STUDY ON
THE INDUSTRIAL STANDARDIZATION
AND
QUALITY ASSURANCE IMPROVEMENT PROGRAMME
IN
MALAYSIA

JANUARY 1993

JAPAN INTERNATIONAL COOPERATION AGENCY

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Preface

In response to a request from the Government of Malaysia, the Government of Japan decided to conduct a study on the Industrial Standardization and Quality Assurance Improvement Programme in Malaysia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Malaysia a study team headed by Mr. Masayasu Sakanashi of UNICO International Corporation, three times between January 1992 and December 1992.

The team held discussions with the officials concerned of the Government of Malaysia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

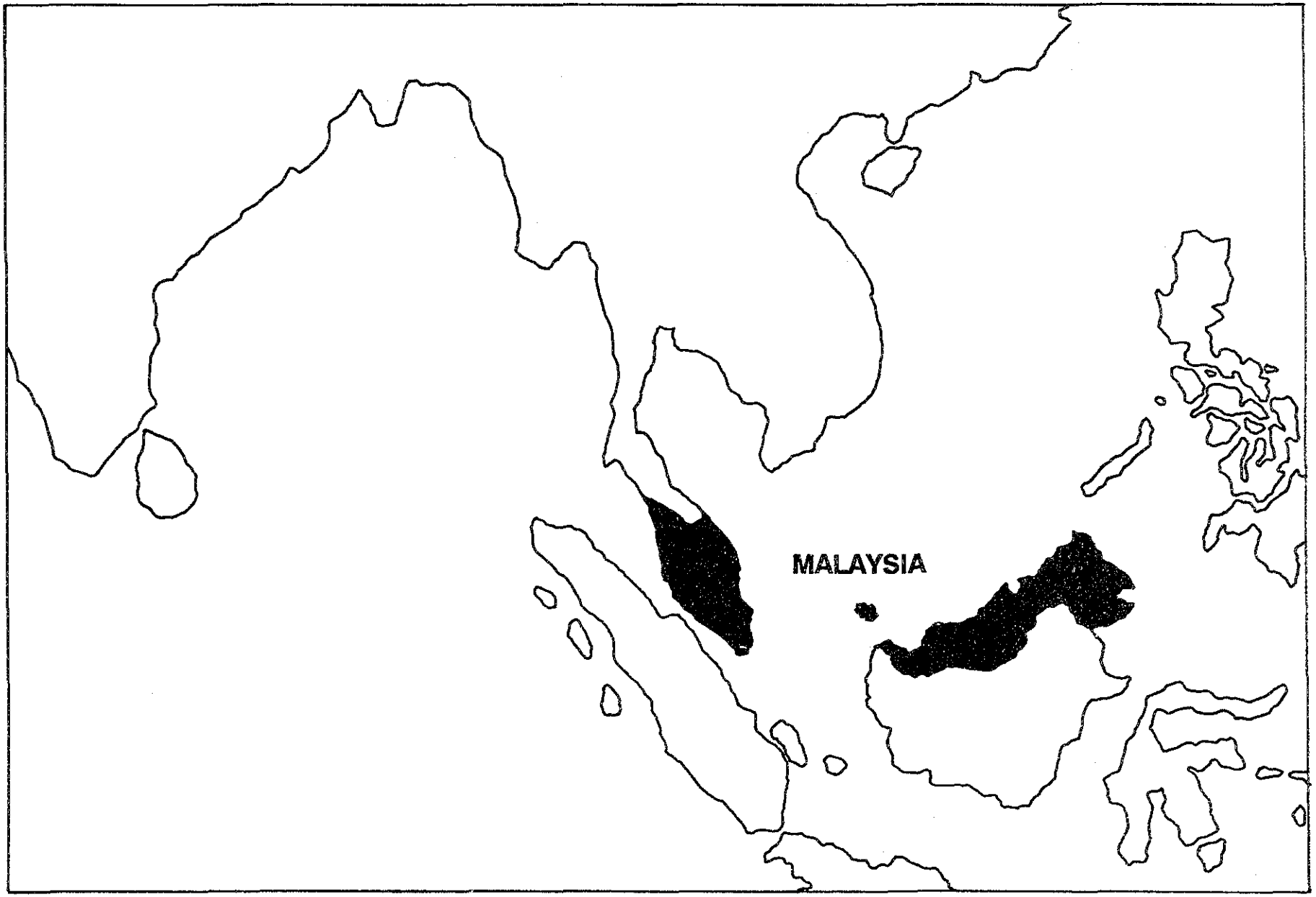
I hope that this report will contribute to the promotion of the programme and the enhancement of friendly relations between our two countries.

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

January 1993

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency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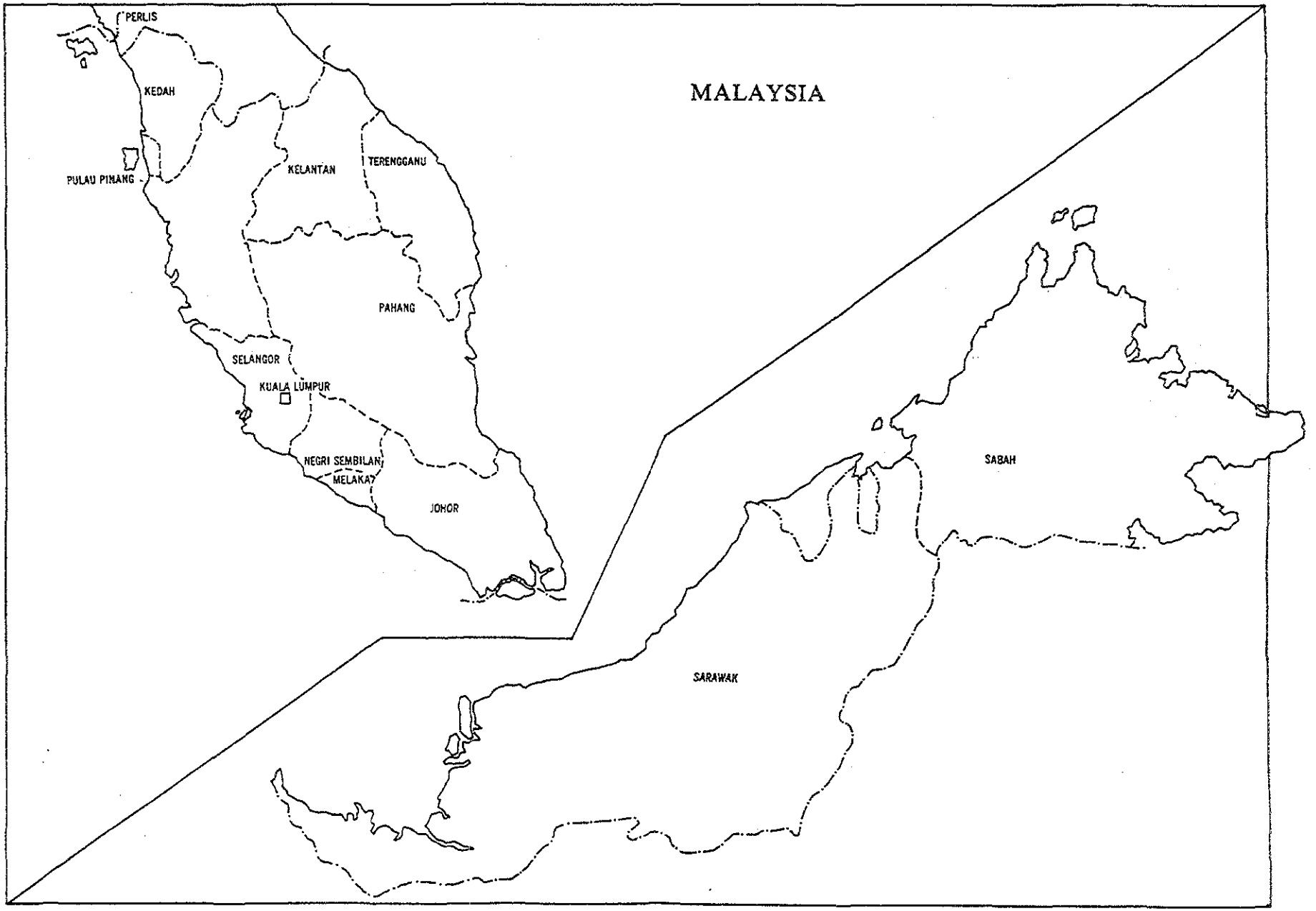
MALAYSIA
PERLIS
KEDAH
PULAU PINANG
KELANTAN
TERENGGANU
PAHANG
SELANGOR
KUALA LUMPUR
NEGRI SEMBILAN
MELAKA
JOHOR
SABAH
SARAWAK

Abbreviations

ADB	Asian Development Bank
AFTA	ASEAN Free Trade Area
AIST	Agency of Industrial Science & Technology (Japan)
AJDF	ASEAN–Japan Development Fund
AMTC	Advanced Manufacturing Technology Centre
ANSI	American National Standards Institute
APITD	Action Plan for Industrial Technology Development
APMC	Association Pan Malaysian Cement
ARQS	Assessment and Registration of Quality Systems
ASEAN	Association of South East Asian Nations
ASTM	American Society of Testing and Materials
AT & T	American Telegraph and Telephone
ATC	Appropriate Technology Centre
BCS	British Calibration Service
BNM	Bank Negara Malaysia
BS	British Standards
CAD	Computer–Aided Design
CAE	Computer–Aided Engineering
CAM	Computer–Aided Manufacturing
CBC	Chemical and Biochemical Centre
CBU	Completely Built–up Unit
CCIR	Consultative Committee on International Radio
CCITT	Consultative Committee on International Telegraph and Telephony
CE Meter	Carbon Equivalent Meter
CEO	Chief Executive Officer
CIAST	The Centre for Instructor and Advanced Skill Training
CKD	Completely Knocked Down
COC	Certificate of Competence Scheme
CPI	Consumer Price Index
CPIG	Concrete Products Industry Group
CPO	Crude Palm Oil
CRT	Cathod Ray Tube
CS	Canadian Standard
CSA	Canadian Standards Association
CTC	Ceramic Technology Centre
CUEPACS	Congress of Unions of Employees in the Public Civil Service
CWQC	Corporate–Wide Quality Control
DEC	Digital Equipment Corp.
DOA	Department of Agriculture

EDI	Electronic Data Interchange
EI	Electrical Inspectorate
EIA	Electronics Industry Association
EIAJ	Electronics Industry Association, Japan
EPU	Economic Planning Unit
EXCO	Executive Committee
FAMA	Federal Agricultural Marketing Authority
FMM	Federation of Malaysian Manufacturers
FMP	Fifth Malaysia Plan
FRIM	Forestry Research Institute of Malaysia
FTZ	Free Trade Zone
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GNP	Gross National Product
GTZ	The German Agency for Technical Cooperation
HICOM	Heavy Industries Corporation of Malaysia
HOKLAS	Hong Kong Laboratory Accreditation Scheme
HP	Hewlett-Packard Corp.
IC	Integrated Circuits
IC	Instrumentation Centre
ICA	Industrial Coordination Act
IEM	Institute Engineers Malaysia
IKM	Institiut Kimia Malaysia (Mara Vocational Institute)
ILAC	International Laboratory Accreditation Conference
IMF	International Monetary Fund
IMP	Industrial Master Plan
INTAN	National Institute of Public Administration
IPQC	In-Process Quality Control
IQA	Institute of Quality Assurance
IQC	Incoming Quality Control
IQCM	Institute of Quality Control, Malaysia
ISC	Industry Standards Committee
ISDN	Integrated System Digital Network
ISO	*International Organization for Standardization*
ITAF	Industrial Technology Assistance Fund
ITM	Institut Teknologi MARA (MARA Institute of Technology)
ITU	International Telecommunication Union
JACTIM	The Japanese Chamber of Trade & Industry, Malaysia
JARING	Joint Academic/Advance Research and Integrated Networking
JAS	Japanese Agricultural Standards
JASO	Japanese Automobile Standards Organization

JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
JISC	Japanese Industrial Standards Committee
JKR	Development of Public Works
JMI	Japan Machinery & Metals Inspection Institute
JSA	Japanese Standards Association
JSAE	Society of Automotive Engineers of Japan, Inc.
JUSE	Union of Japanese Scientists and Engineers
KIS	Korean Industrial Standards
KS	Korean Standard
LCD	Liquid Crystal Display
LMW	Licensed Manufacturing Warehouse
LNG	Liquefied Natural Gas
LSI	Large Scale Integrated Circuits
MANPU	The Malaysian Administrative Modernization and Management Planning Unit
MARDEC	Malaysian Rubber Development Corporation
MARDI	Malaysian Agricultural Research Development Institute
MAYPAC	Malaysian Packet Services
MDP	Mandatory Deletion Programme
MDTCA	Ministry for Deomestic Trade and Consumer Affairs
MEF	Malaysian Employees Federation
MELCOM	Matsushita Electric Company, Malaysia
METP	Ministry of Energy, Telecommunication and Posts
MEXPO	Malaysian Export Trade Centre
MFA	Multinational Fiber Agreement
MHLG	Ministry of Housing and Local Government
MIDA	Malaysia Industrial Development Authority
MIDEC	Metal Industry Development Centre
MIDF	Malaysian Industrial Development Finance
MIMOS	Malaysian Institute of Microelectronic Systems
MIMOS	Malaysian Institute of Microelectronics Systems
MITI	Ministry of International Trade and Industry (Japan)
MITI	Ministry of International Trade and Industry (Malaysia)
MNC	Multinational Corporation
MOA	Ministry of Agriculture
MOH	Ministry of Health
MOL	Ministry of Labour
MOSTE	Ministry of Science, Technology and Environment
MOT	Ministry of Transport
MOU	Memorandum of Understanding
MPI	Ministry of Primary Industries
MS	Malaysian Standards

MTMA	Malaysian Textile Manufacturers Association
MTUC	Malaysian Trade Union Congress
MYS	Ministry of Youth and Sports
NAMAS	National Measurement Accreditation Service
NATA	National Association of Testing Authorities
NATLAS	National Testing Laboratory Accreditation Scheme
NAVLAP	National Voluntary Laboratory Accreditation Programme
NCR	National Cash Resister Corp.
NDP	National Development Policy
NEP	New Economic Policy
NFPEs	Non-financial Public Enterprises
NIEs	Newly Industrialized Economies
NIF	New Investment Fund
NIST	Agency of Industrial Science & Technology
NPC	National Productivity Corporation
NPL	National Physical Laboratory
NR	Natural Rubber
OECF	Overseas Economic Cooperation Fund
OEM	Original Equipment Manufacturer/Manufacturing
OJT	On the Job Training
OPP1	First Outline Perspective Plan
OPP2	Second Outline Perspective Plan
OQC	Outgoing Quality Control
OS	Operating System
PDC	Product Design Centre
PDC	Penang Development Centre
PIA	Promotion of Investment Act
PMD	Prime Minister's Department
PORIM	Palm Oil Research Institute of Malaysia
PROTON	Perusahaan Otomobil Nasional (National Automobile Industry)
PTC	Plastics Technology Centre, SIRIM
QCC	Quality Control Circle
QIP	Quality Improvement Practice
QM	Quality Management
QRSP	Quality and Reliability Society of Penang
QSCRS	Quality System Consultants Registration Scheme
R & D	Research and Development
REM	Replacement Equipment Manufacturing/Manufacturer
REM	Replacement Equipment Market
RRIM	Rubber Research Institute of Malaysia
RTC	Rubber Technology Centre

SAMM	Skim Akreditasi Makmal Malaysia
SIA	Semiconductor Industry Association of America
SILAS	SIRIM Laboratory Accreditation Scheme
SINGLAS	Singapore Laboratory Accreditation Scheme
SIRIM	Standards and Industrial Research Institute of Malaysia
SKD	Semi-Knocked Down
SMC	Standard Malaysian Cocoa
SME	Small and Medium Scale Enterprise
SMI	Small and Medium Scale Industries
SMP	Sixth Malaysia Plan
SMR	Standard Malaysian Rubber
SPM	Sijil Palajaran Malaysia (Malaysia Certificate of Education)
SQC	Statistical Quality Control
SRIJ	Society of Rubber Industry, Japan
SRIS	Society of Rubber Industry, Japan Standard
SRP	Sijil Rendat Palajaran (Lower Certificate of Education)
STANCO	Standards Committee
SUM	Science University of Malaysia
T/C	Technical Agreement
TAB	Tariff Advisory Board
TC	*Technical Committee*
TELARC	Testing Laboratory Accreditation Council
TEXPRO	Technical Services For Exporters Programme
TQC	Total Quality Control
TQM	Total Quality Management
TTC	Telegram and Telephone Committee
TV	Television Set
UN	United Nations
UOM	University of Malaysia
USM	Universiti Sains Malaysia (University of Science Malaysia)
UTM	Universiti Technologi Malaysia (University of Technology Malaysia)
VAT	Value Added Tax
VLSI	Very Large Scale Integrated Circuits
WG	Working Group

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1.1 Background of the Study

The industrial standardization has been undertaken with SIRIM (The Standards and Industrial Research Institute of Malaysia) under MOSTE (Ministry of Science, Technology and Environment) being the core body of enhancement and promotion activities. As for the quality management, there are three organizations for the promotion activities at the national level; namely, MANPU (The Malaysian Administrative Modernization and Management Planning Unit) in the government sector, and NPC (National Productivity Corporation) and SIRIM in commerce and industry sector.

Malaysia has promoted export-oriented industrialization, targeting the growth of economy to become a fully developed nation by the year 2020.

The rapid industrialization of recent years in Malaysia has been promoted by active introduction of foreign investment. As a result, the export-oriented industries are dominated mainly by large businesses such as public (or ex-public) corporations and foreign invested firms. However, the development of supporting industries which supply materials and parts is still behind, and small- and medium-scale industries (SMIs) engaged in those sectors have not reached a level that can produce exportable quality products.

In order to overcome such shortcomings, efforts have been exerted to restructure domestic industries by enhancing SMIs as supporting industries for export related industries. Enhancement and promotion of the standardization and quality management in industrial sector is becoming more important and essential.

The Malaysian Government has decided to develop comprehensive program to enhance and promote standardization and quality management among the industry, and requested technical assistance to the Japanese Government for the study in February 1990. In response to the above request JICA (Japan International Cooperation Agency) dispatched preliminary study mission in January 1991, reached the agreement on implementation of the study, and signed the Scope of Work with EPU (Economic Planning Unit, Prime Minister's Department) for implementation of the study. This report presents the outcome of the study thus carried out by the study team of JICA in accordance with the agreed Scope of Work.

1.2 Objective of the Study

The Objective of the Study is to prepare a comprehensive plan of action through, among others,

1) Developing more effective programs for industrial standardization, certification and quality control;
2) Promoting activities of industrial standardization, certification and quality control; and
3) Upgrading capabilities of testing and inspection ("testing" means testing for standards development and product certification);

in order to improve the quality of Malaysian industrial products, thereby contributing to industrial development and export promotion.

2. Industrial Development and Needs for Enhancement of Industrial Standardization and Quality Assurance in Malaysia

2.1. Present Status and Future Outlook of Industrial Development in Malaysia

2.1.1 Overview of Economy

2.1.1.1 General

Malaysia comprises Peninsular Malaysia situated at the edge of continental South-east Asia and the states of Sabah, Sarawak and the Federal Territory of Labuan in the north-western coastal part of Borneo Island, covering an area of about 329,758 square kilometers in total. These two regions are separated by about 540 kilometers of the South China Sea. Peninsular Malaysia covering 131,598 square kilometers borders on Thailand in the north and Singapore in the south. Sabah and Sarawak, with areas of 73,620 and 124,449 square kilometers respectively, have frontiers with Kalimantan, Indonesia. The Federal Territory of Labuan is situated off the west coast of Sabah, and has an area of 91 square kilometers. About four-fifths of Malaysia, including Sabah and Sarawak, are covered by tropical rain forest (See the map on the first page).

Malaysia, as a federal nation, consists of 13 states, namely 11 Peninsular states, Sabah and Sarawak, and 2 Federal Territories (Kuala Lumpur and Labuan Island). As economic zones, Malaysia is usually split into three areas, namely Peninsular, Sabah and Sarawak following their geographical features. The names of respective states and the Federal Territories, area and population are shown in Table 2-1.

Peninsular Malaysia consists of the central mountainous area, the east and the west coastal plain areas and another plain area at the south tip of the peninsula. Most of the rubber and oil palm estates, which are the main agricultural export products of Malaysia, are located on the west and south coasts. The mining of tin, another traditional export item, is done mostly in two states of Perak and Selangor in the western area.

The coastline of Peninsular Malaysia stretches 730 kilometers north and south and 320 kilometers east and west totaling 2,000 kilometers. The east coast, facing the South China Sea, is less developed because of lack of good harbors while the west coast enjoys lively economic activities much of which is through ports as traffic centers located at the river mouths. Since the mid-1970s, oil and natural gas have

been developed intensively off the east coast. However, economic activities in the area have not been sufficiently promoted as yet although relevant industries and port facilities have been developed.

In Sabah and Sarawak, the land is mostly mountainous. Small plains exist in limited coastal and river basin areas. In these plains, traffic is usually hampered by dense tropical primeval forests and swamp forests on soft alluvial ground. Owing to such natural conditions, economic activities in these states are limited to within each local area. Since the 1970s, development of oil and natural gas in offshore fields as well as related industries have made progress as the principal industry in these areas where timber had been a traditional product. Besides, pepper in Sarawak and cocoa in Sabah are known as major agricultural products.

The population of Malaysia is 17.8 million as of mid-1990. The population of 14.6 million, 82.3% of the total population, live in Peninsular Malaysia. Sabah has 1.5 million inhabitants and Sarawak has 1.7 million. Malaysia, as a multi-racial nation, comprises the Malays and the aborigines 62%, Chinese 30% and Indians 8%. The average population growth rate was 2.6% in the last decade.

2.1.1.2 Economic growth and changes in economic structure

The economy of Malaysia has sustained stable growth for the last two decades. Major economic indicators of Malaysia and its neighboring countries are shown in Table 2-2. Though Malaysia has a relatively small population, industrialization of the nation is well advanced and the Gross National Product (GNP) level is also in a moderate range.

Malaysia's average growth rate of the Gross Domestic Product (GDP) in real terms in the 1970s was 6.6% per annum in 1970-75 and 8.6% in 1975-80. In the 1980s, the growth rate in real terms declined to 5.1% per annum in 1980-85, under the influence of the recession of 1985-86. However, owing to rapid recovery of the economy, the annual growth rate was sustained at the level of 6.8% in 1985-90.

GDP by industrial origins in 1980-91 and the gross national expenditure[*1)] in the same period (both in 1978 constant price) are shown in Tables 2-3 and 2-4 respectively. Recent growth of the GDP shows a higher rate than in the past, namely, 8.7% in 1989, 9.8% in 1990 and 8.6% in 1991, respectively, in comparison with the previous years. Along with growth of the GDP, growth of the gross national expenditure is also remarkable. The annual rate in 1980-95 was 5.0%, corresponding to the rate of the GDP, but in 1985-90 it rose to 10.2%, higher than that of the

GDP. In particular, the growth in recent years has been conspicuous: 16.1% in 1989, 16.8% in 1990 and 14.6% in 1991. Thus, the economy of Malaysia has substantially expanded and the gross national expenditure (in 1978 constant price) has risen from M$68.4 billion in 1980 to M$162 billion in 1991 which is 2.4 times as high as 1980.

The greatest factor behind the drastic expansion of the Malaysian economy is the growth of exports. The Government has promoted economic growth by encouraging industrialization of export-oriented business as a basic strategy, in view of limits of domestic-market-oriented industrialization due to the limited scale of the domestic market based on the small population. As Table 2-4 shows, exports reached the comparatively high ratio of 33% in the gross national expenditure as early as 1980. Then, exports sustained substantial growth, far higher than that of the GDP, resulting in the annual average of 7.1% in 1980-85 and 14.9% in 1985-90. In particular, growth in the past three years has been remarkable: 18.1% in 1989, 18.3% in 1990 and 16.2% in 1991 which are almost two times higher than the growth rate of the GDP. Consequently, the ratio of exports in the gross national expenditure rose year by year and reached 45.8% in 1991. Meanwhile, the growth rate of the domestic expenditure*2) also rose from 4.2% as an annual average in 1980-85 to 6.6% in 1985-90; these rates are lower than those of the GDP. As a result of these conditions, growth of gross fixed capital formation was also conspicuous and its ratio in the domestic expenditure rose from 30.2% in 1980 to 34.5% in 1991. Especially important is that gross fixed capital formation in the private sector significantly grew with 30.5% in 1989, 24.8% in 1990 and 19.5% in 1990.

As the past trend indicates, the sound growth of the Malaysian economy has been sustained by drastic expansion of exports. Moreover, recent increases in local construction demand stemming from growth of private investment also contributes much to the economy. These tendencies suggest that the expansion of exports and domestic investment will be essential key factors for Malaysia to sustain the sound growth of economy.

Analysis of the composition of the GDP shows that both the agriculture sector (including forestry and fisheries) and the mining sector (excluding oil and natural gas) continued modest growth while the manufacturing sector grew rapidly, particularly in recent years. Since the mid-1970s, the development of oil and natural gas has advanced so that it has become the core industry in the mining sector in place of tin production, a traditional mining industry. The average annual rate of growth in 1985-90 shows a very high figure of 13.6% in manufacturing industry compared

to only 4.6% in the agriculture sector and 4.3% in the mining sector even including oil and natural gas. Growth of the manufacturing industry, particularly in the past two years, has been further advanced, with 17.9% in 1990 and 15.5% in 1991. This pulled up the ratio of the sector in the GDP from 19.6% in 1980 to 28.7% in 1991 while that ratio of agriculture as well as the mining sector (including oil and natural gas) declined respectively from 22.9% and 10.1% in 1980 to 17.3% and 9.3% in 1991.

As such, industrialization in Malaysia has developed rapidly in the 1980s and manufacturing industry is thus the leading force for economic growth of the country. For further development of the economy, expansion of manufacturing industry, in particular export-oriented industry, is indispensable.

Meanwhile, a relatively high ratio of imports and years of steady increases are notable observations derived from analysis of the composition of the corresponding gross supply*3) to the gross national expenditure. Especially, the increase of imports since 1985 has been sharp. The average annual increase rate in the five year period of 1985--90 is 15.7%, as much as 2.3 times greater than the GDP growth rate. Tendency for a further increases is seen in the most recent three years, namely 29.1% in 1989, 27.0% in 1990 and 22.2% 1991. Consequently, the import ratio in the gross supply rose from 34.9% in 1980 to 47.0% in 1991. This trend indicates that the Malaysian economy is still greatly dependent on imports despite smooth growth.

The Malaysian manufacturing sector has been dependent mostly on import for its parts and raw materials supply, and the import tends to increase accordingly with the expansion of manufacturing, as to be examined in the latter part of this report. The diversification and deepening of material production basis, therefore, is one of the important the tasks to be tackled by the manufacturing sector.

Notes: *1) Gross national expenditure: total of the consumption expenditure, gross fixed capital formation, increase in stock and exports of goods and non-factor services indicated in the national accounts.

*2) Domestic expenditure: total of the consumption expenditure and gross fixed capital formation indicated in the national accounts.

*3) Gross supply: total of the gross domestic product and imports of goods and non-factor services indicated in the national accounts (the gross supply corresponds to the gross national expenditure).

2.1.1.3 Structure of external trade

The external trade of Malaysia for the period of 1980–90 is shown in Table 2–5. As reviewed in the above, exports played an important role in the economy, sustaining smooth growth in the past decade except for the 1986 recession. The growth rate of exports rose sharply in 1985–90 at an annual average of 15.9% for five years while the rate in 1980–85 was 6.2% per annum for the same length of period. In the meantime, the value of exports rose from M$28.2 billion in 1980 to M$38.0 billion in 1985 and further to M$79.6 billion in 1990 which was almost 2.8 times as much as the amount in 1980. In particular, the growth after 1987 was so drastic that it registered 28.0% in 1987, 22.2% in 1988, 22.7% in 1989 and 17.4% in 1990. On the other hand, the imports which came to M$23.5 billion in 1980 increased to M$30.4 billion in 1985 with increases at an annual average rate of 5.4%. In 1986, imports as well as exports declined due to the recession. However, imports returned to a growth path in accordance with recovery of the economy. The rate of increase was 35.6% in 1988, 40.6% in 1989 and 30% in 1990. Imports in 1991 were M$79.1 billion which was about 3.4 times as much as the amount in 1980. Although the external trade has always been shown an excess of exports, the trade surplus has been reduced year by year owing to increases of imports. If this trend lasts longer, it is likely that the external trade balance may show a deficit in the near future.

The exports of major commodities in Malaysia are shown in Table 2–6. The structure of the export industry has greatly changed in the past decade. Primary products such as rubber, oil palm, tin and timber are the traditional export items. Since the 1980s, however, exports of these primary products stagnated or declined. After the 1970s, the export of oil, and in the mid–1980s, the export of natural gas as LNG, have started. Although these two items now form the principal export industry, current growth is not conspicuous. The Government has made efforts to promote the export–oriented industrialization since the mid–1970s. Exports of manufactured products grew at an annual average rate of 14.6% in 1980–85, and their share in total exports expanded from 22.4% in 1980 to 32.8% in 1985. After 1985, it rose further to 30.5% per annum on average and registered a 59.2% share in total exports in 1990. Thus, the manufactured products are the main export items in Malaysia recently, followed by oil and LNG with the share of 16.2%, timber 8.9%, oil palm 5.5%, rubber 3.8% and tin, which registered 8.9% of total exports in 1980, counts merely 1.1% now.

Among manufactured exports, the largest items are electrical and electronics products, and textiles and garments. Out of these two groups, the former dominat–

ed 56.5% of all exports of the manufactured products while the latter was 8.7% on average in the three years of 1988–90. Shares of the other products were: food processing and chemicals 4.7% respectively, metal 3.9%, transport equipment 3.5%, wood–based 3.3% and rubber–based 3.1%.

Exports to selected destination countries are shown in Table 2–7. The principal export markets for Malaysia are Singapore, the U.S.A., Japan and the EC. These countries are also major export markets for the manufactured exports. The share of these areas in total exports was 70.4% in 1990 (Singapore 22.8%, the U.S.A. 16.9%, Japan 15.8% and the EC 14.9%). Also in case of manufactured exports, 77.7% were exported to these areas (Singapore 27.3%, the U.S.A. 24.9%, the EC 17.4% and Japan 8.1%).

Changes in the import structure of Malaysia in the past twenty years is shown in Table 2–8. Since the mid–1960s, imports of foods and general consumer goods have gradually declined along with progress of domestic production through diversification of agriculture and the development of import substitution industries. The share of these commodities in total imports fell from 14% in 1980 to 13% in 1990. In the 1970s, imports of consumer durables sharply increased at an average rate of 24.6% per annum against the background of growth and change of demand supported by improvement of the income levels. The share of consumer durables was 2% of total imports in the 1970s, and rose to 4% in 1980. However, along with the progress of domestic production in the 1980s, imports of consumer durables decreased by 11.6% at an annual average and in 1990 the share fell to 3% of total imports.

Meanwhile, imports of raw materials and intermediates exhibit tendency to increase in proportion to the increase of imports of capital goods for factory construction and progress of industrialization. As assembly industries such as electric and electronic equipment, automobiles and other precision machinery have developed rapidly in recent years, imports of parts, components and intermediates required for those industries substantially increased, because domestic production for those items are not yet well established. The annual rate of increase of capital goods imports was 20.3% on average in the decade of 1970–80 and 15.6% in 1980–90. Shares in total imports increased from 25% in 1970 to 30% in 1980 and further to 38% in 1990. Likewise, imports of raw materials and intermediates expanded at the annual average rate of 22.9% in the decade of 1970–80 and the share in total imports rose from 35% in 1970 to 50% in 1980. However, growth in 1980–90 declined to the an annual average 11.8% and the ratio of these items in total imports fell to 45% in 1990. It was mainly due to a drastic retrenchment of crude oil im–

ports caused by progress of oil development and a diminution of imports of agricultural inputs, such as fertilizers and pesticides, the being a result of a shift to domestic production. On the other hand, imports of raw materials and component parts for manufacturing industries increased greatly year by year. Growth averaged 22.2% in 1970–80 and 15.5% in 1980–90 and the share in total imports rose from 21% in 1970 to 28% in 1980 and further to 36% in 1990. This trend reflects the present state of Malaysia's industrialization in which domestic production of component parts and intermediates still lags due to overemphasis on assembly industries for manufacturing of finished products.

2.1.1.4 State of labor force and employment

Smooth economic development over a period of two decades, and in particular, rapid expansion of manufacturing industries has contributed to the creation of employment in Malaysia. The trend of the labor force and employment in 1980–90 is shown in the Table 2–9. During that period, the labor force increased at the rate of 3.2% per annum. Meanwhile, employment expanded in keeping with smooth economic growth since the 1970s and in 1980 the unemployment rate fell to the level of merely 5.6%. It worsened in 1985–86 due to the recession. After that, along with recovery of the economy, employment rose and the unemployment rate fell to 6.0% in 1990 through yearly improvement after it had peaked at 8.2% in 1987.

Thus, employment in Malaysia has stayed at a high level in recent years. However, considerable changes are seen in specific industrial sectors. The trend of employment disaggregated by sector is shown in Table 2–10. In 1980, the agriculture sector (including forestry and fishing) accounted for a 37.2% share of the total employed population, while 15.5% was in manufacturing, 5.6% in construction, and 1.3% in mining and quarrying. Shares of the tertiary industry sector and the Government service sector were 21.7% and 13.3% respectively. Since 1980 employment in agriculture had maintained a 0.7% growth on average till 1988, and since then has shown a gradual yearly decline. Meanwhile, employment in manufacturing sustained a 5.6% increase in the past decade and, in particular, after 1988 expanded at an annual rate of more than 10%. Consequently, agriculture's share in total employment fell to 27.8% in 1990 while the share of the manufacturing sector rose to 19.5%. Employment in the mining sector shows a tendency to decrease due to decline of tin mining. In construction, a employment increased, accounting for a 6.4% share in total employment in 1990, as a reflection of recent private investment and public works. Employment in the tertiary industry also shows yearly increases along with recent expansion of economic activities. The share reached 26.5% in

total employment in 1990. The Government service sector's employment also has increased year by year. However, its share decreased to 12.8% as the increase in this sector is not so high as in other sectors. As the aforesaid trends indicate, the employment has remained on the same level or decreased in the primary industry sectors such as the agriculture and mining while in manufacturing, construction and tertiary industry sectors, employment increased. It is expected that these tendencies will continue, and in particular, employment in manufacturing will grow.

According to the Economic Report 1991/92 of the Ministry of Finance, Malaysia, in 1991 increase in employment further reduced the unemployment rate to 5.6%. This rate includes those who are not actively seeking employment. If this group is excluded, the situation is close to full employment. Reflecting this is the tightening of the labor market which has resulted from the demand by many sectors not only for more skilled workers but also unskilled workers. The Employment Turnover Survey recently conducted by the Manpower Department, reports that a significant level of turnover of skilled workers is observed in the manufacturing sector at the national level in keeping with the tightening of the labor market. The sectors struggling with frequent turnover include metal fabrication, textile and garment, wood-based, electrical and electronics, printing and rubber-based industries. Shortages of skilled workers have also been reported in the construction sector.

According to the Economic Report, wages also show an upward tendency reflecting the tightening of the labor. In recent years, average wages in the manufacturing sector have increased by 6% annually while the labor intensive industries such as the textile, wood-based and rubber-based industries have registered a higher wage growth.

2.1.2 Present State of Industrial Development and Structural Characteristics of Industry in Malaysia

2.1.2.1 Historical changes in industrialization strategy and industrial development policy

In Malaysia, since gaining independence in 1957, various industrial policies have been introduced in order to promote rapid growth of the manufacturing industries. These policies were mainly aimed at attracting investment from the developed countries. Tax incentives, tariff protection and the establishment of industrial estates were introduced as promotive measures. In 1958, the Pioneer Industries Ordinance was enacted to accelerate industrial development. This ordinance provided generous tax relief and tariff protection to selected industries.

The development policy of Malaysia in the 1960s called for the expansion of the economic base through diversifying the agricultural products and promoting industrialization. As the initial step of industrialization, the Government adopted industrialization strategy based on import substitution which had been pursued in many developing countries. Under this strategy, various incentives, including tariff protection, were created to encourage the development of local industries, in particular for the manufacture of simple consumer products such as canned food and beverages for the domestic market. However, in case of Malaysia, extremely high tariff barriers were not erected, unlike the other developing counties.

In 1960, the Malayan Stock Exchange was established as a measure to provide an environment for promotion of industrialization by mobilizing private capital for industrial development. Also in the 1960s, other agencies such as the Malaysian Industrial Development Finance Berhad (MIDF), to promote industrial finance, and the Tariff Advisory Board (TAB), to promote familiarization with the system of tariff protection, were established. However, the average effective rate of protection in Malaysia was relatively low compared with other countries owing to the Government's emphasis on a liberal trade and market-oriented strategy.

In the late 1960s, in view of the limited size of the domestic market, questions were raised regarding effectiveness of the import substitution based industrialization to attain rapid expansion of industries and thereby absorb the rapidly expanding labor force. Hence, in 1968, the focus of policy shifted to export-led growth and the Investment Incentives Act was introduced to broaden the scope of incentives for industrial development.

In 1971, the New Economic Policy (NEP) was introduced and a new dimension and direction to industrialization was set force. Industrialization became an important vehicle to achieve the objectives of the NEP, particularly in terms of providing opportunities for employment and equity restructuring. With the emergence of the Non-financial Public Enterprises (NFPEs) and the regulation of commercial and industrial activities, direct public sector participation was seen in the 1970s. At the same time, efforts were made to promote private investment in industry. In 1971, export-processing or free trade zones (FTZs) were set up under the FTZ Act. Companies operating in these zones may enjoy tax holidays, exemptions from import and export duties, and unrestricted, tax-free remittance of profits and dividends. Consequentially, many subsidiaries of large foreign enterprises, assembling mainly electrical appliances and parts, built factories in the FTZs.

In 1975, the Investment Incentives Act, 1968 was amended to increase incentives available to labor-intensive industries. For firms operating outside the FTZs to enjoy similar benefits to those in the FTZs, the Customs Act of 1967 was also amended to allow the establishment of Licensed Manufacturing Warehouses (LMWs) outside the FTZs.

In the mid-1970s, arguments were put forward that despite active Government promotional efforts, the industrialization process remained largely uncoordinated and progress in achieving the NEP objectives was still limited. Taking such an environment into account, the Industrial Coordination Act (ICA) was enacted in 1975 to rationalize industrial development and provide some direction for the types of industries which would be promoted. Under the ICA, licenses were issued to those wishing to engage in manufacturing activities, subject to compliance with guidelines on equity ownership and employment structure. However, the ICA was amended in 1977 with a provision for a procedure for appeals as the Act caused some uncertainty in the investment environment.

In the 1980s, the second phase of import-substituting industrialization took place; it put emphasis on the heavy industry sector. A number of large projects such as iron and steel, cement, the national car and small engine production were initiated under the leadership of the Heavy Industries Corporation of Malaysia (HICOM). However, during this period, the world economy entered a recessionary phase as a result of the second oil crisis. In 1982, the Government was confronted with the twin-deficit problem in the fiscal and external balances as the recession was more prolonged and deeper than expected. As a countermeasure, the structural adjustment program was introduced to cut government expenditure, particularly on low-priority and import-intensive projects. At the same time, a comprehensive policy package was announced to encourage the private sector to act as a driving force for the growth of economy. Thus from 1984 onwards, economic policy was oriented towards deregulating the economy and reducing the role of the public sector while the industrialization strategy was based on export-led growth.

Under such circumstances of economic liberalization, licensing procedures of the ICA were further liberalized in 1985 and 1986. In accordance with the amended guidelines, the level above which companies were required to obtain licenses to engage in manufacturing activity, expand production capacity or diversify product lines, was raised in 1985 from M$250,000 to M$1 million in terms of paid-up capital or a full-time work force of more than 50 persons. This was further increased to M$2.5 million or a full-time work force of more than 75 persons in 1986. In the same year, in place of the Investment Incentives Act, the Promotion of

Investment Act was introduced covering small and medium-scale industries, tourism and hotel projects.

In the process of structural adjustment of economy, industrial policies were reviewed comprehensively and the Industrial Master Plan (IMP) was introduced to plot the industrialization strategy for the period 1986-95. The IMP framed policies to promote outward-oriented industries with particular emphasis on resource-based industries and diversification of the non-resource based industries, as well as several heavy industries.

In 1991, the effect of past policies and strategies were thoroughly reviewed during the formulation of the Second Outline Perspective Plan (OPP2) and the Sixth Malaysia Plan (SMP). Under these plans, Malaysia stepped forward to a renewed economic development which will be a core of industrialization as the basis of the economic growth. At present, these development plans are being implemented within the overall framework of the National Development Policy (NDP) which will enable Malaysia to become a developed nation by the year 2020.

2.1.2.2 Present state of manufacturing industry

Under the positive industrialization policy of the Government, industrial growth in Malaysia has been very rapid in the past two decades. As reviewed in 2.1.1, growth of the manufacturing industry in the latter half of the 1980s was most remarkable and value added in the sector reached nearly 29% of the GDP in real terms in 1991 as the largest growth element of Malaysia. The manufacturing industry is also the largest export industry in Malaysia. It accounted for about 59% of total exports with such manufactured exports as electrical and electronics products, textiles and garments, etc. In terms of employment, the manufacturing industry absorbs about 20% of total employment, next to the agriculture sector including forestry and fisheries.

Production indices by sub-sector of manufacturing industry in 1985-90 are shown in Table 2-11. The electrical and electronics machinery and the rubber-based industries grew most rapidly with respective annual averages of 26.8% and 23.2%. The transport equipment, textile and garments, and wood-based industries also grew considerably, at respective rates of 14.1%, 11.6% and 11.2%. Growth of the other industries remained below 10%.

Reflecting these recent conditions, major transitions have been seen in the sectoral structure of the manufacturing industry. The food, beverage and tobacco industries

which had the largest production share of 24.2% in 1985 fell to second rank with 17.5% in 1990 while the electrical and electronics industry rose in terms of its share from 17.4% to 29.8% and came to account for the largest production share in 1990. Although the production share of the chemicals and chemical products industry declined from 18.1% to 14.8% it ranked third in 1990. As for the rubber products industry, the production share in 1985 was 5.8% at 7th rank, but rose to 8.6% and 4th rank.

The production shares of the sectors following these four are: metal and metal fabrication 6.1%, wood and wood products 5.5%, non-metallic mineral products 5.2% textile and garments 4.9%, transport equipment 4.9% and petroleum products 2.7%.

Also in terms of exports, as shown in Table 2-6, the electrical and electronics industry is the largest having a 56.5% share on average in total manufactured exports in 1988-90. The textile and garments industry follows as the second largest export industry, having a 8.7% share during the same period. These two sectors account for almost 65% of exports of manufactures and about 35% of total exports. Other exports of manufactures are as follows: food products 4.7%, chemical and chemical products 4.7%, metal products 3.9%, transport equipment 3.5%, wood-based products 3.3%, rubber-based products 3.1% and non-metallic mineral products 1.7%.

Expansion of resource-based industries as well as diversification of non-resource-based industries are basic strategies for industrialization in the Industrial Master Plan (IMP) which was adopted in 1985 by the Government for long-term industrial development of Malaysia. The following 12 sectors of industries are focused with emphasis on development;

1) Non-resource-based industries (five sectors):
   - Electrical and electronics
   - Transport equipment
   - Machinery and engineering products
   - Ferrous metal
   - Textile and apparel

2) Resource-based industries (seven sectors):
   - Food processing
   - Rubber
   - Palm oil
   - Wood-based
   - Chemical and petrochemical
   - Non-ferrous metal products
   - Non-metallic mineral products

According to the production indices of manufacturing industry shown in Table 2-11, annual growth of the output of the non-resource-based industry was 19.7% on average in 1985-90 whereas that of the resource-based industry remained at 10.0%. Consequently, the ratio of the output of the non-resource-based industry in total manufacturing industry sector rose from 35.5% in 1985 to 45.7% in 1990 while that of the resource-based industry declined from 64.5% to 54.3%.

In terms of exports as shown in Table 2-6 annual growth of the non-resource-based industry was 32.4% on average in current price while that of the resource-based industry was 23.8%. Likewise, as to the ratio in all manufactured exports, the former rose from 75% in 1985 to 81% in 1990, whereas the latter's ratio fell from 25% to 19%.

Output and export targets of selected manufacturing industries indicated in the IMP are shown in Table 2-12. Although the growth of the non-resource-based industry sector as a whole surpassed targets both in terms of output and exports, concentration in exports in the electrical and electronics industry and the textile and apparel industry is still high resulting in insufficient achievement of industrial diversification, contrary to the intent of the IMP. The resource-based industry sector also expanded both output and exports, but its status as an export industry is still low. Tasks for Malaysia henceforth are diversification of the non-resource-based sector as an export industry and enhancement of export competitiveness as well as development of resource-based export industry on the basis of the comparative advantages of Malaysia.

2.1.2.3 Capital structure and investment trend in manufacturing industry

The majority of the manufacturing industry in Malaysia is owned by the private sector, in particular largely by foreign affiliate companies and joint ventures with foreign companies.

In the early 1980s, the Government announced an aggressive policy for development of heavy industries. For large scale industrial projects to which private initiative is difficult to mobilize due to huge scale of investment and long gestation period required for realization, the Government initiated the development of those projects through direct investments or joint ventures with the private sector. Consequently, public investment in the manufacturing industry increased greatly, but the ratio of the public investment in the manufacturing industry sector was still not so high.

In the Survey of the Manufacturing Industry 1989, published by the Department of Statistics, Malaysia, the ratio of private investment in the manufacturing industry is about 84% in terms of the value of fixed assets of which about 38% is held by foreign capital firms or joint ventures with foreign companies.

In the past thirty years, the Government of Malaysia has made efforts to promote domestic and foreign investment by providing various incentives for investment to promote industrialization. Since after the 1970s in particular, development of export-oriented industry depended heavily on foreign investment because of deficiency of capital, technical know-how and marketing ability.

Influenced by these investment promotion incentives, private investment in the manufacturing industry expanded favorably after the 1960s. Along with the transition of the times, structural changes have been evident in private investment corresponding to changeovers of industrialization strategy and industrial development policy of the Government. Such changes comprise three phases.

In the 1960s, private investment mainly focused on the processing of agricultural products and the import substituting industry for general consumer products and intermediates such as food products, tobacco, wood and wood products, building materials and chemicals. In the 1970s, the Government placed emphasis on development of the export-oriented and labor-intensive manufacturing industry, and made efforts to promote foreign investment by means of establishment of the FTZs and various foreign investment incentives, particularly for setting up factories in FTZs to manufacture electronic components and textile products. Consequently in this period, many foreign capital firms started production of ICs, semiconductors, textile and garments for export in the FTZs.

By the mid-1980s, investment stagnated because of the global recession. However, with recovery from the recession, foreign investment in the manufacturing industry was reactivated and became a leading element in the economic recovery of

Malaysia. In addition, in 1987, the Government commenced new industrial promotion activity which resulted in an active inducement of foreign investment which stimulated capital inflows, transfer of new technology and new markets.

Table 2-13 shows capital structure by sub-sector of manufacturing companies registered with the Malaysian Industrial Development Authority (MIDA) and in operation as of the end of 1989. There are 3,520 companies registered with M$18 billion of paid-up capital and M$24 billion of fixed assets. Of these, foreign companies had M$6.4 billion of paid-up capital or 35.5% of the total and M$9.6 billion of fixed assets or 40.2% of the total. The food industry, which is the largest, has 480 companies followed by wood and wood products industry (including furniture and fixture) which has 474 companies. Other industries which include a large number of companies are as follows: textile and garments (322), metal fabrication (293), electrical and electronics products (265), non-metallic mineral products (249), chemical (238), plastics (202), rubber-products (194), paper processing-printing-publication (181), machinery (151), and transport equipment (145). Among these, the following industries contain a high rate of foreign investment on the basis of fixed assets ratio: electrical and electronics products 85.9%, textile and garments 59.3%, rubber products 55.7% and machinery 49.9%. Foreign investment is concentrated in export-oriented industries.

Table 2-14 shows the number and capital investment of manufacturing projects by sub-sector approved by MIDA in 1987-90. As this table indicates, investment in manufacturing substantially increased after 1988 and the value of investment projects approved by MIDA in 1988-90 was M$49.5 billion. This nearly corresponds to twice as much as the amount approved in the preceding seven years (1981-87). Of the approved investment in these three years, foreign investment was M$31.2 billion, approximately 63% of the total. Investment by foreign interests is concentrated in the non-resource-based industries such as electrical and electronics, basic metal, metal fabrication, textile and garments, and machinery.

Private investment in manufacturing in 1988-90 grew at an annual average rate of 58%, according to the Survey of Private Investment in Malaysia, covering 400 companies every year and the Survey of New Investments in the Manufacturing Sector covering 300 companies in 1991, both conducted by Bank Negara Malaysia (BNM). This includes reinvestment by existing companies as well as new investment. The largest reinvestment was undertaken by the chemical and petrochemical industries followed by other industries such as electronics, food, non-metallic mineral products, paper products and transport equipment. Nearly 50% of the new investment was undertaken by the electrical and electronics sector and about 12%

by the chemical product sector. Another 29% were distributed among five industries, namely metal fabrication, rubber products, textile and garments, petrochemical products, wood and wood products industries. The remaining 9% were in the transport equipment, paper products, non-metallic mineral products and food industries. Of this new investment, two thirds were for the non-resource based industries led by the electrical and electronics industry. Through these tendencies, it is foreseen that the manufacturing industry in Malaysia will have a higher ratio of non-resource based industry in the future.

According to these surveys, most investment projects are export-oriented, particularly in the case of foreign investment. These projects require higher technology than in the past and many are capital intensive. Also, domestic market-oriented projects often embody plans to locally manufacture parts of considerably high quality to be sold to existing producers of end products. These recent tendencies of investment suggest the direction towards which the manufacturing industries of Malaysia are headed, namely higher export orientation and diversification and enrichment of industrial structure. However, on the other hand, imports of capital goods and raw material components are likely to increase in keeping with the tendency for manufacturers to adopt higher technology which results in more dependence on imports of machinery and equipment for production and also a large portion of raw materials and parts that must be imported.

2.1.2.4 Areal distribution of manufacturing industry

Historically, industries in Malaysia have developed in Peninsular Malaysia mostly in the west coast area. Table 2-15 shows gross valve of output and value added of the manufacturing industry by state based on the Survey of Manufacturing Industry in 1989. Out of 6,092 enterprises covered by the survey, the majority, namely 27% of the companies, are located in Selangor (including the Federal Territory of Kuala Lumpur), and Johor and Sabah have 13.1% each, Sarawak 11.4%, Perak 10%, Penang 9.5% and Kedah 4%. Seven states (including Kuala Lumpur) contain 88.1% of all companies surveyed. The remaining 11.9% are dispersed in the other six states and Labuan. As for the output, Selangor (when Kuala Lumpur is included) has the highest share in total national output, 33.9% . It is followed by Johor, 17.5% and Penang, 15.9%. The total of these three states is 67.3%. Otherwise, in descending order, are Negeri Sembilan, 5.8%; Sarawak, 5.3%; Perak, 5.2%; Kedah, 3.7%; and Melaka, 3.3%; these eight states account for 90.6% of the national total output.

Table 2-16 shows distribution of investment projects in manufacturing industry approved by the MIDA during the period of 1987-90. The state which has the largest number of approved projects is Selangor (including Kuala Lumpur) accounting for 31.9%, followed by Johor, 24.6%; and Penang, 13.7%; totaling to 70.2% of all projects. The sum of eight states reaches 92.9% adding the following five states, namely, Perak, 5.8%; Kedah, 5.5%; Sabah, 4%; Sarawak, 3.7%; and Melaka, 3.7% However, in terms of capital investment, the three states, namely Selangor (including Kuala Lumpur), Johor and Penang have only 47% of all invested capital. It is because of huge oil and gas-related investment projects in Terengganu and Sarawak, and also relatively large investment in Kedah and Melaka.

It is likely that these three states of Selangor (including Kuala Lumpur), Johor and Penang will still be investment centers for general manufacturing industries, while progress of industrialization is also expected in the states of Perak, Kedah, Melaka and Sarawak. Industries related to oil and natural gas will expand in Terengganu State on the east coast of Peninsula Malaysia and Sarawak State in Borneo Island as they are located close to oil and natural gas fields.

2.1.2.5 Industrial linkages of manufacturing industries and present state of the SMIs

As it has been seen, diversification of manufacturing industries in Malaysia is gradually moving forward in recent years. However, heavy concentration is still observed in exports of electronics, textiles, garments, and electrical products. Further, a large number of enterprises engaged in these industries operate within the FTZs and many of them possess LMW licenses even though located outside the FTZs. As of 1991, a total of 158 companies had been established in the 11 FTZs in Malaysia. Despite the fact that they contributed significantly to exports of manufacturers and employment creation, there was little transfer of technology and few linkages with the rest of the economy since they were allowed to import free of duty necessary materials and parts and had little or no need to develop a relationships with the domestic sectors. In particular, the self-contained nature of the electronics, textile and garments industries implied few forward and backward production linkages, resulting in little technology transfer, adaption and diffusion.

According to a recent study conducted by BNM on linkages between large-scale foreign capital firms operating in the FTZs and local firms, the local content ratio is only 2% for the electrical and electronics industry and an even lower 0.5% for the textile industry. As for domestic supply linkages among manufacturers outside the FTZs, BNM's annual survey showed that the domestic content of the output from existing manufacturing companies has been rising since 1986. For the resource-

based industries, the domestic content had increased from 64% of total raw material cost in 1986 to 70% in 1990. Likewise, the leading non-resource based industries have also been making progress in attaining a high level of local materials and parts procurement. The machinery and electrical appliances sub-sector had raised their domestic content from 40% in 1986 to 61% in 1990, while the transport equipment sub-sector recorded an increase from 36% to 49%. However, the industrial linkages of the manufacturing sector are still at an early stage of development, being limited in both forward and backward directions.

In a study report published recently, effects of the industrial linkages in the mid-1980s are indicated as the following indices:

	Resource-based industries	Non-resource-based industries
Backward linkage index*1)	77.0	69.5
(Domestic flow)	(58.7)	(28.3)
Forward linkage index*2)	49.8	39.9
(Domestic flow)	(43.1)	(29.2)

Notes: *1) Value of input goods for production of the goods, fixing the value of the produced goods as 100.

*2) Value of the above-mentioned goods used in the production of other products, fixing the value of the thus produced goods as 100.

The above analysis indicates that resource-based industry has higher linkage effects than the non-resource-based industry, in terms of both backward and forward linkage, having higher domestic flow. Particularly in the case of non-resource-based industry, the ratio of domestic flow remains at about 40% in the backward linkage which stands for a high rate of raw materials and parts procured from foreign sources. Furthermore, ratios of the forward linkage index the backward remain at about 65% even in case of the resource-based industry and merely about 40% in case of the non-resource-based industry. This signifies that a large proportion of products manufactured in Malaysia is end products for domestic or export markets and there is little consumption of domestic raw materials and intermediates. This implies simplicity of industrial structure in Malaysia.

Apparently, the industrial structure of Malaysia has not been improved or developed greatly since the mid-1980s in view of recent principal investment trends

in which the end product manufacturing is still of major importance, although similar study on recent industrial linkage effects is not possible as analysis of industrial linkages based on the latest data is unavailable. Diversification and deepening of the horizontal and vertical structure of industry is a major task requiring attention to insure further development.

Specifically, the diversification and deepening of industrial structure, should be focused on:

* development of upstream industries like heavy and chemical industries for production of raw materials, and

* modernization of those Small and Medium-scale Industries (SMIs) which are engaged in
  - production of metallic and plastic parts
  - processing of industrial materials
  - processing of food and agricultural products
  - production of furniture and wood products and rubber products, and
  - fabrication of textile and garments,

as commonly seen in the process of industrialization in advanced industrial countries and NIEs such as Korea (Rep. of) and Taiwan. In particular, modernization and expansion of SMIs is an essential element for expansion of the industrial base such as establishment of supporting industries and resource-based industries.

Table 2-17 shows the number of establishments, gross value of output and value added in the manufacturing industry by fixed assets and employment which were reported as the result of the Industrial Survey-Manufacturing, 1989. Out of 6,092 surveyed establishments, fixed assets are less than M$1million in 3,928, corresponding to 64.5% of the total, and 1,303 establishments are in the range of M$1 million to M$5 million, accounting for 21.4%. In 3,420 establishments or 56.2% of the total employment is less than 50 persons, and 1,939 establishments or 31.8% employ between 50 and 200 persons. More than 60% of total establishments hold fixed assets below M$1 million and employ between 50 and 100 persons. 25-30% of the total establishments range between M$1 million and M$5 million in fixed assets and between 50 and 100 persons employed. Large-scale establishments with fixed assets above M$5 million and employment of more than 200 persons account for only 12-14% of the total. In view of this distribution, SMIs are the majority in manufacturing industry in Malaysia. However, in terms of the gross value of output and the value-added, 60-70% of the total is contributed by large-scale

establishments with fixed assets more than M$5 million and employment above 200 persons.

Capital productivity and labor productivity by three classes of establishments in the following grouping are shown below:

Scale of establishment	Capital productivity*1)	Labor productivity*2)
Small	2.5 – 3.1	53.0 – 79.5
Fixed assets – less than M$1 million		
Employment – less than 50		
Medium	3.5 – 5.3	82.2 – 123.4
Fixed assets – between M$1 million and M$5 million		
Employment – between 50 and 200		
Large	6.9 – 8.7	100.3 – 140.4
Fixed assets – more than M$5 million		
Employment – more than 200		

Notes: *1) Capital productivity: Production output per M$1,000 of fixed assets (Unit in M$1,000)

*2) Labor productivity: Production output per one employee (Unit in M$1,000)

In comparison with large-scale establishments, capital productivity of small-scale establishments is about one third and labor productivity is about one half. In case of medium-scale establishments, capital productivity is about one half and labor productivity is about 0.8 when compared with large-scale establishments.

A comprehensive grasp of the realities of SMIs is not possible at present as results of a census on SMIs conducted recently have not been published yet. However, the above figures indicate that capital and labor productivity of SMIs in Malaysia are low and, as a principal cause, the level of technology is still low.

In these circumstances, parts and components industries and supporting industries are mostly dominated by the SMIs which manufacture products for the electric equipment, transport equipment and other precision machinery industries. However, their modernization is still lagging and the scope of industrial linkages still

remains limited. The resource-based industries are also dominated by the SMIs. For example, in a survey conducted in 1988, 48% of the firms in the food processing industry were firms with paid-up capital of less than M$1 million. In both the wood-based and rubber product industries, 93% of total establishments were SMIs. In general, the SMIs have such problems as low level of technology, lack of finance and management expertise and lack of skilled labor. Therefore, the SMIs are less competitive in international markets due to their poor quality control and low R&D which results in slow product development. In the background of lagged growth of the resource-based industries, where the SMI are dominant, there are many causes arising from the foregoing problems in the SMIs. Enhancement of quality improvement and cost competitiveness through modernization is a great task for the SMIs.

2.1.3 Industrial Development Plan of the Government

2.1.3.1 Long-term economic development policy and economic growth target

Following the First Outline Perspective Plan (OPP1), 1971-1990, the Second Outline Perspective Plan (OPP2), 1991-2000, embodying the National Development Plan (NDP) was adopted in June 1991.

As the first phase in the implementation of the OPP2, the Sixth Malaysia Plan (SMP), covering the period 1991-1995, is being implemented. The SMP elaborates the strategies as well as the programs and projects designed to achieve the objectives of NDP.

The objective of the NDP is to attain a balanced development of the economy in order to establish a more united and just society towards the realization of the ultimate objective that Malaysia becomes a fully developed nation by the year 2020 not only economically but also in all other aspects. The NDP places emphasis on increasing efforts to make the economy more resilient in meeting external changes and uncertainties, and also a need to maintain a conducive climate to attract investment into the country in order to cope with increasing competition around the world and from neighboring countries for foreign capital and investment.

Economic policies under the NDP are therefore directed towards:

1) strengthening the domestic sources of growth by maintaining macro-economic stability, promoting private sector efficiency and productivity, encouraging high levels of private investment, diversifying the industrial base and expanding

exports; and

2) accelerating human resource development which can contribute to improvements in productivity and efficiency to cope with the problem of diminishing natural resources and labor supply.

After the recession of the mid-Eighties, the Malaysian economy has recovered strongly. The economic policy anticipates that this growth momentum will continue in the 1990s, that are targeting to grow by an average rate of 7% per annum in real terms in the decade of OPP2 as compared with the average growth of 6.7% achieved during the OPP1 period.

The manufacturing sector is expected to play the leading role for achieving the GDP growth target. The target average growth rate for the manufacturing sector set at 10.5% per annum in real terms by far exceeds the growth rate envisaged for all the other sectors of the economy in the OPP2 period. Thus the manufacturing sector's share to GDP is projected to increase from 27% in 1990 to about 37% by the year 2000, making Malaysia an industrial-oriented economy, increasingly dependent on manufacturing exports for the growth of incomes and employment in the country. Manufacturing exports are projected to account for about 81% of total exports by the year 2000 as compared with 60.4% in 1990.

2.1.3.2 Long-term development strategy of manufacturing industry

The manufacturing industry, particularly export-oriented industry, has sustained rapid growth in recent years. Nevertheless, with recognition of risks associated with increasing competition in the export of manufactured products which Malaysia will face especially from neighboring countries which have the advantage of low labor costs, the policy plan emphasizes that Malaysia cannot rely as strongly as it does now on exports of electronics and electrical products, and textiles and garments for the growth of the export sector. Further, emphasis is placed on structure of the industrial base which remains potentially weak as it is heavily concentrated in two sub-sectors, the electrical and electronics and the textile and apparel sub-sectors. Although these two sub-sectors continue to be the major contributors to output growth and export earnings, the plan has identified several issues still to be solved. These issues are:

1) limited linkages both within the sub-sector and with the rest of the economy, notably with SMIs;

2) heavy dependently on imported technology coupled with inadequate R&D activities leading to limited product development and design capabilities;

3) inadequate international marketing capabilities, with exports hinging on parent companies' demand and specifications, subcontracting arrangements and GSP privileges; and

4) competitive advantage lying in the availability of relatively low cost, productive and skilled labor with comparatively lower wage rates vis-a-vis the NIEs and the developed countries.

Thus, in order to remain competitive in the export of manufactured goods and to sustain rapid economic growth, the NDP has adopted the development strategy of increasing productivity and further diversifying into higher value-added production, while pursuing policy reforms aimed at widening and deepening the industrial base, leading to higher value-added products and increased linkages with SMIs.

Towards this end, the NDP's development strategy for the manufacturing is as follows:

1) Identification of new sources of growth to further accelerate the expansion of the manufacturing sector, through:

   a) efforts to efficiently shift resources towards more promising and rapidly growing sub-sectors which will lead towards greater diversification of products and market;

   b) development of new products based on continued research and applications of composite, new and advanced materials; and

   c) supporting these activities by programs aimed at improving comparative advantage by enhancing skills and technology development and upgrading the infrastructural support facilities.

2) Pursuance of industrial deepening in order to achieve greater value-added and linkages, both vertical and horizontal, particularly in the following areas:

   a) basic metal, fabricated metal, petroleum and transport equipment industries as well as non-metallic mineral, rubber and timber-based industries, especially those related to engineering and metal fabrication which are essential in

providing the ancillary support and improving the linkages among industries;

b) electronic component fabrication which can enable greater backward integration and greater value-added electronic products, moving away from mere assembly activities; and

c) any other areas where value-added products can be developed with greater linkages through further downstream activities, especially of resource-based industries such as wood and rubber products, food and beverages as well as chemicals and petrochemical products.

3) Further promotion and upgrading of SMIs to make them an important and viable vehicle for industrial expansion and the creation of inter-industry linkages and support, with the target of raising the contribution of SMIs in terms of value-added and labor absorption in the manufacturing sector to the level of 40% and 50%, respectively, within the next decade from the current positions of 20% and 30%. This includes:

a) active involvement of several public agencies in promoting SMIs to provide supporting services such as training, advisory, extension and research and development related services as well as assistance in marketing activities through subcontracting and government procurement;

b) provision of wider access to financing on attractive terms and conditions such as the Asean Japan Development Fund (AJDF) and the Industrial Technical Assistance Fund (ITAF);

c) more integrated approach for the development of SMIs with better coordination and rationalization among the various public agencies to reduce conflicting priority and duplication of programs; and

d) major initiatives by the public agencies for identification and extension of support facilities and services to potential high growth sub-sectors of SMIs, strengthening financial and non-financial support, improvement of product quality and internationalization of SMIs, and strengthening further the modernization and technology development programs for SMIs.

4) Acceleration of regional dispersal of industries not only to achieve a more balanced distribution of investment but also to locate industries closer to sources of labor and raw materials. This includes:

   a) strengthening the Federal and State administrative and planning machineries to provide for a more integrated approach in the development of promoted areas;

   b) adopting an integrated approach for the development of industrial estates to provide necessary facilities and amenities; and

   c) selecting locations for industrial specialization taking into account their comparative resource endowment, including the opening of new industrial zones and upgrading of existing ones, as well as the development of a few selected high technology industrial estates.

5) Expediting the restructuring and rationalization of industries which have lagged behind in growth as a result of outmoded structures of production and technology, and high cost of production. This includes the development of selected basic industries, particularly machinery and engineering, automobiles and chemicals, which can create new demand for intermediate and capital goods and services, provide new opportunities for growth, industrial technology and inter-linkages, and in particular nurture SMIs in the manufacture of component parts and intermediate products.

6) Export promotion of manufactured products by means of the following efforts:

   a) intensifying efforts not only to market manufactured products to traditional markets but, more importantly, to penetrate new markets;

   b) continuing to develop aggressive marketing strategies, including joint-ventures with international corporations having strong global market links; and

   c) improving local capability in international product promotion, product quality, design and packaging.

2.1.3.3 SMP's industrial development plan

In the context of the long-term development strategy set forth in the NDP as outlined above, the SMP sets up a more specific plan for industrial development to be attained in the period of 1991-1995.

(1) Progress of industrial development in the Fifth Malaysia Plan (FMP)

During the FMP period, the development of industry was guided by the Industrial Master Plan (IMP), 1986-1995. The IMP provided a long-term indicative plan for the development of specific sub-sectors, policy measures and areas of specific emphasis. The IMP identified 12 sub-sectors as priority sub-sectors, comprising 7 resource-based industries and 5 non-resource-based industries. These are:

A. Resource-based industries

- food processing
- rubber products
- palm oil products
- wood-based
- chemical and petrochemical
- non-ferrous metal products
- non-metallic mineral products

B. Non-resource-based industries

- electronics and electrical
- transport equipment
- machinery and engineering
- ferrous metal (iron & steel)
- textiles/apparel

The Malaysian economy grew at the high average rate of 6.7% per annum in real terms during the period, and the leading source of this growth was the manufacturing sector. Value added in the sector registered a remarkable rate of growth of 13.9% per annum, more than double the FMP target of 6.4% per annum. Correspondingly, its share in GDP rose from 19.7% in 1985 to 27% in 1990. This development marked another milestone in the nation's transition towards an industrializing economy.

While the overall performance has been commendable, the development of the manufacturing industry was still characterized by a narrow industrial base, substantially depending on two traditional sub-sectors of electric and electronic and the textile and apparel. Further, the main impetus to the rapid growth of these sub-sectors was provided by the expansion in exports. The export of manufactured products as a whole increased by 31% per annum during the FMP period, and as a result its share in total merchandise exports almost doubled from 32.8% in 1985 to 60.4% in 1990. The exports from those two sub-sectors accounted for nearly two-thirds of the total manufactured exports in 1990.

(2) Development thrust in SMP

The SMP's thrust for industrial development is to promote new sources of growth so as to strength and diversify the industrial base while maintaining the importance of the traditional sources of growth, namely, the electric and electronics, and textile and apparel industries. It emphasizes the development of export-oriented, high value added, high technology industries with strong support from R&D and the growth of domestic high technology industries. The growth target and measures set in the SMP are highlighted below:

1) Sustaining the momentum of growth

* Growth target for the manufacturing sector:

a) Sectoral growth at 11.5% per annum in real terms during the SMP period, contributing 45.8% of the increase in the total GDP. As a result of this growth the sector will account for almost one third of GDP by 1995.

b) Expansion of the manufactured exports so that the exports by manufactures will continue to sustain the sector's growth momentum, accounting for more than 70% of the nation's merchandise export earnings by 1995.

2) Broadening and deepening the manufacturing base

a) Further enhancing the development of new sources of growth to provide greater dynamism in an increasingly broad-based and integrated manufacturing sector. These sources include wood-based, rubber-based, oleochemicals, mineral-based, and non-metallic mineral-based industries, as well as capital and intermediate goods industries.

b) Product improvement in terms of quality and technology, through efforts towards the establishment of a strong scientific and technical infrastructure. In this respect, the intensification of industrial R&D with greater public sector sources as well as the development of adequate industrial manpower for R&D will be pursued in line with the National Action Plan for Industrial Technology Development (APITD).

c) Promotion of greater inter-industry and sectoral linkages and the promotion of downstream activities especially in the resource-based industries.

d) Encouraging local firms to upgrade their product quality and support services so that industries located in FTZ can source their inputs from local firms.

3) Enhancing and sustaining the competitiveness of manufactured exports

a) Restructuring and modernizing selected industrial sub-sectors in terms of improvement in capacity utilization, level of technology, cost competitiveness, productivity growth and export potential, in order to ensure an efficient and competitive manufacturing sector. There are seven sub-sectors identified for on-going restructuring and modernization programs. These are:

- textiles
- wood-based
- machinery and engineering
- steel rolling
- shipbuilding and ship repairing
- automotive assembly
- palm oil processing

b) Placing emphasis towards the production of sophisticated high quality and high value added products, and productivity growth to sustain the competitive edge of the industrial sector.

4) Development of SMIs

a) Improving the capability of SMIs to supply the required production inputs of the larger enterprises and also to penetrate export markets.

b) Undertaking the development of special industrial sites for the relocation of SMIs, in particular the foundry and engineering and the timber-based indus-

tries, such as the furniture complex established in Olak Lempit, Selangor, and foundry and engineering complexes which are being planned in Perak and Selangor.

c) Promoting the "umbrella projects" through which the Government's purchasing scheme will provide business opportunities to small-scale enterprises.

d) Undertaking programs for the development of international marketing network and expertise, upgrading of managerial and entrepreneurial know-how and the development of indigenous technology.

e) Undertaking the SMI development program particularly focusing on the supportive industries producing parts and components; mold and die; testing and tool-making; and high quality castings, forgings and other components.

f) Instituting efforts to link SMIs with larger enterprises through subcontracting arrangements, especially for the parts and components sub-sector and the provision of machining services, as well as the development of SMIs to provide ancillary support for the downstream activities of the electronic sub-sector.

5) Development of heavy industries

a) Undertaking the Government's measures to ensure an orderly and sustainable development of heavy industries to strengthen the foundation for industrial growth, but placing emphasis towards greater reliance on the private sector for the development and the Government's role being essentially catalytic and supportive in nature.

b) Continuing, nevertheless, the Government initiatives to intervene in areas which requires huge investments and the private sector is reluctant to venture into, those including automotive, petrochemicals, iron and steel, and cement industries.

6) Human resource development

a) Undertaking the Government's positive measures to encourage the private sector to train their employees to meet the increasing skill requirements. In this connection, the double deduction incentive on approved training introduced in 1987 has been reviewed to expand its scope of eligibility to include

training related to productivity and quality control improvement and new manufacturing firms undertaking the training of craft, supervisory and technical skills, as well as extending eligibility to all manufacturing firms for training conducted at approved training institutions.

b) Introduction of a levy-grant scheme to encourage greater private sector involvement in training.

c) Formulating a Human Resource Development Fund which will provide incentive grants to enterprises undertaking the training of the work force in basic, enterprise-based and new emerging skills as well as retraining for higher skills.

7) Science and technology development

a) Improving and strengthening public and private sector R&D organization and infrastructure in line with APITD.

b) Implementing quality and design enhancement programs that are readily accessible to industries, including the establishment of a number of quality enhancement centers with special emphasis on assisting SMIs which has been proposed in the APITD.

2.2 Needs and Tasks for Enhancement and Promotion of Industrial Standardization and Quality Assurance in Relation to Industrial Development in Malaysia

2.2.1 Introduction

This section discusses exactly what is required and what tasks need to be tackled in furthering the enhancement and promotion of industrial standardization and quality assurance in Malaysia from the standpoint of promoting industrial development. Later, in Chapters 3 to 5, assessment is made of the present systems and activities relating to the industrial standardization, testing and inspection, and the promotion of quality management in industries, with a view to analyzing effectiveness of those systems and activities to meet the tasks discussed hereunder.

Section 2.2.2 first discusses what is needed for the enhancement of industrial standardization and quality assurance to be adopted in Malaysian industries to sustain their growth while coping with the changing international economic environment. Section 2.2.3 then assesses the actual situation of industries undertaking industrial standardization and quality assurance and, in particular, any differences or characteristics in activities undertaken by different sectors of industries or different types of enterprises, to identify the tasks which need to be met through the industrial standardization and quality assurance, while keeping in mind the needs discussed in Section 2.2.2. In Section 2.2.4 the focus is on the enhancement and promotion of industrial standardization and quality assurance for small- and medium-scale industries (SMIs) which will play a vital role in the industrial development of Malaysia.

2.2.2 Needs for Enhancement of Industrial Standardization and Quality Assurance to Meet the Economic Environment in Malaysia

2.2.2.1 Trends of the international economic environment and direction of industrial development in Malaysia

When analyzing what is required in Malaysia for pursuing industrial standardization and quality assurance in the industrial sector, it is not enough to broadly grasp the current state of the industries with regard to industrial standardization and quality assurance. It is more important to assess the trend of the international economic environment which affects the advancement of industrialization in Malaysia, and to foresee the future position of the Malaysian industry and direction for its development with consideration also given to the changing international economic envi-

ronment.

In common with the current situation of industrial development in neighboring countries, Malaysia's recent industrialization has been linked to international operations in some major industries in the advanced industrial countries. As noted in 2.1 above, Malaysia's industrialization began with primary processing of domestic resources such as rubber, tin and timber, for exports. Then the industrial development was extended to manufacturing industries for import substitution, those including iron and steel, chemical, electric appliance, and textile industries oriented to meeting domestic demand. However, the rapid development of industry in recent years, rather than be based on domestic demand or domestic resources, is attributed to shift of production bases to Malaysia from the advanced industrial countries including NIEs. Manufacturers in those countries transferred their production bases to Malaysia, to produce products to be supplied to their established markets in the home countries or abroad.

Manufacturing industries in the advanced industrial countries have made strenuous efforts to maintain international competitiveness in the face of eroding factors such as rapid appreciation of their currencies and increases in the cost of labor, and also labor shortages in some countries. One strategy commonly adopted has been to concentrate on production of higher value added products in their home countries, together with automation for saving labor, while proceeding apace with the international division of labor and specialization of production on an international level. To set up an international network which optimizes the overall production systems on an international level encompassing all stages from procurement of raw materials through production and distribution of products has been of vital importance. To meet this requirement, the leading manufacturers in the advanced industrial countries have been setting up bases in several countries abroad, each specialized for the procurement and primary processing of raw materials, the production of parts, components and intermediates, and the production of final products. Similarly, manufacturers in the NIEs, especially South Korea and Taiwan, also have been expanding their international operation to counter the effect of rapid appreciation of home currency values and increasing labor costs.

Against this background manufacturers of those countries seeking to transfer their production bases have been attracted to Malaysia because this nation is equipped with the various forms of infrastructure vital to industrial activities and has energetically pursued policies to attract foreign investment as a means of promoting industrial development. Thus, a large number of foreign companies have transferred their production bases to Malaysia and the country has succeeded in building up a

thriving export-orientated industry based on foreign investments.

At that time the foreign companies which decided to undertake such a transfer to Malaysia did so particularly in view of the competitive labor force and the comparatively well equipped infrastructure available in the country, and the policies for luring foreign investors. As a result a large number of foreign companies in the electrical and electronics industries and in the textile and apparel industries have set up production bases in Malaysia, and these now constitute Malaysia's main export industries. The main interest of those companies was to undertake the labor intensive operations of processing or assembling imported materials, parts and intermediates to manufacture final products, thereby benefiting from the cheap and abundant labor force. In Malaysia, however, the supply of labor, that has been a vital factor in attracting foreign capital, has become tight and hence more costly in recent years, while neighboring countries can still offer a cheap and abundant labor force. At the same time, for foreign companies operating abroad to sustain their competitiveness, it has become increasingly important that the supply of parts and intermediates imported from the advanced industrial countries be made available locally in the country where the overseas production bases are located or at least be supplied from its neighboring countries.

In order for Malaysia to cope with these international industrial trends, it is vital to promote industrial development in the fields in which the country has comparative advantages. Notable relevant trends in home countries among the advanced industrial nations are 1) the application of advanced automation in order to assure a production system which maintains competitiveness even under the condition of high-cost labor, and 2) the specialization of production in the fields which require extremely advanced technology and high quality, while transferring labor intensive work and production to those countries where cheap labor is abundant. Some of the production in the fields which lie in between these two extremes is so far being continued in the home countries but it is likely that the production in those fields will also be transferred to countries where the currency is less strong than that of the home country and which can offer satisfactory operating conditions supported by comparatively high quality human resources available at competitive cost as well as well equipped infrastructure.

It is considered difficult for Malaysia to continue to maintain comparative advantage relative to the surrounding countries on the basis of the competitiveness of its labor costs alone since a rise in those costs can not be avoided. Therefore, the key to success in alluring foreign capital in the future will be in the provisions which can be made for the industrial and technical infrastructure, and in developing pe-

ripheral industries. A survey carried out among Japanese firms located in Malaysia by the Japanese Chamber of Trade and Industry in Malaysia (JACTIM) in 1991/92 showed quite clearly that the main reason for their entry to Malaysia was no longer anticipation for the availability of a cheap labor force. Surveys conducted by the Federation of Malaysian Manufacturers (FMM) also show a similar tendency.

> *According to the FMM's annual "Chief Executive Survey", questionnaire surveys made among member firms by the FMM every year from 1987 to 1991/92, political stability and economic stability have ranked first and second respectively as the reason for locating production bases in Malaysia, except 1987 when economic stability ranked fourth. Ease of acquiring labor, that was second in the 1987 survey, became third in the 1989/90 survey, and was below fifth in the 1991/92 survey. It is worthy of note that importance of comparative cost advantage was ranked third, indicating more concern about this factor.*
>
> *On the other hand, regarding evaluation of Malaysia's cost competitiveness, only 40–45% of the responding companies deemed it better than Indonesia, Thailand and the Philippines, or, 55–60% of the responding companies did not feel that Malaysia has comparative cost advantages compared to those countries, although about 80% of the responding companies evaluated Malaysian costs more competitive than Singapore.*
>
> *This implies that many companies no longer rely on cost competitiveness based on labor-intensive operations, and pay much regard to advantages of long-term or fundamental factors such as political and economic stability.*

In Malaysia, due to the small size of the domestic market, there are limits on the economical scale of operation for manufacturing firms supplying only the domestic market. This condition makes it hard for them to recover investments in a short period, so that it is difficult to modernize manufacturing facilities and keep up with innovation of technology. Hence Malaysia should have to pursue industrial development that is focused on the fields where manufacturing operation on international scale can be carried out in line with globalization of international operations of manufacturers in the advanced industrial countries.

2.2.2.2 Need to promote the localization of industry

In order to promote industrial development on international scale as mentioned above, the development of supporting industries is indispensable. At present the industrialization in Malaysia appears to have progressed to a fairly advanced level, but the development of local supporting industries lags considerably behind. This

situation is evident from the following aspects.

1) The Malaysia's main export-orientated manufacturing industries are located in the FTZs and therefore have few linkages with the local industries of Malaysia.

2) The country's main industries still undertake a limited scope of assembling or final step of processing based largely on imported raw materials, intermediates and parts, particularly for manufacturing high quality products and precision machinery. Further, the industries requiring some sophisticated technology are mostly operated by foreign affiliates. Thus the local firms are engaged in very limited fields of industry.

3) There are a large number of small and medium manufacturing enterprises which have no links with the export-orientated industries that have rapidly grown up in recent years, although there is no statistical data showing a profile of SMIs.

Industrialization in Malaysia certainly does seem to be progressing in quantitative and qualitative terms. However, the main driving force for this industrialization is the foreign affiliates or the joint venture firms depending on the technical support of foreign companies. The domestic production of precision parts and high quality materials required for the production of manufactured exports is definitely advancing to some extent but this is almost due to in-house production by the foreign affiliates or even in cases where supplies are made from external sources these come from a very limited number of suppliers. Moreover the majority of such suppliers are themselves foreign affiliates which were producers of those materials and parts in their home country. The majority of local firms with the exception of such foreign affiliates have no links with the export orientated industries. There are some local manufacturers of component parts and intermediates to be supplied to the foreign affiliates, but these supplies are confined to those which do not require high precision, or those which are not critical for the performance and strength of final products. Moreover the materials used by such local manufacturers of component parts and intermediates are largely imported, since domestic supplies can not be anticipated. In the case of the molds and dies used for metal and plastic processing, all that is locally available are those which are used for the production of general consumer products destined for the domestic market. The molds and dies used for the production of important parts are imported and supplied to the parts manufacturers by the users of those parts. In general, standard parts and devices are imported as well. Further, treatment processing (such as surface or heat treatment) of metal materials which has a considerable influence on the final quality of products is not handled by local industries. All such treatment processing is

done by specialist industries comprising the foreign affiliates.

The current strategy of the manufacturing enterprises in the advanced industrial countries which seek to expand their international operations is to set up their overseas production bases in the countries where not only investment environments are satisfactory but also competitive production is assured with the local supply of required parts and materials. Malaysia can offer considerably satisfactory conditions which attract foreign investors, including the provision of incentives for foreign investment and well equipped infrastructure, but there are few local manufacturers who are capable of absorbing the technology required by foreign affiliates. This in turn means that Malaysia is still behind in the provision of a supporting network of peripheral industries and of technical infrastructure which will increasingly be demanded for the localization of overseas production bases as part of the international operation of manufacturers in the advanced industrial countries. Moreover for the balanced development of industry in Malaysia it is necessary to undertake the modernization of the local industries which will support the mainstay industries while the development of the latter will be further promoted mainly with the expansion of foreign capital investments. These efforts to expand the localization of industry will provide the key to the development of domestic technologies in the country.

2.2.2.3 *Industry localization and needs for enhancement of industrial standardization and quality assurance*

Industries of the NIEs particularly South Korea and Taiwan have already achieved a sufficient level of development, and manufacturers in these countries have been active in setting up their production bases abroad in recent years. The successful development of industry in the NIEs is attributed to a successful evolution of localization of industries which have been developed with foreign capital investment at the initial stage, particularly through the expansion of the local production of materials and parts and also technology transfer in the framework of technical collaboration with foreign manufacturers.

In Malaysia, some local firms have been assimilating advanced technology through business relations with foreign affiliates, but the majority of local firms see as irrelevant the technologies owned by foreign affiliates which are engaged in export-oriented manufacturing. It is important to promote technical collaboration between small and medium local firms and foreign affiliates and thereby promote technology transfers to the local firms in order to strengthen technical capabilities of local industry. Since such technical tie-ups must be realized on a commercial basis,

there are a number of conditions demanded by foreign affiliates if the tie-ups with local firms are to be encouraged. Entrepreneurship and managerial capability of managements and adequate financial capacity would be primary, important conditions. In addition to those conditions they should have technical capability to some extent as discussed hereunder.

According to the questionnaire survey conducted by the JACTIM, the following two points are given emphasis when choosing a local partner for joint ventures or business tie-ups. One of the requirements is that the local firm has potential capability to assimilate transferred technology so as to manufacture products meeting the required specifications in the future. The other is sufficient reliability of the firm to ensure a stable supply of products having the required specification.

Recent advancement in the technology for manufacturing of parts and materials has substantially upgraded the technical level of the firms in the advanced industrial countries which are engaged in manufacturing those parts and materials to be supplied to the manufacturers of final products, so that the firms which previously had acted simply as sub-contractual suppliers have amassed a considerable amount of technical know-how of a highly specialized nature. As a result, the finished product manufacturers increasingly undertake the development of products with participation of the manufacturers of such parts, as partners from the initial stages of product development. Moreover, the manufacturers of machinery and appliances undertake mainly the assembling of final products, and the inspections originally carried out when receiving supplied parts or materials are increasingly omitted by trusting the quality control of the suppliers themselves in order to simplify procedures. Such assembly-manufacturers no longer possess specialist technical know-how for the manufacture of parts and materials and they are reliant on external supplies of those parts and materials when undertaking the production of final products in overseas countries. Further, the assembly-manufacturers now intend to simplify inspections of incoming parts and materials by forcing parts suppliers to rigorously maintain defective product rates at the lowest possible levels. Therefore the parts suppliers are required not only to have reliable inspections at the time of delivery but to have thorough quality control systems integrated in every production process. The ability to achieve such overall quality control is a necessary prerequisite for local firms to be nominated as suppliers to foreign affiliates.

The most important condition to be met by local firms in terms of capacity to assimilate technology is the availability of personnel capable of operating the machinery and equipment, since technology transfer is realized through the acquisition of machinery, equipment and raw materials, etc. The main stages of technolo-

gy transfer in the machinery industry can be classified as follows, 1) operating technology, 2) maintenance, 3) quality control, 4) production control, 5) improvement of process technology, 6) manufacturing of molds and dies, 7) design technology, 8) product development and 9) development of manufacturing equipment. Technology involved in the stages of 1) to 5) relates to manufacturing processes as well as the operation and maintenance of relevant machinery and equipment. Japanese managements are active in transferring those types of technology. However, they believe it to be more efficient to carry out the stages from 6) onwards in Japan in view of the technical levels and capabilities for R&D in Malaysia, although such technical expertise should be transferred to Malaysian industry in the future.

It is essential that the foregoing technology related to the stages of 1) to 5) is assimilated by the local firms at first if they are to proceed with the improvement of acquired technology and the development of new technologies at their own efforts. However, such technology can not be acquired by relying solely on technology transfer. A long term program for human resources development encompassing educational systems is necessary.

In order to promote technology transfer to local firms undertaking local supply of parts and materials, the most important step is to provide technical guidance to local firms so that they can correctly understand the specifications of the orders issued to them. At present, the companies issuing such orders make use of specifications based on their own in-house standards. This is because the orders are placed to a few selected firms on a custom-production basis. However in the future if orders are placed widely to a large number of firms it will be increasingly necessary to set up commonly applicable standards as a means of precise and accurate communication. The ability of suppliers to understand such standards will contribute to the upgrading of their capacity of technology assimilation.

1) *Regarding the peripheral industries, Malaysia has adopted the policy of restricting entry by foreign interests. This is because the Government believes that those industries are already providing the services required of them, or can be brought up to that level. But as to the evaluation of the existing peripheral industries, there is a wide gap between that held by local firms and that held by MNCs or foreign affiliates that produce export-grade products, or high quality products required for the domestic market.*

   According to the JACTIM study, 70% of the responding companies complain of a lack of peripheral industry. The sectors which were most often identified as being insuffi-

cient are 1) mold and die fabrication, 2) precision machining, 3) electronic devices (semiconductors, ICs), 4) chemicals, 5) precision plastic parts, 6) forging, 7) precision processing, 8) machine tools, 9) maintenance services, and 10) ancillary materials.

JACTIM gives as examples precision and multicolored plastic molding, precision dies and molds with a micron level tolerance, machined or pressed precision parts, surface treatment techniques based on heat treatment and plating, for which there is a great difference between what is needed and what is available locally. These technologies must be acquired as the fundamental technologies for the advancement of industry, and it would be necessary to promote foreign investment in these fields thereby encouraging transfer of technology.

According to the JACTIM survey, there are some instances of Malaysian-made parts being brought to sales depots in Singapore and then brought back to Malaysia. This is because of 1) inventory management required for parts suppliers to meet assemblers' requirement of just-in-time parts delivery, and 2) absence in Malaysia of the sales engineer or sales management function whereby the needs of the individual assembler are taken into account in the development and production sectors, or where technology and know-how can be provided 'upstream' to the suppliers. Such know-how can be transferred from foreign companies only through OJT. To this end it is necessary to encourage those foreign companies to set up their sales depots in Malaysia, thereby encouraging the transfer of their technology to local industries.

2) *The evolution of R&D is not necessarily achieved only by enhancement of research institutions. In Malaysia, because much of the technology in use has been transferred from abroad, there are immediate needs for undertaking R&D on application technologies rather than basic technologies for which Malaysia may rely on foreign sources, so that manufacturing technologies in use can be improved to be Malaysian companies' own technologies thereby to better meet changing needs of the market place. In order to carry out such activities, it is vital for manufactures to enhance comprehensive capabilities so that they can carry out market research to identify product development needs in market and R&D for the development of product and manufacturing technologies based on the thus identified needs. For this end, transfer of technology should be promoted with regard not only to manufacturing technology but also to marketing, product planning and development, and sales service functions.*

3) *As stated earlier, in order to develop advanced technology in Malaysia, it would be most effective to promote the investment by foreign manufacturers who have such technology, and on the basis of that facilitate transfer of technology. Transfer of technology is not solely a matter of transactions between foreign and domestic compa-*

nies. As may be often seen, the transfer is accomplished by technical personnel who have acquired technology by working for a foreign company, by means of setting up their own firms, or moving to work for other companies. For this to take place, however, it would have been necessary that the parent company had assigned suitable technical personnel or other functional staff for the purpose of OJT.

2.2.3 Approaches to Industrial Standardization and Quality Assurance in the Industrial Sector and Tasks Involved

2.2.3.1 Tasks to be undertaken

Approaches to industrial standardization and quality assurance which have been undertaken by the industries in Malaysia differ according to industrial sector, company scale, and technology bases as is explained in detail hereafter. In general the following represent the weak points of such undertakings.

1) The biggest problem is the lack of sufficient understanding of the significance of quality management, so that quality management is largely undertaken only in response to the demands made by clients. Consequently quality management is generally carried out as quality inspection and the results of quality management are not fed back to the production technology level. As long as this state of affairs remains unchanged quality management will not lead to the development of the in-house standards essential to the upgrading of production technology of individual companies.

2) Development of the standards which are to serve as the basis for quality management is as yet insufficient. Production is possible by using the specifications provided by the client in the case of parts to be produced to meet the client's orders, but in the case of production of own products standards do not exist so that production is limited in most cases to simple imitation. In such cases to all intents and purposes there are virtually no standards serving as the basis for quality management, and there are no indicators to guide technology upgrading.

3) Introduction of quality systems based on the ISO 9000 Series has become essential in quality management due to prevailing market demands but such introduction is very difficult for the small and medium companies, since they do not understand the procedures and methods involved and lack appropriate personnel while such changes lead to increasing their costs.

4) With quality systems based on the ISO 9000 Series, emphasis is placed on preparation of the forms and documents required for quality management, and therefore applicants devote to the establishment of those procedures and documentation rather than actual application of quality management to production processes.

2.2.3.2 Approaches to quality management

(1) Present situation

Since industrialization in Malaysia has been furthered on the basis of the entry of foreign firms, there are differing trends in quality management in accordance with the nature of the industry concerned. The main trends can be classified into the following categories; 1) Japanese affiliates, joint ventures with Japanese companies or those companies supplying the above with their products which apply Japanese systems of quality management, 2) multi-national companies from Europe or the USA which apply TQC (total quality control) in accordance with their own standard manuals, 3) those companies aiming to realize quality systems in line with the ISO 9000 to meet the demands of export markets, 4) those companies recognizing the importance of quality management and which try to realize this on an in-house level but whose efforts are not more than in-line inspections, and 5) those companies recognizing the importance of quality management but who are unable to realize objective results because of insufficient facilities.

The firms manufacturing parts and materials to be supplied to the mainstay assembly companies of automobile or electrical and electronic appliances industries apply quality management systems which have been adopted by those assembly companies. As noted above, there is a strong trend to simplify the inspections carried out on reception of parts and materials and in any case it is imperative for the supplying firms to ensure that defective product rates are kept to an absolute minimum. A zero defect rate is demanded in the case of the electronic industries while the electrical appliances and automobile industries require ppm levels. In order to satisfy such rigorous demands, the ordering firms force the suppliers to make inspection agreement or QC agreement regarding quality management systems, and carry out checks and surveillance on a regular or spot basis to ensure that these agreements are exactly observed, while also carrying out technical supervision of the local firms focusing especially on quality management systems. Such technical supervision is given by the ordering firms themselves or a professional firm appointed by these firms.

However only a small number of the local firms have reached the stage of development where they are able to apply quality management and effect an upgrading of their technical levels autonomously. The majority implement quality management in response to demands coming from their clients. Of course there are some companies which started to use advanced quality management systems such as TQC or SQC, but in only a very few cases does this result in the feedback of results to the production processes, the identification of root causes or the improvement of technical aspects. This is seen as being due to two main factors. One is lack in the local firms' capabilities to improve the applied technologies which have been transferred either through the acquisition of machinery or technical tie-up with foreign companies. Another difficulty is communication between the operation unit and quality control unit.

As a result of the above background, whereby quality management is seen as an obligation to be fulfilled in accordance with external requirements, it is often the case that even inside the same company rigorous quality management is not applied in the case of production of products destined for the domestic markets where requirements are much lower. Even in the case of firms focusing on supplying local markets, many companies employ special personnel for quality management but these generally go no further than inspections at the time of shipment of products. The inspections at shipping themselves are often insufficient in the case of local small and medium companies. Also the level of quality set as the targets for the quality management is often quite low.

(2) Awareness of importance and role of quality management

Many firms have awareness of the necessity of quality management. This is particularly so among the firms whose main markets are in exports or firms which produce parts and materials to be supplied to the manufacturers of products for exports. However, it is extremely rare among local companies to find firms which actually apply total quality management including QC circle activities and other necessary practices as an important element for upgrading in-house technical levels. The majority of local firms regard quality management as a response to buyers' requirements, and so they rarely undertake anything beyond the scope of product inspection. Very few firms recognize the importance or effectiveness of an integrated system of quality management on the Plan-Do-Check-Feedback style. It is also noted that little genuine attention is given to the question of quality levels in quality management. Many firms regard the quality levels demanded by users producing products for export markets or export-grade products as being excessively high, and reluctantly strive to meet the users' quality requirements as im-

posed obligations which must be met simply in order to sell output. For international marketing, the local firms should recognize the importance of satisfying quality levels of products demanded in international markets.

1) *According to the FMM's "Chief Executive Survey", awareness of the importance of quality is very high, and many companies indicate that ability to offer consistent quality is the most critical capability for competitive advantage. Further, all responding companies cite quality control as the most emphasized area for their efforts.*

2) *Concerning the extent of quality processes adopted by respondents, the FMM survey found that more than 90% 1) had a department or committee for promotion of quality, and 2) had adopted written quality and product regulations. These were followed by 3) formalized procedures to deal with customer complaints, that was given by nearly 90%, and 4) quality audit, that was given by nearly 80%. About 50–60% were given by 5) employee suggestion scheme, 6) quality control circles, and 7) other activities.*

3) *According to the FMM survey, among efforts recently made by the responding companies in order to improve productivity, there were high scores for assuring quality of products produced, documentation of quality management system, and application of statistical quality control. These were scored highly in the electronics and electric, transport machinery, and chemical industries, followed by cement and concrete, and plastics industries, that had scores higher than average. Regarding quality control circles as well, the same tendency could be seen.*

4) *About 80% of the companies were undertaking quality inspection in production lines or at the final stage of production, according to the questionnaire survey on manufacturers undertaken in this Study. It is understood, however, that most of these were employing only visual inspections, or inspections by simple testing equipment. Further, 55–60% of the companies had set up a section for quality control, and had adopted written manuals for carrying out quality control. The number of companies that was using feedback of the results of quality control for the improvement of technology, however, was limited. Only 36–40% of the companies had adopted SQC. No more than 18% had been undertaking QC circles.*

   The number of companies that are interested in taking up quality control activities, however, is high, and this shows, similar to the above-mentioned FMM survey, high interest in quality control in industry. In that context, interest in ARCS is particularly high (43%), followed by QC circles, (35%), and there is strong interest in the use of QC consultants, employee suggestion schemes, and SQC.

In contrast to this, however, 41% of companies did not know about the QIP that SIRIM set up with the aim of encouraging the adoption of ARQS in SMIs. Because this scheme has started recently, it is too early to make an evaluation of it, but it seems to be clear that publicity efforts are not enough.

The problem given by most companies as the one preventing them from carrying out quality control activities is the lack of staff who can carry out quality control in factories. In the automotive component parts industry, where quality control is extremely important, 76% of the companies said that they had a shortage of quality control staff, followed by insufficient understanding of quality control methods, and a high rate of personnel turnover. These conditions indicate that it is necessary to make a great effort at development of human resources if quality control is to be more widely diffused.

(3) Education and training of quality management

Only a limited number of firms make active use of the services of the NPC which is the body responsible for the promotion of quality management in Malaysia. Although a fairly considerable number of persons participate in seminars relating to quality management, they are mostly from foreign affiliates or large local firms undertaking quality management which represent a relatively small number of the total.

The majority of local firms show low interest in seminars pertaining to the introduction or basic theory of quality management, but they appreciate seminars or training for quality management applicable to specific industries which are given usually by manufacturers' associations in specific industrial sectors. For example in the plastics processing sector, seminars on the quality targets for plastic products to be used in the electric and electronic industries often have been held by the leading manufacturers of electric and electronic appliances, and these seminars are popular with the firms engaged in plastics processing and the fabrication of molds for plastics processing. Another example of training for quality management specialized for specific industries is the technical supervision which the leading automobile manufacturers as well as the leading manufacturers of electric and electronic appliances provide to the manufacturers of component parts.

One big problem encountered in employees' training for quality management is difficulty of communication. In the case of foreign affiliates, the staff dispatched from the parent company are usually responsible for quality management. Some of them face difficulty in communication with local employees. Moreover in recent

years there is difficulty been among local staff to communicate in English. Such communication difficulties are magnified in areas involving fine details or sensitive questions. In the case of small enterprises even local staff who are responsible for quality management encounter linguistic problems in directing local operators. Another problem is the fact that there are very few textbooks or reference works on quality management written in local languages, and so the local staff in charge must translate for trainees, and this slows down and obstructs the promotion of quality management. Communication problems are not only caused by such linguistic barriers. Inability to comprehend the directions given by quality management staff due to educational limits also occurs. In particular to some extent basic education on statistics is vital to quality management, since quality management relies on application of statistical methods.

(4) Approaches to ISO 9000 quality systems

Many firms have interest in complying demands from export markets for the application of quality management systems based on the ISO 9000 Series. To meet this requirement, industrial associations are examining the possibility of instituting technical assistance to be provided to member firms which intend to seek certification of quality systems based on the ISO 9000 Series. This assistance would include the holding of seminars organized with the assistance of the SIRIM or the employment of qualified quality consultants by the associations. However, in general because of the large amount of paperwork required by ISO 9000 it is difficult for the small and medium firms to tackle such tasks.

As noted above, in the case of the parts manufacturers serving the automobile and electric/electronic industries, the mainstay manufacturers ordering component parts require the suppliers of those component parts to use the same quality management systems as they do. A number of large manufacturing companies or some medium size firms manufacturing component parts have already obtained certification based on the ISO 9000 Series. There also are some firms planning to apply for the certification. Nevertheless in general it seems unlikely that there will be substantial increases in the applications. This is partly because the undertaking of quality management based on the ISO 9000 Series is still immature among the Japanese affiliates which account for the majority of the mainstay assembly firms. In Japanese industrial circles there is currently an active movement for launching the undertaking of quality management based on the ISO 9000 Series, but such efforts have not extended to overseas production bases. One reason for this is that the main export market for such firms is Japan. In the case of European and American companies, since the main export market targeted is Europe, a more active ap-

proach to quality management based on the ISO 9000 Series has been taken.

Concerning the adoption of quality management systems based on ISO 9000, 13% stated that they were doing that, while 18% had no interest in the matter, according the manufacturers' questionnaire survey made in this Study. The remaining 70% stated that they did not adopted ISO 9000 as a basis for quality control, due to the reason that their customers did not require it, and also because of difficulties in procedures, and cost increases. This implies that, at the present time, many companies are not aware of the benefit that adoption of a quality management system results in improvement of their technology, thereby bringing about more profits in production. Also, these companies are not thinking of forcing their parts or materials suppliers to adopt ISO 9000. It should be noted, however, that at the same time 43% of the companies replied that they planned to adopt ISO 9000.

2.2.3.3 Utilization of standards and standardization by industries and individual firms

(1) Present state of the use of standards

In Malaysia the only field in which an active approach to industrial standardization has been undertaken by industry is that for raw material rubber for which the international standards have been commonly used.

Individual firms use a variety of foreign standards or international standards depending on the requirement of their clients. In particular, the BS, ASTM and JIS have been widely applied as standards. In Malaysia industrial standardization has been evolved to meet the needs of foreign companies rather than the needs of domestic industries, because many of the manufacturing firms in Malaysia have been relying for their business on their overseas parent companies, overseas clients and their affiliated companies and, moreover, the supply of required materials and parts has been met largely by imports.

A number of national standards exist for electrical appliances which are subject to mandatory certification, and the MS standards therefore are used for those products destined for domestic consumption.

Although MS standards, foreign standards and international standards are used under certain circumstances, manufacturers in Malaysia tend to use them simply in order to meet the orders of clients. In some cases related service companies provide comparative charts showing the various different standards in relation to each other.

In addition to the foreign and international standards, the specifications written by the main parts manufacturers in the advanced industrial countries are often used as standards for the manufacturing of materials and standard parts. Most instances of this can be found in the metal engineering industry and the plastics processing industry.

(2) Awareness of the necessity of national standards

In contrast to the use of such international and foreign standards, the awareness of necessity for national standards remains very weak among the industrial circles in Malaysia. There is a general view prevailing in those circles that MS standards are less rigorous than the international or foreign standards, and this leads to their misunderstanding that as the level of products produced at present is already higher than the level of MS standards, the MS standards will force them to produce products which fail to conform to international standards. Another misunderstanding prevailing in the industries is that the standards are restrictive regulations rather than technical guidelines.

(3) Necessity of developing standards as technical basis for quality management

Despite the fact that international and foreign standards are applied, there are still many areas in which national standards need to be developed as the technical basis for production. In particular, this is essential for the small and medium enterprises.

For example, troubles arise in the textile and plastics industries when the color of products differs from what is required by the specifications. Development of the standards defining samples and the standards defining the methods for color discrimination would help avoid such problems arising.

In the case of the production of rubber gloves, the standards existing for raw material rubber are not sufficient, and the use of raw material rubber up to standard grade is in itself not enough to prevent fluctuations from arising in the quality of the finished product. It is necessary to establish standards for the raw material in view of the use envisaged for rubber gloves. However, despite the fact that rubber gloves constitute the largest export item of this industry the sector is composed of relatively small firms who are without the equipment needed for carrying out inspections of the incoming raw materials on a firm by firm basis.

Many firms among the automobile replacement parts manufacturers do not have standards for safety or pollution prevention for their products, and many such

manufacturers produce products which simply copy the external look of similar products. The Government of Malaysia needs to indicate the minimum safety standards required of these companies and ensure that only products which meet these are produced.

In the case of the metal engineering industries, orders to meet local demand are often accepted without the use of shop drawings and just on the basis of visual comparison with actual items ordered. Since orders from foreign affiliates made to local firms are likely to increase in the future, the existence of standards is vital to ensure accurate communication between the ordering client and the supplier to ensure supply according to the specifications.

The government and public agencies procure supplies which meet the specifications prepared by them. However, there are no standards to serve as general standards for such specifications and so the standards used are determined individually case by case. If there exist general standards forming the basis of specifications such as size, strength, coating methods, or testing methods, these could be quoted in the specifications. This would also contribute to rationalization of distribution while being used as technical standards for production.

It is not necessary that all standards be developed anew as national standards. If there already exist appropriate international or foreign standards, the adoption of these would be effective.

In the JICA Questionnaire Survey regarding the company's use of standards, the same tendency was found for products and raw materials as for equipment and machinery. About 25–30% of the responding companies indicated the use of their own standards which are presumed to be both specifications indicated by customers and those developed by themselves, and 15–23% were using international standards or foreign standards. In contrast to this, not more than 4–9% were using MS. This implies that Malaysian industry has developed in close relation with external business conditions, and thus many factories are operated in compliance with standards or specifications indicated by foreign customers. Hence many manufacturers in Malaysia do not have much need for the development of MS standards.

Whilst there is wide use of specifications and standards adopted apart from MS standards, some industries adopt MS standards although the degree of adoption differs by industries. Among the companies indicating the use of MS standards, the highest group is companies manufacturing construction materials such as cement and steel bars (50% of the responding companies in this sector), followed by foundries producing casting

products for irrigation facilities and other civil works, accounting for 32% of the responding companies belonging to this sector. Other sectors are electric appliances, rubber processing and textiles in which about 20% of the respondents respectively indicated the use of MS standards.

In general, nevertheless, a strong affinity to international and foreign standards is evident. In particular, more than 70% of respondents who are engaged in the manufacturing of textile, rubber, electronics and electric, or cement indicated the adaptation of their in-house standards to meet international standards. In comparison to that, in the garment sector 40% of the respondents refused to use public standards, and it is conventional for each company to use specifications indicated by buyers.

2.2.3.4 Tests and Inspections

In-house testing and inspection capacity of manufacturing firms is not adequate. In fact the production is carried out on the assumption of the insufficiency of such testing and inspection capacity. For high quality materials and parts, tests at the time of receiving those materials and parts are minimized by procuring them from reliable suppliers which are mostly abroad. Further, items for which high quality is required are often not produced domestically but are imported from reliable overseas supply sources.

The main external tests which firms need to carry out are performance tests, either in the development stages or in the trial production stages. Although tests during normal operation are minimized through a rigorous application of quality control in production lines and also thorough control of the quality of incoming materials and parts as noted above, the performance tests on finished products carried out in the trial production stages are essential for determining optimum production processes. Such testing is entrusted to SIRIM and other domestic testing institutes, and where the equipment of these bodies is not sufficient, arrangements are made for use of testing equipment owned by foreign-affiliated companies, while those affiliates depend on their parent organization for conducting tests in many cases. Moreover, the facilities of the SISIR, SEEL or STS of Singapore are also made use of.

With regard to the calibration of measuring devices and equipment, use is often made of the services offered by foreign measuring device manufacturers who have service offices in Malaysia.