91)

State	Number of Firms	% of Total	Of which: Injection Molders (% of Total)
Johor	122	23.4	21.8
Kedah	18	3.4	10.9
Kelantan	1	0.2	
KL & Selangor	166	31.8	36.4
Melaka	16	3.1	0.9
Negeri Sembilan	2	0.4	0.9
Pahang	1	0.2	
Penang	83	15.9	25.5
Perak	92	17.6	3.6
Sabah	8	1.5	
Sarawak	13	2.5	
Total	522	100.0	100.0

Source: MPMA

Table A1-5-9 ESTIMATED PLASTICS RESIN CONSUMPTION IN MALAYSIA

(Unit: 1,000 tons)

Resin	1990	1991
LDPE	45	50
LLDPE	25	30
HDPE	65	75
PP	70	80
PVC	50	60
PS	50	60
Others	20	25
Total	325	380

Source: MPMA

Table A1-5-10 PROJECTED DEMAND FOR POLYOLEFINS IN MALAYSIA

(Unit: tons)

Year	PEs	PPs	Total
1990	135,000	70,000	205,000
1991	155,000	80,000	235,000
1992	179,000	93,000	272,000
1993	205,000	106,000	311,000
1994	236,000	122,000	358,000
1995	272,000	141,000	413,000

Source: MPMA

Note: 1990 figures are estimates based on the figures supplied by various raw material suppliers.

Table A1-5-11 NUMBER OF TESTING WORK PERFORMED, PLASTICS TECHNOLOGY CENTRE, SIRIM

Year	Outside Application		Internal Application		Total	
	Number	Increase Rate (%)	Number	Increase Rate (%)	Number	Increase Rate (%)
1990	242		64		306	
1991	398	64.5	103	60.9	501	63.7
1992	274	18.0	58	-3.5	332	13.6

Notes: 1. 1992: as at 31.7.1992
2. Increase rate in 1992 was calculated assuming that number of monthly application is same over the year.

Source: SIRIM

Chapter 6 Textile and Apparel Industry

6.1 Current Situation of the Textile and Apparel Industry

6.1.1 Overview of the Industry

The main components of the textile industry in Malaysia comprise the upstream areas of the primary textile sector (manufacturing of fibers, spinning and weaving) and the dyeing and finishing sector and the downstream area of the apparel sector (garments and production of knitwear products). Other sectors besides the above include production of household textile articles such as carpets, towels, bed linen and table linen in addition to which there are the industrial textiles such as car seat belts, as well as the traditional sectors of batik and silk textiles. However the output of these latter sectors is very small compared to that of the former group. Therefore this study focuses on the primary textile sector, the dyeing and finishing sector and the apparel manufacturing sector in assessing the present situation of the textile industry in Malaysia.

The primary textile sector experienced rapid growth in the 1970s followed by a period of stagnation consequent to the downturn in the world economic situation in the 1980s, the effect of which was felt up to the mid-1980s. After this the industry recovered and in the last few years expansion has been steady. Most of Malaysia's textile output is destined for export, and exports have rapidly increased since the mid-1980s.

The real output of textile and apparels showed annual growth of 11.6% in average over the five years from 1985 to 1990. This exceeded the target set in the Industrial Master Plan of Malaysia for annual growth of 10.3% for that period. As can be seen in Table A1-6-1, comparing the textile industry of Malaysia with those of surrounding countries such as Thailand and Indonesia and of other Asian countries such as South Korea and Taiwan, the scale of the industry in Malaysia is quite small despite the important position the industry has among domestic manufacturing industries. In 1990 the textile industry accounted for about 5% of the total industrial output of the manufacturing industries while its exports accounted for about 10% of the exports of the entire manufacturing sector in 1990 (Table A1-6-2). The textile industry is the second most important export industry after the electrical and electronic industries.

6.1.2 Overview of Sub-sectors in the Textile Industry

Overview of the individual sub-sectors of the textile industry is summarized in the subsequent sections. These are based on the results of a survey of the textile industry conducted by MIDA in 1989.

6.1.2.1 Raw material fiber manufacturing sector

Malaysia, having no cultivation of cotton, depends on imports of raw cotton. In Malaysia there is one synthetic fiber manufacturer which produces polyester staple fiber. This manufacturer, an affiliate of Toray Industries, a Japanese synthetic textile manufacturer, operates a plant in the Free Trade Zone (FTZ) set up in the Butterworth district on the coast facing Penang Island. Commercial operations were started in 1974 and initial production was 43,000 tons per year but expansion of facilities recently has increased output to about 60,000 tons.

As an FTZ company this manufacturer is required to export more than 80% of its product output. Therefore only about 15 to 20% of output is supplied to the domestic market. All raw material chemicals required for making fiber are imported.

With the exception of polyester staple fiber all synthetic and man-made fibers have to be imported. There are a number of texturizers who import filament yarn and for processing. The total capacity of texturizing is about 4,000 tons per year.

6.1.2.2 Spinning and weaving sector

A profile of the spinning and weaving sector is shown in Table A1-6-3. There are 11 companies operating integrated textile mills (of which seven also do dyeing and finishing operations). In addition to the above there are four companies operating spinning mills, and seven companies operating weaving mills. As indicated above the 15 companies engaged in spinning operate 17 spinning mills.

The main spun yarns produced are cotton yarn, polyester/cotton blended yarns, polyester/rayon blended yarn, acrylic yarn and acrylic/wool blended yarn. The total production of yarn produced annually is about 60,000 tons. Two of the 17 spinning mills manufacture acrylic and acrylic blended yarns and output totals about 5,300 tons annually. The other 15 mills produce cotton, polyester/cotton blended and polyester/rayon blended yarn. Almost all mills were constructed in the 1970s. The number of installed spinning machines, as shown in Table A1-6-1, totals 466,000 ring spindles and only 6,800 open end spindles.

The three largest spinning mills in Malaysia are all located in the FTZ in Butterworth and are spinning units in integrated textile mills orientated to the export markets. These three mills together account for 36% of the total spinning machines installed in Malaysia, and their yarn output represents about 27% of the total Malaysian output.

Almost all the spinning mills are located in the northwest and southern regions of Peninsular Malaysia. About 70% of the country's total spinning capacity is located in the northwest regions centering in Penang and Butterworth and the remaining 30% in the southern region from Johor to Kajang.

There were 18 companies operating 20 weaving mills in 1988. One new company commenced weaving operation at the end of 1989, so that at present there are 19 companies operating 21 weaving mills. Except the newest factory almost all mills were built in the 1970s. Table A1-6-1 indicates the number of installed weaving machines, there being 7,100 shuttle looms against only 1,200 shuttleless looms representing only 14% of the total. The annual production of woven fabric is 285 million square meters (equivalent to around 39,200 tons).

The largest weaving mills in Malaysia are located in the FTZ in Butterworth, and are weaving units in the three export-oriented integrated textile mills mentioned above. The looms in these factories account for 42% of the total looms installed in the country, and fabric output from these mills represents about 45% of the total national output.

As with spinning mills the majority of the weaving mills are located in the Penang/Butterworth and Johor areas.

6.1.2.3 Dyeing and finishing sectors

There are at present seven fabric dyeing and finishing factories, which are units in integrated textile mills. The total processing capacity of these is about 200 million square meters annually (equivalent to 26,600 tons). This represents about 70% of the national output of fabric. The largest dyeing and finishing factory is the integrated textile mill located in the Butterworth FTZ which accounts for about 38% of the total national dyeing and finishing capacity.

There are 30 companies which carry out dyeing and finishing of knitted fabrics, of which 16 operate knitting factories combined with dyeing and finishing, while the

remaining 14 are engaged only in dyeing and finishing. The largest dyeing and finishing factory for knitted fabrics is owned by an export orientated knitwear manufacturer located in the Butterworth FTZ. The processing capacity of this factory accounts for about 14% of the total national capacity for dyeing and finishing of knitted fabrics which is equivalent to 35,000 tons per year.

The dyeing and finishing factories for woven and knitted fabrics mainly do bleaching and dyeing, and only a small number of factories do printing.

The majority of the fabric dyeing and finishing factories were constructed in the 1970s. Most knitted-fabric dyeing and finishing factories were constructed after the 1980s, so equipment is comparatively new. The fabric dyeing and finishing factories which tend to follow the weaving mills are located in the Penang/Butterworth and Johor areas. Many dyeing and finishing factories for knitted fabric are in the Batu Pahat and Penang/Butterworth areas since the knitting factories are concentrated there.

6.1.2.4 Knitwear manufacturing sector

The knitwear manufacturing sector of Malaysia has recently enjoyed very rapid expansion. At present, there are 155 knitwear manufacturing companies of which 15 are large in scale and carry out integrated production involving all steps from the production of knitted fabric up to dyeing and finishing. The remaining 140 companies are medium to small or petty in scale. Of these 100 specialize in production of knitted underwear and other knitwear items, and produce the required knitted fabric on an in-house basis, while 40 carry out the production of knitted fabric only.

About 3,000 knitting machines are in operation in Malaysia, of which 45% are of circular knitting machines. The remaining 55% are flat knitting machines and warp knitting machines. The majority of knitting factories are located in the Batu Pahat and the Penang/Butterworth areas.

About one third of the 155 knitting manufacturers are small, employing less than 25 persons, while many are very small production units with only two or three knitting machines. Even the specialist knitted fabric manufacturers are small in scale and most produce on a subcontract basis for the large apparel manufacturers.

6.1.2.5 Garment sector

The garment sector in Malaysia has experienced rapid expansion mostly on exports, and there are more than 1,000 garment manufacturers. There are a few large scale export-oriented manufacturers employing more than 1,000 operators but 85% of the companies are of small scale. The main articles produced are men's and boys' shirts and trousers, and ladies' and girls' blouses and dresses. The current production of this apparel is shown in Table A1-6-4. Almost all articles show a steady increase and most of the output is exported. Garment factories are scattered in the areas of the main cities in the west coastal region of Peninsular Malaysia and the centers of the industry are located in the Kuala Lumpur/Selangor, Penang/Butterworth, Melaka and Johor areas.

6.1.3 Structure of Production

Despite the rapid expansion of the downstream apparel sectors (garment and knitwear production) in recent years, the upstream primary textile sector has not expanded and there is an increasing gap in scale between the two sectors of the textile industry in Malaysia. As a result, there is a large dependence on imports to supply the knitting yarn and woven fabrics needed to manufacture apparel.

On the other hand, for the primary textile sector there are a large number of export orientated spinning and weaving mills which are located in the FTZ, and many of those located outside the FTZ carry out production as bonded factories as Licensed Manufacturing Warehouses (LMW). Since these factories are required to export an overwhelming majority of output (yarn or fabric), only a small quantity is supplied to the domestic market.

In particular the majority of foreign affiliates operating large-scale spinning and weaving mills are FTZ or LMW companies and have engaged in exports since initial operations. It is reported that about 60% of the total spinning and weaving capacity is in the hands of such FTZ/LMW companies.

As mentioned above, the typical synthetic fiber manufacturer in Malaysia which produces polyester staple fiber is an FTZ company and the majority of output is for export. The produced fiber is supplied to the affiliate spinning mill of this company which is located in the FTZ as intra-FTZ trade while carrying out exports of fiber itself, so that only 15 to 20% of its total output is supplied to domestic industry outside the FTZ. All other raw material fiber requirements are met with imports.

Since the FTZ/LMW companies in the primary textile sector operate integrated textile mills, imports of yarn are minimal but the major part of the fabric produced is exported. In 1988 exports of fabric amounted to 40,200 tons calculated by weight representing about 57% of Malaysia's total fabric output. On the other hand, the imports of fabric for the same year amounted to about 117,300 tons so that imports were almost three times exports.

Productive capacity in the spinning sector is small compared with the capacity of the weaving and knitting sectors. As a result the domestic production of yarn does not meet the demand and some quantity of spun yarn must be imported. In 1988, 18,700 tons of yarn were imported, representing about 27% of domestic consumption that year. On the other hand about 9,900 tons of yarn was exported in the same year. The entire demand for filament yarn is met by imports.

Almost all of the medium- or large-scale apparel manufacturers (including the knitwear manufacturers) are export-orientated FTZ/LMW firms, and taken together account for 70 to 75% of total sector capacity. It is estimated that exports of these companies account for about 73% of the total output of apparel in the country. The fabrics required by these firms are almost all imported.

The above overview shows that the upstream and downstream sectors of the textile industry in Malaysia have developed individually as export industry, and the backbone of both sectors is found among the FTZ/LMW firms which flourished under the favorable conditions and incentives provided under the government's foreign investment promotion policies. As a result the respective sectors import the materials necessary for production while exporting the major part of output, and consequently linkage between these sectors is limited.

6.1.4 Capital Structure and Recent Investment Trends

At the end of 1989 there were 322 manufacturing companies in the textile sector which were registered with the MIDA. Foreign capital was 39.2% of the total equity capital invested (equaling M$1.55 billion), and accounted for 59.3% of the total fixed assets (M$1.06 billion). The textile industry has a relatively large share of foreign capital among the manufacturing industries in Malaysia.

Capital investment in the textile industry has grown at conspicuous rates from around 1987. Table A1-6-5 shows the number and value of investments in the textile industry approved by the MIDA between 1987 and 1991. Over this period

348 investments amounting to a total value of about M$2.6 billion were registered.

6.1.5 Structure of Trade in Textile and Textile Products

Table A1-6-6 shows the balance of trade in 1990 for textile and textile products. As explained above a large part of the primary textile products (fiber, yarn, woven or knitted fabric) produced in Malaysia are exported, while the import of primary textile products and in particular of yarn and woven or knitted fabric considerably exceeds the quantity which is exported. The records of exports and imports of primary textile products in 1990 show that while exports amounted to M$1.05 billion, imports reached M$2.61 billion so that imports exceeded exports by M$1.56 billion.

The exports of apparel for the same year totaled M$1.99 billion, while imports amounted to only M$60 million so that the balance showed M$1.93 billion of net export earnings.

The total export value of textiles and textile products in 1990 was M$3.04 billion, and after subtracting the import value the net export value was only M$370 million representing only 12% of the export value.

Despite the fact that the textile industry in Malaysia has developed as an export industry the net value added of exports is taken to be extremely small as a result of the trade structure which has developed.

Table A1-6-7 shows the main destinations of exports of textile products from Malaysia. The main destination for exports of textile products is the USA, which takes about 12% of exports of yarn and fabrics and 50% of apparel exports. The EC absorbs about 18% of the yarn and fabrics, and 32% of the apparels exported from Malaysia. The share of exports of these products accounted for by Singapore is traditionally large and 19% of the exports of yarn and fabrics go there while 6% of apparel exports are destined for this market. Exports to Japan are very small accounting for 8% of exports of yarn and fabrics and 1% of the apparel exports.

6.1.6 Employment

According to the survey of the textile industry conducted by MIDA, employment in the textile industry in 1988 was as follows:

1) Synthetic fiber manufacturing sector	500	(1 firm)
2) Spinning sector	7,000	(15 firms)
3) Weaving sector	6,500	(17 firms)
4) Knitting sector	17,000	(115 firms)
5) Dyeing and finishing sector	4,000	(37 firms)
6) Garments sewing sector	65,000	(1,000 firms)
Total	100,000	(1,225 firms)

The above total of employees represents about 10% of the working population in the manufacturing industry, making the textile industry is the largest industrial employer. If the investments currently approved for the textile industry are realized then it is forecast that further 70,000 to 80,000 employment opportunities will be created.

6.2 Main Challenges Facing the Textile Industry

6.2.1 Linkage between the Primary Textile Sector and the Apparel Manufacturing Sector

As reviewed above, the textile industry in Malaysia has continued remarkable growth as an export industry but linkage between the primary textile sector and the apparel manufacturing sector remains weak, and this limits the value added of production and the net foreign exchange earnings achieved by the industry as a whole.

The following factors are the causes of these structural problems:

1) The varieties and supply of domestically produced knitting yarn and woven fabric which can be supplied to domestic markets are limited and the quality of those products is below the required standard.

2) The majority of apparel manufacturers use imported yarn and fabrics because they are FTZ or LMW firms which may import raw materials free of duty.

3) As a result of the above situation the major part of domestically produced yarn and fabrics supplied to domestic markets is used for low or medium quality apparel, and since domestic demand is on a relatively small scale, demand is limited.

Generally the primary textile sector in Malaysia can be divided into the foreign-affiliated large scale spinning and weaving mills which focus on exports, and the small and medium scale mills managed by local companies. The former mills were mostly built during the 1970s by large textile companies of Japan or other industrial countries. These firms entered Malaysia and established those factories with the aim of establishing export production bases that take advantage of low-cost and relatively good quality labor and well developed infrastructure as well as the incentives given to foreign capital by the Malaysian Government. Thus the factories were designed to export from the start of operations, and mass production of a limited variety of products meeting the needs of the export markets was given priority. Since these firms were all FTZ/LMW companies they were obligated to export 80% or more of their output. The output of such companies meets with international levels of product quality, but because of the limited variety and supply to the domestic markets, it meets only a part of materials requirement of the apparel manufacturers. As mentioned above the large-scale FTZ/LMW firms account for about 60% of the spinning and weaving sector, but the fabrics which they supply to the domestic market represents only about 3% of the fabric output of Malaysia and so only meet a bare 1 to 2% of the total consumption of fabrics in Malaysia.

The majority of small and medium scale spinning and weaving mills owned by local companies were also built during the 1970s. As the spinning and weaving machines, there were not replaced, these machines are now superannuated and productivity is poor, and the quality of the yarn and fabrics produced does not meet standards. For example, the width of the fabrics produced in these mills averages 132cm although the companies manufacturing garments for export require fabrics with 150cm width. The quality of the work carried out in the small and medium-scale dyeing and finishing factories is also inferior. These small and medium-scale spinning and weaving mills supply their products mainly to the small-scale knitting or garment factories producing apparel destined for the domestic market, but as a result of the relatively small size of demand involved, production is inevitably of a small batch variegated product variety. This type of operation requires long lead-time in switching over production lines and this hinders productivity and makes the production of quality products difficult.

Investment in the primary textile sector has picked up slightly since 1987, but as the major impetus comes from the exporting firms, the supply of domestic yarn and fabrics to local apparel industries has not improved. The above structural problems continue to prevail and are expected to remain.

In the apparel sector (including knitwear and garments), the production of FTZ/LMW firms account for 70–75% of total output, and more than 70% of their output is exported. The large scale manufacturers are export production bases set up by foreign apparel manufacturers, or the local manufacturers which either have been established joint ventures with foreign manufacturers or reached technical and business tie–ups with them. These are FTZ or LMW firms. These firms depend on the overseas parent firms or the overseas partners for design, production technology and product sales, and carry out production and sales within the context of the brands and sales networks established by those overseas companies. The yarn and fabric used are either supplied by the overseas parent or partner firms or imported in accordance with specifications indicated by these firms. Since the import lots are comparatively large in the case of the large scale manufacturers economies of scale make it more advantageous to use imported raw materials in terms of cost and delivery time.

These large scale local firms are only about 30 firms among the knitwear manufacturers and garments manufacturers. Besides these there are also about 200 medium–sized local manufacturers but the majority of these are export–orientated LMW firms. Only a small number of these medium scale firms practice technical or managerial tie–ups with specific foreign manufacturers. The majority of such firms carry out production to orders received from overseas buyers, and production is done on a copy basis to meet the designs and samples supplied by the client buyers. Materials are purchased and used in accordance with the specifications laid down by the clients. As purchase lots are small, imports of materials cause higher costs and long lead–time so that orders requiring short delivery time cannot be met. Hence they prefer to use domestic materials. However, as the supply of good quality domestic yarn and fabrics is limited in varieties and quality and in most cases domestic materials available do not meet the specification requirements set by clients, reliance must be placed on imports. It would be possible for these companies to use domestic materials for manufacturing export apparel if the quality of these domestically produced materials could be improved to assure a sufficient supply at the right quality.

6.2.2 Levels of Production Technology of the Small and Medium Scale Manufacturers

The level of production technology of domestic small and medium scale manufacturers in both the primary textile sector and in the apparel manufacturing sector is generally below international levels. Upgrading of the level of production technology is essential to the structural improvement and sound growth of the textile industry in Malaysia. Since the problems encountered differ for each sub–sector,

analysis is made for each sub-sector.

6.2.2.1 Spinning and weaving sector

The majority of Malaysia's spinning and weaving mills were built in the 1970s. The large spinning and weaving mills producing export goods have high production efficiency because some modern machines have been replaced and there has been careful maintenance of old machines. In addition operations are carried out using well-established production and quality control systems.

In contrast to this, in the case of the small and medium scale mills machine efficiency is fairly low because aged machines are still used and not well maintained. Moreover insufficient production and quality control have resulted in a lowering of productivity and product quality. The increasingly tight supply of personnel, particularly experienced technicians and skilled labor, has resulted in lowering the levels of production efficiency.

6.2.2.2 Dyeing and finishing sector

The situation in the dyeing and finishing sector is similar to the foregoing conditions. All of the dyeing and finishing units for woven fabrics are owned by the large scale integrated textile mills. These factories were built in the 1970s when those textile mills were built, but machines are maintained in good order by means of regular repairs and improvements, as well as daily maintenance. These factories have adequate testing equipment for the inspection of finished products and are managed by use of well organized production and quality control.

With the exception of dyeing and finishing units owned by large scale knitwear manufacturers, the majority of dyeing and finishing factories in the knitwear sector are on a small or medium scale. Many of the dyeing and finishing factories for knitwear were constructed in the 1980s and so facilities are relatively new. In the case of the large scale dyeing and finishing units for knitwear there are no special technical problems. However, in the case of the small and medium scale factories the shortage of experienced technicians and of skilled operatives as well as the insufficiency of testing equipment installed for the inspection of finished products, together with the poor production and quality control systems creates problems in productivity and product quality for these factories.

6.2.2.3 Apparel manufacturing sector

A common problem shared by the export-orientated apparel manufacturers is their reliance on overseas partners or buyers for designs. Almost none of the manufacturers are capable of developing their original designs to be produced and sold on export markets. The majority of manufacturers are engaged in the production of bulk items such as men's T-shirts, trousers, shirts or knitted underwear, and a relatively small number of manufacturers are specialized in the production of fashion items such as ladies' ready-made blouses, sportswear, etc. Only few companies are devoted to the in-house development of products they designed but these efforts have yet to bear fruit.

The large scale garment manufacturers are well equipped to carry out all processes from the industrial paper pattern making, spreading and cutting, to finishing, and these factories are managed using processing technology, production control and quality control that are at the international level transferred from overseas manufacturers with whom they have technical and business tie-ups.

In the case of leading medium scale manufacturers, managements by themselves supervise the operation exerting their technical expertise acquired overseas, or employ experienced engineers from Hong Kong, Taiwan or elsewhere to supervise the operations. As such they are trying to build up production systems and technical expertise by self-efforts. However, their technical level is still low. Many factories do not have well established systems of production planning, production management or quality control. The level of processing technology and control technology found among the petty and small manufacturers falls below even the low levels of medium scale manufacturers.

The situation of the knitwear manufacturers is similar to that found among the garment manufacturers. Particularly in the case of the small and medium scale knitwear manufacturers the knitting technology is low. As a result the quality of the knitted fabric is poor and this impairs the quality of the finished product.

6.2.3 Influence of Employment Problems

The shortage of manpower has become a serious problem in the textile industry in recent years. Rapid industrial growth in Malaysia has caused an increasing strain on the supply of labor, and all industries are affected by the problem of recruitment. The textile industry is no exception.

The textile industry in all of its sectors from the upstream areas of spinning, weaving, dyeing and finishing to the downstream areas of garment manufacture is labor intensive by nature. One of the main reasons for the entry of foreign capital to Malaysia for the establishment of export production bases was the assurance of low cost and good quality manpower. Such a work force is a vital factor in the exporting textile industries for sustaining competitiveness.

However the recent strain on manpower resources has accelerated turnover of skilled and unskilled labor as well as rises in wages. An increasing number of companies are worried about the loss of cost competitiveness, and this situation has become an important concern of the textile industry.

6.2.4 Shift and Diversification Towards High Value Added Exports

The main destinations for textiles and apparel are North America and the EC countries. In the framework of the Multinational Fiber Agreement (MFA), Malaysia has drawn up bilateral textile trading agreements with the USA, the EC, Canada, Sweden, and Norway, under which export quotas to these countries have been set for certain items. Agreements have also been made on a governmental level with Finland and Australia. There is a trend among these industrialized nations to strengthen their import quotas and so a large expansion of exports is considered difficult to realize. Moreover other Asian or ASEAN countries export similar textile products and apparels, and there is fierce competition for the business of the above destination countries. It is particularly important for Malaysia to tackle the problems presented by the increasing scarcity of manpower and the rising costs of labor although Malaysia has enjoyed favorable labor conditions to date. In the same way that South Korea and Taiwan adapted when faced with this problem, it will be necessary to consider ways to raise productivity and also to shift and diversify export goods towards higher value added ones.

Recently there has been increased attention among consumers in the domestic market to product quality and product design, reflecting the rise of living standards in Malaysia. Domestic manufacturers are increasingly required to carry out improvements in the clothing items destined for domestic markets.

In order to meet market demand, there is a need for manufacturers to undertake the development of product designs and new commercial products, as well as to pay more efforts to acquiring advanced technology and establishing the production system for manufacturing high quality products.

6.2.5 Future Tasks

The following represents the most important tasks to be carried out in order to tackle the common problems which are faced by textile industries in general, with consideration of the relevant situation in Malaysia.

1) Improvement and rationalization of production facilities, research and development, product development and their commercialization.
2) Acquisition of production technology more advanced than that now in use.
3) Reinforcement of production and quality control to improve productivity and product quality.
4) Development of human resources such as engineers, technicians and skilled labor to carry out the above activities.

6.3 Requirements for the Promotion of Standardization and Quality Control in the Textile Industries

6.3.1 State of Industrial Standards related to the Textile Industries

Japanese Industrial Standards (JIS) relating to the textile industry are classified as the L sector. The standards cover a wide area such as marking, testing and inspection methods, specifications of yarn and fabrics, dimensions and sizes of textile products and clothing, and also standards relating to the textile machines, dyeing and finishing machines and their parts. Except for the standards relating to textile machines, dyeing and finishing machines and their parts, the JIS for textile industries in Japan at the end of March, 1990 includes the following items.

1) Marking and sign	7 standards
2) Testing and inspection methods	79 standards
3) Sizes of clothing item	11 standards
4) Standard specifications of sewing thread and interlining	11 standards

There are about 130 MS standards relating to the textile industry in Malaysia. Development of the standards has been worked out with the participation of the representative members of the Malaysian Textile Manufacturers Association (MTMA), and the standards cover the main aspects relating to specifications of the major products, marking, sign, testing and inspection methods, etc.

6.3.2 Application of Standards

During the development phase of the Japanese textile industry the JIS played a guiding role by providing the bases for rationalizing transactions and textile product markets, and by indicating targets for quality upgrading of textile products. Along with the increasingly expanded penetration of ready-made apparel in markets, the standardization of sizes and materials contributed to safeguarding the general consumers' interests and to rationalizing transactions. The apparel manufacturers and distributors as well as their associations defined inspection and trading standards which are used as the bases for the standardization of grades and classification of apparel sold in markets and on the basis of these in-house or association standards they carried out inspections of goods delivered and grading of commodities. JIS standards are used as the basis for formulating those in-house or association standards.

In Malaysia only a very small number of the textile and apparel manufacturers actually employ the MS standards. This is because the majority of Malaysia's textile and apparel manufacturers are export orientated. Since the large scale spinning and weaving mills export yarn and fabric to the advanced industrial countries, production is carried out in accordance with the standard specifications of the main destination countries. Further, the large and medium scale apparel manufacturers are also mostly concerned with exporting, and production is carried out in line with the design specifications indicated by the overseas clients and buyers, so that there is no opportunity for making use of the MS standards. In domestic markets distribution systems for apparel are not well evolved and for the present the standardization of transactions in this sector is not demanded. Moreover there is no established common market for yarn or fabric in Malaysia, and so grading for the purposes of transactions does not exist, and standards have not been applied to date.

However, consumers in Malaysia have shown an increasing awareness of design and product quality. Further to the spread and development of department stores, supermarkets and large retail outlets there has been a growing need for the standardization of transactions. As a result of such market changes, some manufacturers have begun to demand the establishment of trade standards for carrying out domestic transactions.

Also some members of the textile industry point out the need for fire regulations relating to curtains and other houschold textile items and also for health protection relating to baby's underwear and clothing.

6.3.3 Response to Certification System

There are only two textile manufacturing companies which have licenses for use of the MS Mark. The license has been granted to the sewing threads produced by them for domestic household or industrial use. Since the majority of the textile firms in the primary sector are export orientated FTZ/LMW companies, these carry out production according to the standards and trading specifications in the advanced industrial countries which are the destinations of output. Since the medium scale manufacturers who supply domestic markets with their output of yarn and fabrics mostly look to supply the small apparel manufacturers, this is a seller's market, requiring little quality assurance for the moment.

In the case of apparel manufacturers, as the majority of the apparel manufacturers is export-orientated, there is no need for them to use MS mark certifications. Many of the apparel manufacturers supplying domestic markets are small in scale, and since consumers have not sought to obtain quality assurance to date these manufacturers have not felt the need to apply the MS mark certification. Also the absence of developed distribution systems in Malaysia for apparel has meant that rationalization of trading practices in this sector has been slow to evolve and as a consequence there has been little response among manufacturers to the MS mark.

Recently there has been an increased interest in the ISO 9000 among the export orientated textile and apparel manufacturers. MTMA has held a series of seminars on the ISO 9000 with the support of SIRIM, and the MTMA reports that a large number of its members attended these seminars. Firms have also sent personnel to attend the seminars separately held by SIRIM. However, none of the firms has actually prepared the application of quality system certification on the ISO 9000.

Many of the large textile manufacturers are Japanese affiliates and these are currently evaluating the possible benefits of ISO 9000 certification. This is partly a result of the fact that the Japanese response to the ISO 9000 is still in the initial phase and so it is not possible to make decisions on the basis of implementation results in Japan.

In the case of small and medium scale manufacturers, and in particular of apparel manufacturers there are financial and personnel restraints to what can be done and the fact that many manufacturers carry out production to order for particular buyers makes them uninterested in the opening of new markets. The ISO 9000 certification is left as a task for future consideration by the majority of firms.

6.3.4 Inspection Systems and Use of External Inspection Institutes

Large textile, dyeing and finishing factories have installed in-house testing and analysis laboratories where tests and inspections of their products and of raw materials are carried out. However, other textile, dyeing and finishing factories are not equipped for carrying out the full range of tests and inspections. There is no officially accredited textile testing institute, and there is no trade practice in the country which requires certification issued by accredited independent institutes. There is the only case of a few large companies that do occasionally commission public institutes to carry out calibration of measurement equipment.

Since the large manufacturers depend on imports for their materials and use materials which have been assured by the large foreign suppliers, inspections of delivered materials are done only by use of visual methods. In the case of small apparel manufacturers, the small size of the import lots purchased by them are not usually provided by reliable large material suppliers and as a result sub-standard materials are often delivered and there are frequent claims at the time of shipment of apparel made by using those materials. Some of the small and medium scale manufacturers seek to use external, independent inspection agencies which undertake inspections for a free.

6.3.5 Quality Management Systems of Textile Firms

The situation relating to quality management systems differs considerably depending on the sector of the textile industry, the scale of the firm, and the nature of sales (whether largely exports or domestic sales).

A large number of the large spinning and weaving mills of an export orientated type are Japanese affiliates and so have introduced quality control systems similar to those practiced in Japan, and these companies are active in the promotion of TQC and QC circles. A certain large manufacturer chooses nucleus of operatives (not necessarily university graduates) from each workplace who are given in-house training for a duration of 2 to 3 months in QC to qualify them as personnel to undertake QC work, and they supervise the introduction and running of QC systems. Further, necessary manuals are drawn up by the companies in English, Malay and Chinese with illustrations accompanying the trilingual text.

In the case of the small and medium scale manufacturers the level of QC is generally low. Many firms only carry out quality inspections of the final products, supervision of individual processing line is confined to keeping records of data, and only

a few firms carry out feedback procedures or any systematic analysis of the root causes of disorders or problems. In the knitting sector, as the majority of manufacturers are small scale, there are no general specifications of product which are to be used as the basis for quality control, and further these firms only carry out visual inspection of finished products. A major task to be undertaken in this sector is the establishment of uniform product standards and the promotion of quality control systems.

The large and medium apparel manufacturers have established in-house standards for visual inspections which include standards for product size, defects, finishing (unevenness of weaving, uneven dyeing, color, handle, etc.). These firms implement statistical quality control (SQC) based on inspection and data record and feedback analysis of defects of each line. Some of the large manufacturers also carry out activities for TQC and QC circles. However many of the small manufacturers continue to view QC as being simply inspections of the finished products.

A common problem for firms which are actively engaged in QC or which wish to further their QC activities is the shortage of related personnel, and the danger of engineers qualified in QC being enticed away, or transferring to, other companies. In the case of small and medium scale manufacturers, since in-house personnel training resources are not available, employees are sent to external training courses. However many of the firms express dissatisfaction with such courses which tend to over emphasize general theory and consequently provide training which is of little practical use.

Recently, in some areas seminars and workshops on QC have been held by a number of apparel manufacturers working together but such initiatives remain sporadic. Promotion of such initiatives on a national level remains an important task for the future.

Table A1-6-1 NUMBER OF INSTALLED SPINNING AND WEAVING MACHINES AND CONSUMPTION OF FIBERS IN MALAYSIA AND NEIGHBORING COUNTRIES (1990)

	Malaysia	Taiwan	S.Korea	Thailand	Indonesia
1. Installed Spinning Machines (1,000 units)					
* Ring Spindles	466.0	3,678.0	3,648.0	3,000.0	4,500.0
* Open End Spindles	6.8	150.9	38.4	45.0	60.0
Total	472.8	3,828.9	3,686.4	3,045.0	4,560.0
2. Installed Weaving Machines (1,000 units)					
* Shuttle Looms	7.1	18.0	30.0	60.0	125.0
* Shuttleless Looms	1.2	22.9	25.0	4.0	15.0
Total	8.3	40.9	55.0	64.0	140.0
3. Consumption of Fibers for Spinning (1,000 tons)					
* Cotton	46.0	282.0	413.0	290.0	305.0
* Man-made Fibers	41.7	621.0	187.0	130.0	180.0
Total	87.7	903.0	600.0	420.0	485.0

Source: International Textile Manufacturers Federation (ITMF)

Table A1-6-2 EXPORTS OF TEXTILES AND APPAREL

(Unit: million M$)

	Export of Textiles & Apparel (A)*1			Export of Manufactured Goods (B)*2	A/B (%)
	Textiles	Apparel	Total		
1980	492	329	821	6,319	13.0
1985	522	839	1,361	12,471	10.9
1986	592	1,108	1,700	15,352	11.1
1987	735	1,544	2,279	20,344	11.2
1988	875	2,169	3,044	26,848	11.3
1989	1,011	2,891	3,902	36,567	10.7
1990	1,152	3,547	4,699	47,143	10.0

Sources: *1 Malaysian Textile Manufacturers Association
*2 Department of Statistics

Table A1-6-3 PROFILE OF SPINNING AND WEAVING MILLS (AS AT 1988)

	No. of Establishments	Spinning Production (1,000 tons)			Weaving Production (1,000 tons)		
		Annual Production	Av. Ann. Production per Mill	% to Total	Annual Production	Av. Ann. Production per Mill	% to Total
A. Integrated Textile Mills							
1) With Spinning and Weaving	4	11.6	2.90	19.4	6	1.50	15.1
2) With Spinning, Weaving, and Fabric Processing	7	38.9	5.56	65	29.8	4.26	74.9
Sub-total	11	50.5	4.59	84.4	35.8	3.25	90.0
B. Non-integrated Textile Mills							
1) Spinning Mills	4	9.3	2.33	15.6	–	–	–
2) Weaving Mills	7	–	–	–	4	0.57	10.0
Sub-total	11	9.3	2.33	15.6	4	0.57	10.0
Total	22	59.8	3.99	100	39.8	2.21	100.0

Note: – not applicable

Source: Textile Industry Study, MIDA, 1989

Table A1-6-4 PRODUCTION OF MAIN ITEMS OF APPAREL (1986 -1990)

(Unit: 1,000 pieces)

	Trousers (Mens' & Boys')		Shirts (Mens' & Boys')		Blouses (Womens' & Girls')		Dresses (Womens' & Girls')	
	Volume	Change in %	Volume	Change in %	Volume	Change in %	Volume	Change in %
1986	9,106		22,743		15,503		3,132	
1987	12,503	37.3	25,610	12.6	15,764	1.7	3,647	16.4
1988	11,697	-6.4	27,762	8.4	17,318	9.9	3,770	3.4
1989	12,885	10.2	26,366	-5.0	23,748	37.1	5,058	34.2
1990	13,948	8.2	27,110	2.8	22,746	-4.2	5,518	9.1

Source: Department of Statistics, Malaysia

Table A1-6-5 APPROVALS GRANTED FOR ESTABLISHMENT OF MANUFACTURING FACILITIES RELEVANT TO TEXTILES AND APPAREL

Item	1987		1988		1989		1990		1991		Total	
	No. of Project	Capital Investment	No. of Project	Capital Investment	No. of Project	Capital Investment	No. of Project	Capital Investment	No. of Project	Capital Investment	No. of Project	Capital Investment
1. Synthetic Textile Mills	–	–	–	–	–	–	1	2	–	–	1	2
2. Spinning and Weaving Mills	3	21	8	156	6	278	9	742	6	215	32	1412
3. Dyeing, Bleaching, Printing and Finishing of Yarn and Fabric	–	–	2	65	4	219	8	43	4	159	18	486
4. Knitting Mills	10	60	16	22	15	46	19	182	6	10	66	321
5. Clothing Factories	27	27	40	70	65	112	68	125	31	45	231	378
Total	40	108	66	313	90	656	105	1094	47	428	348	2599

Source: MIDA

Table A1-6-6 EXPORTS AND IMPORTS OF TEXTILES AND APPAREL (1990)

(Unit: million M$)

Code No.	Products	Exports (f.o.b.) (A)	Imports (c.i.f.) (B)	Balance (A-B)
	1. Fibers			
263	1) Cotton	5.89	191.60	-185.71
266	2) Synthetic Fibers	74.66	74.41	0.25
267	3) Other Man-made Fibers	1.37	31.88	-30.51
268	4) Wool and Other Animal Hair	131.21	144.54	-13.33
	Sub-total	213.13	442.43	-229.30
	2. Yarn and Fabrics			
651	1) Textile Yarn	164.36	452.98	-288.62
652	2) Cotton Fabrics, Woven	228.60	505.81	-277.21
653	3) Fabrics, Woven, of Man-made Textile Materials	263.30	666.90	-403.60
654	4) Textile Fabrics, Woven	0.85	44.86	-44.01
655	5) Knitted or Croached Fabrics	179.16	495.01	-315.85
	Sub-total	836.27	2,165.56	-1,329.29
	3. Apparel			
841	1) Mens' or Boys' Apparel of Fabrics, not Knitted or Croached	685.63	20.81	664.82
842	2) Womens' and Girls' Apparel of Fabrics, not Knitted or Croached	576.55	23.45	553.10
843	3) Mens' or Boys' Apparel, Knitted or Croached	280.86	7.61	273.25
844	4) Womens' and Girls' Apparel, Knitted or Croached	445.48	4.72	440.76
	Sub-total	1,988.52	56.59	1,931.93
	Total	3,037.92	2,664.58	373.34

Note: Imports = Import less re-export

Source: External Trade Statistics 1990, Department of Statistics

Table A1-6-7 EXPORTS OF TEXTILE AND APPAREL TO THE SELECTED COUNTRIES (1990)

(Unit: million M$)

	Yarn and Fabrics *1)		Apparel *2)	
	Value	% to Total	Value	% to Total
U.S.A.	100.70	12.0	988.90	49.7
Canada	24.54	2.9	93.81	4.7
Sweden	6.94	0.8	19.01	1.0
Norway	0.13	0.1	5.77	0.3
(EC)				
Belgium/Luxembourg	1.75	0.2	11.42	0.6
Netherlands	13.99	1.7	90.32	4.5
France	14.19	1.7	123.99	6.2
Denmark	4.81	0.6	20.99	1.1
W. Germany	52.16	6.2	154.89	7.8
Ireland	3.06	0.4	3.08	0.2
Italy	22.00	2.6	37.32	1.9
Greece	1.89	0.2	0.50	*
United Kingdom	32.30	3.9	195.40	9.8
EC Sub-total	146.15	17.5	637.10	32.1
Australia	33.73	4.0	5.75	0.3
Singapore	160.31	19.2	128.25	6.4
Hong Kong	73.37	8.8	23.57	1.2
Japan	67.90	8.1	21.21	1.1
Total	613.77	73.4	1,924.18	96.8
Other Countries	222.50	26.6	64.34	3.2
World Total	836.27	100.0	1,988.52	100.0

Notes: *1) Code No.: 651-655, *2) Code No.: 841-844

Source: External Trade Statistics, Department of Statistics

Chapter 7 Other Industries

7.1 Information Processing and Telecommunication Industries

7.1.1 Overall Status of the Industries

7.1.1.1 Information processing industry

It is estimated that there are approximately 100 companies which are involved in the information processing industry in Malaysia. From the viewpoint of the organization structure of the company, they can be classified into two types. One exists as divisions of large corporations such as power generating companies, telecommunication common carriers and banks, or as subsidiaries or group companies of large enterprises. These companies are involved in the development of application software for their parent companies in the mainframe software development environment. The others are mostly independent small and medium-scale companies which are heavily involved in application software development for personal computers and hardware sales.

In Malaysia, IBM dominates about 60% of the computer hardware market and the remaining 40% is shared by HP, NCR, and DEC. IBM covers direct sales of not only mainframes but also workstation levels of small systems. Therefore, the above-mentioned small and medium-scale software development companies can be involved in sales and distribution of only the personal computer type of small systems.

The main task of these software development companies is development of application software for office automations. In the software development stage, large companies and a limited number of software companies are engaged in development of the basic analysis up to the final test stage, while small and medium-scale companies are involved in only modifications of application software packages available on the market. Since the English language is used in Malaysia, software packages available world-wide are easily accepted or with some minor modification required. Therefore, the need for software development is limited.

7.1.1.2 Telecommunication industry

Regarding telecommunication systems in Malaysia, the public telephone network is relatively well-established while data communication network systems are still in the development stage.

Table A1-7-1 shows the actual number and future prospects for telecommunication subscribers in Malaysia. The public telephone network is well furnished along with the facsimile network which uses the same network system as the public telephone network system. In the public telephone network system, the number of radio communication network systems will grow rapidly because the transmission exchange capacity of wired transmission systems is reaching maximum capacity.

Gateway systems between domestic and overseas public telephone network circuitry are also well established. This will be very effective in expanding the communication capacity of both public telephone and facsimile overseas.

In contrast to public telephone network systems, data communication network systems are not well equipped in Malaysia. There is a certain amount of data transmission volume between central and state/local government offices, or between headquarters and branch offices or factories. But, most data, voice and image transmission has been done by public telephone network facilities. Data transmission circuitry which are currently equipped in Malaysia are as follows:

1) MAPEC (Malaysian Packet Network): This is a private network circuitry system used for packet data transmission which has 9.6 Kbps and 64 Kbps transmission speed. MAPEC adopts X.25 international standard for packet data exchange protocol.

2) T-1: This has the same configuration with high speed digital circuitry which is supplied from AT&T in the United States. In Malaysia, T-1 furnishes gateways which connect with T-1 network systems of the United States and have a high level of usage among US companies based in Malaysia. However, T-1 supplies its data transmission speed of 1.544 Mbps only, so it is not appropriate for use with small volume data transmission users because of its cost performance.

The following are data transmission circuitry systems currently under plan for installment in Malaysia:

1) T-2
2) TV conference circuitry
3) ISDN (Integrated System Digital Network)

7.1.2 Current Status of Standardization

7.1.2.1 Introduction

Under the present circumstances of normal computer usages in telecommunications, it is not appropriate to consider standardization of the information processing industry and the telecommunication industry separately. For example, it is considered that standardization of computer hardware and software, as well as standardization of telecommunication technologies which relate to the connection of different computer systems, are integrated as one total system.

7.1.2.2 Standardization of information processing

Standardization related to the information processing industry has been in a difficult position due to the computer manufacturers' own intentions in their hardware market strategies. That is, each hardware manufacturer had its own basic computer hardware architecture, operating systems and application software, and none of these were compatible with each other. However, worldwide movement toward standardization is gradually being activated because of the following reasons:

1) Along with the increasing volume of computer processing tasks, the required time and cost of application software are rapidly increasing. To cope with these conditions, users are requiring compatibility of different hardware systems and sharing of application resources.
2) To deal with the increasing enormous size of computer systems, the necessity of integration of transmission control systems is growing among computer and communication systems.

The standardization activities of information processing areas are mainly taken its process by ISO and The Consultative Committee on International Telegraphy and Telephony (CCITT) as well as computer hardware and its related manufacturers. The manufacturers include computer manufacturing companies who are declaring systems compatibility by adopting UNIX operating systems into their hardware systems.

At the national level of standardization, ISO recommendations for standardization have been used as the basis for standardization. For example, there are 180 JIS standards which are related to information processing in Japan, and among them, 64 % or 115 JIS standards are based on ISO standards. As shown in Table A1-7-2 the remaining standards were originally created in Japan out of its necessity, like

specification of the processing method of Japanese characters and setting of various kinds of classification codes.

In Malaysia, as of December 1991, there are 19 MS standards in the field of information processing. Most these standards were established to integrate terms and symbols based on the ISO 2382 Series.

7.1.2.3 Standardized protocol for telecommunications

Standardization of telecommunication has been promoted by world-wide bases since it was highly required for connecting independently developed communication systems in each country. The centralized bodies of promotion for international standardization of telecommunication technologies are both CCITT and Consultative Committee on International Radio (CCIR) which are supporting organizations of the International Telecommunication Union (ITU). CCITT is dealing with standardization for cable communication systems and CCIR with radio communication systems.

The standardization which is recommended by those two organizations consists of V-Series, X-Series and T-Series and these standards include settlement of electrical characteristics and conditions of connections for communication terminals or communication network systems, communication protocol for information exchanges and standards and operation method of communication equipment systems.

ITU is gradually cooperating with ISO to promote standardization of information processing and communication equipment because both telecommunications and information processing technologies are closely related in terms of each area of technology.

There are no standards related to telecommunication technology available in MS standards. However, ISO and CCITT standards or in-house standards of multinational computer manufacturers standards or industry associations' standards are generally adopted in Malaysia.

Two directions toward the standardization of communication protocol can be seen in Malaysia. One is JARING (Joint Academic/Advanced Research and Integrated Networking) which is recommended by the Malaysian government-led agency MIMOS (Malaysian Institute of Microelectronics Systems). JARING adopts TCP/IP which is standardized protocol of EtherNet. The number of users and traffic volume are not disclosed. However, most users are limited to government