2.3 GENERAL INFORMATION

2.3.1 SIRIM

7.2 A brief summary of SIRIM's history is contained in Chart 7.1. As can be seen, SIRIM was formed due to an amalgamation of two organisations which were set up earlier -- the Standards Institution of Malaysia (SIM in 1969), and the National Institute for Scientific and Industrial Research (NISIR in 1972). SIRIM itself was set up in 1975.

7.3 The major milestones in SIRIM's history are the appointment as the custodian of weights and measures in 1979. As a result of this, SIRIM had to take on a larger role which is the metrology area. This early history is probably due more to the requirements of the legal standard, and also to the needs for conversion to the metric system. The metric conversion began in 1971 and a phasing period of 10 years was allowed. By 1981, Malaysia had fully converted to the metric system. SIRIM played a big role in this programme.

7.4 Discussions with the Japanese government on the metal industry technology centre project became a reality in 1978 when the MITEC project was launched. Four different metal engineering areas were given technical assistance -- ie electroplating, presswork, press die-making and welding. The principal aim of this project was to upgrade Malaysian technology in this area and also to assist SMIs in upgrading their skills and application of technology. This project was an important component in the development of metal engineering skills for SIRIM.

7.5 The MITEC project was the precursor of several others. The format for all of them are the same. On the Japanese side, machinery and equipments were provided. Additionally, scholarships or fellowships were also provided such that researcher officers and assistant research officers could be sent to Japan for training. Furthermore, Japanese experts were also sent to Malaysia to aid in technology transfer. On the Malaysian side, counterparts were assigned to the Project. The Malaysian government provided in addition land and building for those projects, and also costs for operating those projects.

CHART 2.1
BRIEF HISTORY OF MAJOR EVENTS IN SIRIM & MALAYSIAN INDUSTRIALISATION TRENDS

Year	SIRIM's History in Brief	Malaysia's Industrialisation Trends
May 1969	Standards Institution of Malaysia (SIM) was formed	Import Substitution Strategy
Oct 1972	National Institute for Scientific and Industrial Research (NISIR) was formed	Export Orientation Strategy Free Trade Zone Programme established Industrial Coordination Act, 1974
Sept 1975	Standards and Industrial Research Institute of Malaysia (SIRIM) was established with the merger of SIM & NISIR	
		Third Malaysia Plan begins
Aug 1978	Metal Industry Technology Centre (MITEC) was set up	RIDA becomes Malaysian Industrial Development Authority (MIDA)
Jan 1979	SIRIM was appointed as the Custodian of Weights and Measures under the Weights and Measures Act	
1981	National Metrology Laboratory Project launched	Fourth Malaysia Plan begins
Sept 1981	SIRIM's first branch office was established in Sarawak	
Oct 1981	SIRIM's East Coast Branch Office was established in Terengganu	
Nov 1982	SIRIM's Southern Branch Office was set up in Johore	
Dec 1982	Establishment of SIRIM Branch Office in Sabah	
1983		Look East Policy
May 1984	Patent Information and Documentation Centre formed	Heavy Industrialisation policy
Dec 1984	Metal Industry Research and Development (MIRDC) formed	
1985		Industrial Master Plan, 1985-95
Apr 1986	MIDEC formed via merger with MIRDC, Design & Fab. Unit	Industrial Coordination Act amended
Nov 1986	Plastics Technology Centre was set up	Promotion of Investments Act, 1986 Fifth Malaysia Plan begins
June 1987	Introduction of the Scheme for the Assessment and Registration of Quality Systems	Promotion of SMI
July 1987	Setting up of SIRIM Laboratory Accreditation Scheme	
1988	ASEAN Project on Fine Ceramics launched	MIDA's Centre of Investment launched
Jan 1988	Technical Services to Exporters Programme launched	Malaysia's Technology Park launched
Nov 1988	Establishment of Industrial Design Centre	
Sept 1989	Launching of the new Mark of Quality	
Jan 1990	Restructuring of SIRIM	Industrial Technology Assistance Fund (ITAF) launched
Aug 1990	SIRIM Hotline started	Ministry of International Trade and Industry (MITI) formed
1991	SIRIM's Corporate Plan launched	Sixth Malaysia Plan begins

Source : SIRIM

7.6 The MITEC Project has not continued in its present form, but its components have been redeployed into other units of SIRIM. And an off-shoot of this the Advanced Manufacturing Technology Centre or AMTC. The AMTC is now part of Malaysia's Centre for Excellence in Advanced Manufacturing.

7.7 Another equally, if not more important, request -- ie the National Metrology Laboratory -- was also successfully negotiated by both the Japanese and Malaysian governments in 1981. Five parameters were to be established: Mass, Length, Temperature, Electricity and Volume. The benefits of this Metrology Project have been tremendous. The Metrology Unit claims to have a clientele of 600 throughout Malaysia, ranging from government agencies to the private sector, from SMIs to MNCs. Also because a national system of metrology was established, effects snowballed. For instance, more international inter-comparisons were established. And because there was metrology, the ISO9000 system could also be launched in 1987. Private laboratories are now given accreditation by a special unit within SIRIM. Metrology services earn SIRIM a fairly sizeable income, and is expected to play a very important role in generating income in the future.

7.8 Since the Project ended, the Malaysian industry has experienced a boom. And with the increase in exports, the needs for metrology have increased tremendously. As such, there has been very substantial upgrading of the metrology systems in SIRIM.

7.9 In terms of the services that SIRIM has provided over the years, Table 6.3 shows by parameters the calibration and measurement services between 1976-90. In terms of numbers, there has been something like a 40 fold increase over this period. In terms of importance, mass and volume appear to be the most common parameters that SIRIM calibration services are utilised.

7.10 As for income earned, Table 6.2 shows that since 1980, revenues from metrology have grown 20 times. Compared to even technical services, metrology revenues have averaged growth of about 36% compared to 15% for technical services.

7.11 In addition to the MITEC, various other material centres also were established. Most notably, there is the Plastics Centre and also the Fine Ceramics.

7.12 The ASEAN Project on the Characterisation of Fine Ceramics was initiated and launched in 1988. Although the initial work was only in characterisation (ie basic research on the physical properties of ceramics), substantial benefits are expected in the application side. This FC Project has helped SIRIM to kick off in terms of getting its researchers to focus on future areas of application research. Additionally, ASEAN researchers

have also benefitted through training courses and attachment in Japan (one Filipino) and also in Malaysia.

7.13 SIRIM has also been given the honour of housing the country's Centre for Excellence in Advanced Materials, and ceramics is one of those components. Other new areas which are coming up are eg in powder metallurgy and the foundry project (also funded by JICA).

7.14 Towards the end of the 1980s, SIRIM launched its new initiative, ie quality and technology. This coincides with the entire drive to engage in high gear for industrialisation as seen through various policy documents. A more detailed documentation of these is contained in Section 7B. The staffing in SIRIM has also grown quite substantially from 268 in 1976 to 762 in 1989 (Table 7.1). It will increase further to more than 1000 by 1993 (Dr Tajuddin Ali, per comm, October 1992).

Malaysia (pp 7-1~4)

As additional information, statements by officials in and outside SIRIM and concerned professionals obtained through interviews are included in this Study. Please note that all statements are made from the interviewee's point of view.

(1) Officials

4.28 SIRIM will become a market driven organisation which will attempt to keep in touch with and keep abreast of industry needs. Although it is aiming at corporatising their organisation, it still has a social role (ie developing SMIs) and intends to do that well because SMIs are the key factor in Malaysia's industrialisation programme.

4.29 However, whether it can carry out its functions fully will depend on the quality of staff that it has. External conditions may affect the ability of SIRIM to keep good staff, but SIRIM would not mind if its less capable staff left.

4.30 SIRIM is also making its own separate arrangements for increasing its technical expertise, and actively looking for way to further widen and deepen its knowledge base.

Malaysia (pp 4-4~5)

In Malaysian industries, SIRIM plays an important role in improving the technology and quality of products manufactured by small and medium-sized industries by transferring technology and skills. Because the Government has come to rely on these services, they have provided SIRIM with funds and human resources.

SIRIM is in dire need of personnel and organizational capabilities in order to keep on top the dramatic growth of Malaysian industries.

SIRIM has therefore reformed its organization in order to become more effective in supplying the industry with advanced technology in areas such as advanced materials and manufacturing.

On the other hand, some outsiders have the following opinions:

SIRIM is the only research institute concerned with technological development in Malaysia, and should therefore concentrate the scope of its activities by delegating some of its functions (such as calibration/verification services) to other organization or by contracting out work to the private sector.

(2) Professionals

4.39 It is clear that part of SIRIM's problems are historical. Prior to 1989, SIRIM was very much like a government department. It was not pro-active; out of touch with industry needs, not geared towards serving industry, the staff also not particularly helpful. And industry (especially SMIs) felt that SIRIM did not have any time for them.

But today, things are very much different. There is a Corporate Plan of action, and the entire organisation is being reorganised. But it needs to do this quickly. The increased consultation with private sector, eg through the ICC (Industry Consultative Committee) is a good move. The plans to change the composition and role of SIRIM through Parliament is welcomed.

4.40 SIRIM has weak linkages with industry and also universities. And in some areas (eg MITEC) industry is ahead of SIRIM. So SMIs in this area have developed independently.

4.41 SIRIM's problems appear to be a lack of professionals, trained persons, limited budgets (which are also subjected to the strength of government finances), and an effective and efficient research mechanism as a research organisation. It may also be doing too many things. It's image especially among SMIs is still poor, and needs to build up its reputation as the government agency to support their needs.

4.42 Areas where SIRIM could improve upon are:
- its image and reputation
- technical expertise in advanced research fields
- better linkages with SMIs and also with universities & industry
- mechanism to commercialise research results
- more focussed research and application

4.43 There are many obstacles ahead. SMIs are a conservative lot. They need a lot of coaxing. There is no big industry for SIRIM to lean on for support unlike in Japan.

Malaysia (pp 4-6~7)

No one doubts the importance of the role played by SIRIM in the industrialization of Malaysia. SIRIM's attempt at self-improvement should be appreciated.

SIRIM needs to be able to respond more quickly and flexibly to changes and advancement among small and medium-sized industries in order to progress.

Problems which need to be addressed are as follows:

1) Insufficient public relations activities

2) Technological improvement in areas of advanced technology

3) Collaboration with small and medium-sized industries and other academic research organizations such as universities

4) Development of applied studies and promotion so that industry research results can be better applied

2.3.2 Industrialization

(1) Malaysia's industrialization trends

7.15 Since Malaysia's independence in 1957, its industrialisation policies have undergone tremendous changes. A broad and rough measure of the industrialisation emphasis can be stated as follows:

1950s-60s	import substitution phase
1970s	export expansion and diversification of the manufacturing sector
early 1980s	"industrial deepening", ie heavy industries and resource based inudstrialisation; second round of import substitution
1985	Industrial Master Plan (IMP) incorporating strategies to achieve NIC status, emphasis on development of strategic industrial sectors
1986	further liberalisation of Malaysia's investment climate
1988	emphasis on industrial technology; initiated Industrial Technology Action Plan study
1990	publication of Industrial Technology Development - A National Plan of Action
1991	publication of SIRIM's Corporate Plan 91-95: Building a responsive organisation

7.16 As can be seen from the above, a considerable change in the industrial character has taken place in Malaysia.

7.17 One of the most significant changes occurred in 1968 when the Investment Incentives Act was promulgated. In the 1980s, the adoption of various policies, specifically those relating to the development of heavy industries were particularly important. By 1985, with the implementation of the Industrial Master Plan, the manufacturing sector was encouraged to expand through exports. And with the promulgation of the Promotion of Investments Act, 1986, the manufacturing sector was given its greatest encouragement.

7.18 Since 1987, the share of manufacturing in Malaysia's GDP has overtaken that of agricultre. A more detailed overview of these changes in industrial policies can be found in Osman-Rani (1985), Unido (1985), Spinager (1986), Fong (1990) and Anuwar Ali (1990).

(2) Summary of major policies on industrialization

7.19 Several documents published by the Malaysian government in recent years have established policies for development over the next few years. The long term development vision is outlined in Vision 2020. The medium term development policy is contained in the second Outline Perspective Plan or what is commonly known as OPP2. The Sixth Malaysia Plan is the major planning document for 1991-95.

7.20 Sectorally, the government commissioned a study on the development of industry in the early 1980s. In that regard, the Industrial Master Plan was formulated. Subsequent to this, the government has also published a National Plan of Action for Industrial Technology Development (APITD). And SIRIM being one of the key agencies to implement the government's plan for technological development, has subsequently also published its own Corporate Plan of Action.

7.21 All these documents are briefly described below, especially where they contain major policy and strategic initiatives and are important for an understanding of Malaysia's industrial direction.

C1 VISION 2020

7.22 The Prime Minister of Malaysia presented a paper on his vision for Malaysia by the year 2020. It outlines nine central strategic challenges that confront Malaysia. They have to do with a Malaysian identity, self-confidence as a nation, democracy, establishment of a moral and ethical society, a mature, liberal and tolerant society, of a scientific and progressive society, a caring society, economically just society, and a prosperous society.

7.23 Further on in this paper, the PM also outlined what he considered to be the economic objectives of a competitive economy. Amongst the areas are its sustainability, dynamism, robustness and resilience. The economy should be technologically proficient, fully able to adapt, innovate and invent and move in a direction of higher and higher technologies, driven by brain power, skills and diligence and subjected to the full rigours of market forces.

7.24 Additionally, other issues which emerged in this thought provoking paper are the need for diversifying the industrial base, inadequate development of indigenous technology, and the important role that SMIs have in the entire industrialisation programme. The PM declared that the SMIs will be one of the primary foundations of Malaysia's future industrial thrust, and the government is committed to its development through diversifying manufactures and export markets. However, Malaysia intends to promote SMIs within the context of international competitiveness.

7.25 The government's policy will be geared towards capitalising on the strengths of the nation, and tackling its weaknesses head on. Malaysia intends to become a developed nation by the year 2020.

C2 OUTLINE PERSPECTIVE PLAN

7.26 The Second Outline Perspective Plan or OPP2 covers the period 1991-2000. The OPP2 contains the National Development Policy (NDP) which provides the broader framework for socio-economic development in the 10 year period. The principal objective of the NDP is to attain a balanced development in order to establish a more united and just society.

7.27 Sectorally, the manufacturing sector is expected to achieve a high rate of growth -- targetted at 10.5% per annum. Such a target is achievable because the manufacturing sector has averaged about 13% between 1991-2. The primary strategy is to identify new sources of growth so as to further accelerate expansion of the manufacturing sector. Amongst the initiatives that would be developed further are in industrial deepening to achieve greater value added and linkages in basic metal, fabricated metal, petroleum and transport equipment, non-metallic mineral, rubber and timber-based industries. Engineering and metal fabrication are especially necessary because of the emphasis on ancillary supporting industries as a means to industrial development. In that regard, the role of SMIs are very important. SMIs will be promoted, upgraded in order that they become an important and viable vehicle for industrial expansion and further inter-industry linkages (OPP2: 132-135).

7.28 Science and Technology (S&T) policy will create the conditions which are conducive to innovation and the application of tehcnology to industry. The science base will be strengthened such that they can support technological development. And the government is keen to double its share of R&D investment as a proportion of GDP within the OPP2 period.

7.29 Strategic focus is on the commercialisation of potential research and technology, and will involve downstream activities such as testing, proto-type formulating, designing and redesigning, trial manufacturing and marketing runs, etc. There will be a greater emphasis of involving the private sector in joint research programmes with a view towards transferring research output for active commercial and industrial applications. Within the present constraints, the transfer of technology from abroad is crucial. Priority will be given to building up an indigenous technological base and capability. Current efforts in the selection of technologies for industrial development as well as technology transfer will be further strengthened (OPP2: 137-9).

C3 SIXTH MALAYSIA PLAN, 1991-95

7.29 The Sixth Malaysia Plan (hereafter, 6MP) is the principal development planning document guiding Malaysia's economic and social development for the period 1991-95. This document covers most of the major aspects of government and social life. However, the aspects which are of interest in this study concern mainly industrialisation and the development of science and technology.

(a) Industrialisation and SMI development

7.30 The thrust of the 6MP will be "to promote new sources of growth so as to strengthen and diversify the industrial base while maintaining the importance of the traditional sources of growth, namely, electronics, textiles and apparel. The new approach will emphasize the development of export-oriented, high value added, high technology industries with strong support from domestic R&D and the growth of domestic high technology industries. The objective of the industrial policy in the Sixth Malaysia Plan is to move towards capital-intensive and technologically sophisticated industries producing better quality and competitive products that are integrated with the markets of developed countries. All these will provide the foundation towards the attainment of the status of an advanced industrialized nation by the year 2020" (6MP: 136-138).

7.31 Malaysia's strategy is to diversify its industrial base, promote linkages through SMIs as well as accelerate industrial restructuring and modernisation of all industries through attaining higher levels of efficiency and competitiveness.

7.32 Certainly the principal guiding document for industrialisation has been the IMP. The IMP helped to argue for further liberalisation of the investment climate, broadening the industrial base, enhancing and sustaining the competitiveness of manufactured exports, development of SMIs and heavy industries, skills development, etc.

7.33 Specifically with regards to SMI development, the 6MP envisaged the setting up of an extensive network of modern ancillary firms so that they will play a significant role in providing feeder and technological linkages with larger industrial enterprises, especially the multinational corporations (MNCs). In addition, the 6MP will promote SMIs to penetrate the export market. These initiatives are intended to promote more integrated upstream and downstream activities with greater contribution to domestic value added. Such activities are envisaged to contribute towards the widening and deepening of the industrial base.

7.34 SMIs in supporting role would definitely be encouraged, especially in areas such as component part manufacturing, mould and die, test and tool making, high quality castings, forgings, and other basic components. Specific areas include downstream activities of the electronics subsector for ancillary support. Others are in plastics and rubber, woodworking machinery, industrial pumps, materials processing such as metal plating and textile dyeing for mould and die sub-sector. The envisaged long-term outcome is an internationally competitive industrial sector which would not only increase local content but also a fully integrated manufacturing capability.

7.35 On the institutional side, the Small-Scale Division of MITI will be strengthened so that it can play a greater role in coordination, rationalisation and promotion of SMIs.

(b) Science and Technology

7.36 As for Science and Technology (S&T) Policy, it is aimed specifically at supporting Malaysia's development strategy. In this regard, the government launched a special study -- the Action Plan for Industrial Technology Development (APITD). Details of the recommendations of this action plan are outlined in the next section.

7.37 The Sixth Malaysia Plan also mentioned a need for a more centralised and coordinated management system for R&D and technology development. In this regard, the government set up in 1987 IRPA or Intensification of Research in Priority Areas. IRPA has four main panels: agriculture, industry, medical and selected strategic areas. IRPA provided a mechanism for scientists, academicians, industrialists and researchers from both private and public sectors to hold consultation meetings and discuss R&D for Malaysia's development programme.

7.38 For this study, the two more important panels are industry and selected strategic areas. For industry, the record has been rather poor. And the government wants to increase industrial R&D especially in areas such as microelectronics, information technology, automated manufacturing techhnology, nuclear technology and material sciences with the objective of introducing and disseminating new ideas for product development.

7.39 As for the selected strategic sectors, one of the more important sub-areas is in emerging and future technologies. Areas such as electro-optics, remote sensing, and even advanced ceramics research are areas of strategic importance.

C4 INDUSTRIAL TECHNOLOGY DEVELOPMENT -- A NATIONAL PLAN OF ACTION

7.40 The Industrial Technology Development study was initiated in October 1987 to formulate an action plan for industrial technology development. In some ways, this Industrial Technology Action Plan (APITD) compliments the IMP through examining the technological basis for industrialisation.

7.41 The APITD has five major thrusts, and in greater detail, forty-two (42) recommendations. The government has accepted all these recommendations.

7.42 The five major thrusts, which are aimed at redressing certain structural weaknesses, are (APITD: 8):-

1 To improve a poor S&T infrastructure: providing leadership to strengthen the institutional and support infrastructure for rapid and realistic industrial technology development.

2 To overcome a low level of technology application, and inadequate appreciation of the key role of technology in industry: ensure widespread diffusion and application of technology, leading to enhanced market-driven R&D to adapt and improve tehnologies.

3 To heighten awareness and focus on the critical generic technologies of the future: build competence for specialisation in the key emerging technologies.

4 To develop the human resource base of the required quantity and quality to support industrial technology: strengthen institutions and mechanisms for continual development and elevation of the technological proficiency of the human resource base.

5 To provide leadership to a society that is generally apathetic and indifferent to science and technology development: elevate S&T awareness and appreciation to provide the most conducive climate possible for invention, innovation, and technological advancement.

C5 INDUSTRIAL MASTER PLAN, 1985-95

7.43 The IMP is a long term indicative plan for the development of specific industrial sub-sectors, policy measures and areas of special emphasis. The IMP focussed on policy orientation to attract more private sector investments. Twelve (12) sectors were identified as priority areas:

* food processing
* rubber
* palm oil
* wood-base
* chemcial and petrochemical
* non-metallic mineral products
* non-ferrous metal
* electrical and electronics
* transport equipment
* machinery and engineering
* ferrous metal metal
* textiles and apparel

7.44 Besides these priority industrial sectors, the following support policies were also reported on:

* The New Economic Policy and Industrial Development
* Industrial Infrastructure
* Heavy Industry Policies
* Incentives System
* R&D Technology Policies
* Analysis of Linkage Effects
* Evaluation of Resource Policies

7.45 The key recommendations of the IMP have been directed at consolidating fiscal incentives to promote investments and to induce reinvestments, linkages, exports, R&D and training.

7.46 The Sixth Malaysia Plan notes that one of the key achievements of the IMP has been the increase in the dialogue with the private sector and government in the development of the industrial sub-sectors identified by the IMP.

C6 SIRIM's CORPORATE PLAN OF ACTION

7.47 SIRIM sees its role as a vital link between national aspirations for industrialisation and the industrial sector, ie "a friend and partner of industry". And SIRIM emphasizes quality and technology in its programmes and services.

7.48 The Corporate Plan of Action is a direct translation of the APITD into strategies for SIRIM. It outlines the three broad corporate objectives of SIRIM and major thrusts over 1991-95. Among the key objectives of SIRIM (SIRIM, 1991: 20-21) are:-

* To develop a responsive organisation through streamlining and rationalising its structure
* To acquire strategic resources to enhance long term viability and to ensure the fulfillent of its mission
* To upgrade its corporate image so as to create national awareness of R&D and Quality Programmes in SIRIM

7.49 The specific Corporate Plan Objectives for 1991-93 are as follows:-

1 Enhance R&D and support services infrastructure

2 Strive to achieve national and international recognition as a proficient national standards body

3 Strive for international recognition and acceptance

4 Implement in-house quality management programmes

5 Develop market and customer-driven services

6 Apply automation to increase productivity

7 Institutionalise contract research system

8 Strengthen institutional response through a better management information system (MIS) and continuous administrative upgrading

9 Achieve recognition as a centre for advanced and emerging technologies

7.50 A more detailed programme of action and an implementation schedule is contained in the Corporate Plan (pp. 49-56).

Malaysia (pp 7-4~12)

iv. SMI development

4.19 SIRIM has identified the SMIs as their target market, and is gearing its organisation to serve them. SIRIM intends to help SMIs become more efficient, incorporate quality in their work, upgrade their manufacturing process, introduce a more comprehensive approach for assistance. The strategy to achieve this would be through providing consultancy services, developing firms (through the Incubator Scheme), managing the ITAF scheme, provide training, and technology transfer.

4.20 The external environment (ie outside of SIRIM) is difficult to control. Recessions have had impact on SIRIM where budgets are much below what was requested, and that affects SIRIM's service programmes to SMIs. Hence, it is important to bear in mind that the external environment is crucial for SIRIM.

v. Foreign Assistance

4.21 Foreign assistance and cooperation is still necessary for Malaysia. It can have a leap frogging effect for Malaysia, overcome funding constraints, provide experts, equipment and technology, and supplement funding which is provided by government. As such, Malaysia will still continue to seek foreign technical assistance.

4.22 The forms of technical assistance will be different from before. Malaysia's background was mainly agricultural in nature and therefore the kinds of assistance needed was different compared to today. With the whole country gearing to develop and to achieve the targets of Vision 2020, new forms of technical assistance are needed.

4.23 The Industry Technology Development: A National Plan for Action has already outlined the sectors which would be of keen interest to Malaysia. They are the new growth sectors such as biotechnology, information technology, advanced materials, advanced manufacturing technologies, and electronics.

4.24 Hence, new kinds and forms of foreign assistance will be needed for Malaysia's next phase of development. Malaysia is keen to establish research capability in public R&D agencies, commercialise technology, restructure R&D institutions such that they can carry out contract research, and generally move into more advanced forms of technologies. In that regard, Malaysia is also keen to help less developed countries with training programmes, eg the Commonwealth Fund for Technical Cooperation where Malaysia trains people from less developed areas.

4.25 Malaysia is being classified by several countries as not being able to qualify for grants because its GDP has grown very fast over the past few years. The forms of technical assistance and cooperation provided to Malaysia may also be changing. And Malaysia is keen to anticipate such changes in the external environment.

4.26 New ideas of cooperation are being considered. For instance, there is a new form of cooperation through EMC (Enterprise Malaysia-Canada) which has an office in Malaysia trying to link Malaysian and Canadian firms in joint venture projects. Anther is the one mentioned above on the Commonwealth Fund. Conducting feasibility studies, joint ventures, etc are new forms which the Malaysian government would be keen to explore.

4.27 Nonetheless, Malaysia is still committed to make suitable arrangements with countries such that foreign cooperation and technical assistance can be provided for its continuing development. And all forms of relevant technical cooperation and assistance will be welcomed.

Malaysia (pp 4-3~4)

3 OVERALL EVALUATION AND RECOMMENDATIONS

3 OVERALL EVALUATION AND RECOMMENDATIONS

3.1 OVERALL EVALUATION

3.1.1 Evaluation of Individual Projects

i. MITEC

5.1 The principal issue with regard to a proper evaluation of this project is that there were no mechanisms set up to do such an evaluation in the first place. As such, the present evaluation is an ad-hoc attempt at an assessment. And because the project has lapsed for about 8 years, the passage of time may have blurred impressions of the direct impact of the project or other external factors may have influenced the improvement of technology but not properly categorised.

5.2 Nevertheless, the sections below will elicit comments and views of the respondents to the different questionnaires, plus indicators from the log frame. The evaluation will be based on the five focal points in the log frame.

a. Efficiency of Project Inputs

5.3 Counterparts feel that there were enough project inputs during the project period but with two main concerns: more training in Japan should have been provided and communication problems between Japanese experts and Counterparts may have prevented a more effective transfer of technology.

5.4 Project outputs were satisfactorily achieved.

b. Effectiveness of Implementation

5.5 Since no targets were set up during the project period, it is not possible to examine the effectiveness of project implementation more objectively. The critical issue at this stage of the evaluation is whether and to what extent the project's purpose (ie improvement in technology of local SMI metal industry firms) have been achieved qualitatively and quantitatively.

5.6 Counterparts feel that the achievements of the MITEC project was high at the end of the project period in 1984 but low today. Beneficiaries who were interviewed say that they have benefitted from SIRIM. Counterparts say that MIDEC stagnated

and didn't grow since the project was completed. They also said that MNCs have transferred skills to the private sector.

5.7 Officials from SIRIM feel that MITEC have served its usefulness. Currently, industry needs are above MITEC's outputs. And so there is very little that SIRIM could contribute towards enhancing local SMI's technical capability. Because of this situation, MIDEC needs to upgrade its equipment, reorientate and upgrade its service functions (not only MIDEC but SIRIM as a whole). And there have been significant changes in MIDEC; the AMTC is one good example of more changes that SIRIM management have in mind.

5.8 In terms of effectiveness, it would be important to note that the most important question is the attainment of the project purpose. One of the most significant issues raised in a discussion with one of SIRIM's Official is the pace of industrialisation. Industrial technology was being enhanced at a much faster rate than SIRIM could keep up with. This was compounded by government budget cuts because of the mid-1980s recession; SIRIM's budgets were affected as well.

5.9 Coincidentally, the electronics sector boomed during the period of the mid--1980s recession. Coupled with a change in MNC policies to source components and services locally, the local precision metal engineering industry sector also experienced a boom. And that happened when SIRIM was still struggling with a slimed down budget.

5.10 As such, significant technological development has taken place, albeit only in a small area of precision metal engineering. And that development was due to a generally favourable external environment. Hence, the purpose was achieved, but SIRIM's exact contribution may not be possible to deduce. As such, it may be perhaps be true to say that the key assumptions may not be so accurate, ie MIDEC's technology services match the needs of their beneficiaries.

5.11 In terms of idéal indicators, it would have been best if data regarding the technology status of firms (ie beneficiaries) who received MITEC and MIDEC services had been collected at the time the project was initiated. Their technological capability could then be compared with their current capabilities. It could have been possible to see if and to what extent SIRIM's or MITEC's services have contributed to their technological improvement. However, because the mechanisms was not put in place, it is not possible to gain further insight as to the effectiveness of the project.

5.12 As things stand at this point, information on inputs and outputs are available, but effectiveness cannot be fully assessed because there is no baseline to compare information with.

5.13 This is one area where future projects could improve upon -- ie establishing a system for data collection to facilitate a proper assessment and evaluation of projects implemented. Without such a systematic mechanism, ad-hoc evaluations only yield impressions which are opinions coloured by the passage of time.

c. Impact on Industry

5.14 Impact is concerned with effects on the individual sector or with the overall development of the country. All Counterparts who were interviewed were of the opinion that the MITEC Project had contributed to the growth of local SMIs and to their technological improvement. However, SIRIM Officials were more realistic. They feel that the technology within MITEC may have been adequate during the project, but today, they lack behind industry.

5.15 One of the unexpected outcomes was the reqrganisation of MITEC. Of course, this reorganisation was not conceived at the start of the Project or have anything to do with its original purpose but perhaps with the way in which the SIRIM management felt was the best use of MITEC facilities to serve industry. Some of the Counterparts personally disagreed with the 1986 reorganisation because certain functional units were not only separated into different departments but physically separated as well.

5.16 SIRIM Officials acknowledge that MITEC and subsequently MIDEC's impact may not be quite so obvious. For instance, it is not possible to "measure" spinoff effects from training, advisory visits or consultancy services, etc. However, the MITEC project is out of phase with industry and will be outdated in the 1990s. Industry is ahead of SIRIM in areas like electroplating.

5.17 As for impact indicators, ideally the appropriate measure would be in terms of the increase in value added of metal engineering firms and the increase in local content in production, and business volume of SMIs in metal engineering industries. Better still would be the ability to compare these increases against increases for the manufacturing sector as a whole. However, such indicators are just not available because statistical data on metal engineering firms are not reported separately from manufacturing as a whole. Hence, the available information on measuring the impact on the country is not possible.

5.18 Available indicators are too general and diffuse to enable a precise assessment of SIRIM's services on local SMIs. A special study is necessary to verify SIRIM's impact on the technological improvement of local SMIs.

d. Relevance of Project

5.19 Counterparts, Officials and Professionals say that the goals and purpose of the MITEC project are still relevant and valid.

5.20 About 50% of all Counterparts and Beneficiaries felt that changes to the Project Design are necessary. Over the past 5 years there have been very rapid technological improvement, and only the most advanced firms have kept up with those changes. MIDEC's services must change if they are to serve industry effectively and efficiently.

5.21 Only one-third of the beneficiaries felt that changes in MITEC had met the changing needs of industry. However, Counterparts and professionals felt that adaption have been made, but the rate of adaptation had been only satisfactory or even below average.

e. Sustainability since Project completion

5.22 The Project was affected by the reorganisation of SIRIM, especially the creation of MIDEC. Despite this, the government continued to provide budget and funds for MIDEC. Between 1984-92, the government allocated $19.2 million for MIDEC, averaging $2.1 million annually.

5.23 In terms of staffing, a significant increase was recorded between 1986 and 1987, and that is probably attributable to the organisational change from MITEC and MIDEC; an increase from 57 to 152.

5.24 Counterparts felt that continuation of the MITEC project in some form is necessary. This is because of the external factor where industrial needs are changing so fast. As mentioned above, some Counterparts felt that MITEC should not have been reorganised. However, the reorganisation may have been in response to other factors (see Perunding Atur, 1990 for an discussion of this).

5.25 An unexpected outcome of the MITEC project was the introduction of the Incubator scheme programme. This programme aimed at helping entrepreneurs to set up engineering workshops in MIDEC premises. In addition, office space and facilities were also offered such that they could contract business from other industries. Furthermore, excess capacity in SIRIM's equipments were leased for use to these entrepreneurs. When entrepreneurs have established themselves, then they would probably move into their own premises and be able to stand on their own without support from SIRIM.

5.26 In 1990, MIDEC was able to assist about 10 such entreprenuers with five successfully completing the programme (SIRIM, 1990 Annual Report: 64). However, it ought to be mentioned that this programme was officially listed under the Technology Transfer Division of SIRIM. And under this Division, other initiatives were also launched such as the Konsep Payung which aimed at introducing quality and technology to local SMIs. This programme was jointly held with the Japanese External Trade Organisation (JETRO) to upgrade the quality management system of local firms (ibid).

5.27 Officials in SIRIM mentioned that there will be another major overhaul in 1993. An Advanced Materials Centre is to be set up which would be an amalgamation of three divisions - Plastics, Metals (ie MIDEC) and Ceramics Technology Centres. This, according to the Controller, is meant to provide a better service to their clients (ie industry at large).

Malaysia (pp 5-1~5)

(1) MITEC Project

1) Efficiency

Wholly speaking, input from both the Malaysian and Japanese side during the Japanese Cooperation period, i.e. 1978 to 1984, seemed to be sufficient and output was satisfactorily deduced from the input, though some counterparts expressed dissatisfactions with the shortage of technology transfer from Japanese experts and the training in Japan. Therefore, it can be said that the MITEC project was satisfactory in terms of the "Efficiency". In particular, in the fields of die-making and electroplating, the efficiency is comparatively highly evaluated.

After the Japanese cooperation, it is clear that MITEC's activities have been actively retained. Looking into the services MITEC has provided; the number of advisory/consultancy services increased from 79 in 1980 to 197 in 1988. After that, the fee in exchange for the services to local companies showed a considerable increase. The number of other services also increased; fabrication services from 181 in 1988 to 263 in 1992, and trainingcourse, workshop and seminar from 24 in 1987 to 44 in 1989.As a new service, incubation system was introduced recently in the technical field of electroplating.

On the other hand, regarding the input during the period, there seem to have been no serious problems. Staff numbers have been almost constant. Though the annual budget allocated is fluctuating each year, the development budget has totaled M$5,070,000 since 1987, the same amount as that during the Japanese cooperation period.

Considering the above-mentioned facts, it can be said that the MITEC project seems to have retained efficiency in the activities up to now.

2) Effectiveness

Judging from the interview results from counterparts, beneficiaries and officials, it can be said that the MITEC project contributed to the progress of the metal industry sector in Malaysia in the light of enhancing SMIs' technological capability during the Japanese cooperation period. In particular, the contributions of die-making and electroplating to the industry sector were remarkable among the four technical fields the MITEC project covered.

After the completion of the Japanese cooperation, in recent years MIDEC's services seem to be becoming unable to fully cover the technical needs from the metal industry.

Wholly speaking, the "Effectiveness" of the MITEC project seems to have been retained satisfactorily.

3) Impact

The interview results from counterparts shows that the activities conducted by MITEC contributed to the growth of SMIs in Malaysia, through the improvement of their technology. However, it is recognized by SIRIM's officials that the effect is recently diminishing.

The report prepared by Japanese experts mentions MITEC's contribution to local companies as follows: the services MITEC provided through its activities contributed

to SMIs in the light of the quality improvement and the reduction of production costs through the upgrading of production technology. And it resulted in the increase in orders from local companies for their products. MNCs and venture companies, which had advanced technology, had relationships with MITEC in another way. That is, they utilized the latest machineries possessed by MITEC, such as scanning microscope, to solve technical troubles.

In this regard, the project seems that it has been contributing in some way directly to Malaysian metal industry and indirectly to the industrialization process of Malaysia through the growth of the metal industry.

4) Relevance

So far, MITEC has experienced two major organizational changes; the first one was the merger ofMITEC with MIRDC into MIDEC in 1986, and the second one, the transformation of MIDEC in 1990. The newly-born MIDECwas reduced in its function and the AMTC, another majordivision relating to the metal industry, was set upsimultaneously. Such institutional changes wereindispensable for SIRIM to meet the needs from localcompanies. That is because SMIs' technology has been rapidly upgraded in the process of the industrialization ofMalaysia.

Another point is a favorable change of the project environment in the Malaysian industrial sector. During mid-1980s, electronics industry boomed and there was achange in MNCs policies to source components and services locally. As a result, local metal industry began to boom.

It can be said that, owing to the two-times major institutional changes and the preferable change of the project environment, the MITEC project has managed to retain the "Relevance". However, in recent years, MITEC's activities are lagging behind the high-level technological needs of local industries, and its role in contributing to the improvement in the local companies' technology is becoming marginal, except for die-making absorbed into AMTC.

5) Sustainability

Regarding the "Sustainability" of the MIDEC's activities, there is one concern from a technological aspect. Namely, part of MITEC's activities is lagging behind the needs of local companies. In order to retain the effectiveness of MIDEC's activities, what is needed for MIDEC is to upgrade the equipment as well as technology, especially in the technical field of presswork.

Recently, MIDEC seems to provide priority to R&D activities. In fact, the budget for R&D has been allocated since 1990. Though SIRIM has been conducting both supporting services to local companies and R&D activities so far, in order to match the needs of Malaysian industries and lead them in the process of industrialization, functional specialization to R&D and technically high-level supporting services may be indispensable for SIRIM.

ii. Metrology

a. Efficiency of Project Inputs

5.28 All Counterparts say that the Metrology has succeeded in its objectives. However, Japanese inputs were inadequate, especially training in Japan. Malaysian staffing inputs were also inadequate. However, standards achieved were of a high standard.

5.29 The Japanese government provided equipments valued at Y 302985000 billion or MR$3 million between 1981 and 1986 (ie at the exchange rate of MR$1=100Y). No data was available for the Malaysian side.

5.30 As a result of this Project, many companies now come to SIRIM for metrology services. SIRIM currently has a list of 2,000 client firms.

b. Effectiveness of Implementation

5.31 The Metrology Project established high standards for metrology in Malaysia. However, by 1992, the metrology requirements of industry are exceeding the standards achieved by the Project.

5.32 Officials in SIRIM recognise that metrology standards need to be continuously upgraded because of the fast changing external environment, ie industry's needs are becoming more precise and demanding. As such, a continual programme is needed in the development of skilled resources and equipments as well as research. In a sense, there is no fixed target for the project purpose, which changes with industrial demands for metrology.

5.33 With regards to the contribution of the Metrology Project to Malaysia's metrology requirements, beneficiaries commented that SIRIM needs to improve on its services -- ie mainly to shorten turnaround time for calibration services. Profesionals rated most parameters lower when compared to ratings given by Counterparts' of the Project's contribution to metrology requirements in Malaysia (except for electricity).

c. Impact on Industry and Malaysia

5.34 The Metrology Project has made average to high impact on the industrialisation process and upgrading skills in Malaysia. Counterparts rate SIRIM's contribution much higher than Beneficiaries or Professionals.

5.35 From the survey, SIRIM's share of the metrology services market is estimated to be about 36%.

5.36 SIRIM is aware that their metrology is behind that of industry. However, SIRIM cannot possibly provide all the metrology services required by industry because of limited resources. An upgrading programme within SIRIM's metrology facilities and services is being planned.

d. **Relevance of Project**

5.37 All parties interviewed agreed overwhelmingly that the goal and purpose of the Metrology Project is still valid. However, a majority of both Professionals and Counterparts feel that there should be a change to the Project design.

5.38 About 20% of beneficiaries interviewed use other labs in Malaysia besides SIRIM. About 8-16% use foreign labs outside of Malaysia for their calibration and measurement services.

5.39 Labs in Singapore such as SISIR and SEEL receive higher ratings than SIRIM. Professionals rated the former much higher than other beneficiaries.

5.40 Despite costs for foreign metrology services being high, some firms are still using them. Metrology services in Singapore cost 40% more; 100% more in the US; 200% more in the UK, and almost 400% more on average to Japan.

5.41 The importance of metrology is undisputed as Malaysia plans its industrialisation programme. The principal issue that remains is how can SIRIM keep up with the increasing needs of metrology with its limited financial, human and organisational resources. The Metrology Project has contributed in a very significant way to the establishment of standards, and also in that regard SIRIM has extend services to industry. Beneficiaries and Professionals feel that SIRIM should be more responsive to market demands; then again that would mean that SIRIM has to commit resources towards achieving that goal.

5.42 SIRIM Officials are committed to upgrading their metrology facilities.

e. **Sustainability since Project completion**

5.43 There is no question that SIRIM has made significant progress in the field of metrology since the Metrology Project ended in 1986. This Report has documented budgets and staffing over the 1980s and the calibration services provided, incomes earned by the Metrology Unit. In the area of budgets, the Metrology Unit received an average annual allocation of $1.3 million between 1988-90. For 1991, the allocation increased to $3.6 million.

As for staffing, the increase have been marginal. In the area of services, the number of calibration and verification services have been somewhat commensurate with the increasing in budgets. And as for the economic sustainability (ie measured by income earned by the Unit over operating expenses), the ratio of income earned over operating expenses have increased from about 15% in 1981 (start of Project) to 46% in 1986 to 55.4% in 1990. Empirically, there is no doubt that the Metrology Unit has been sustained both in terms of budgets, staffing, services provided to industry at large and incomes earned (Tables 2B-5, 2B-6, 2B-11 and 2B-12).

5.42 Malaysian Officials are aware of the immediate and strategic importance of metrology. In all interviews conducted for this study, Officials stressed the importance of metrology to industrialisation. Beneficiaries and Professionals also emphasize this point.

Malaysia (pp 5-6~8)

(2) Metrology Project

1) Efficiency

During the Japanese cooperation period, 1981-1986, regarding the "Efficiency" of the Metrology project, all counterparts evaluated the project positively. That is, input into the Metrology project during the period seem to have been converted to output efficiently through various kinds of activities, such as measurement and calibration services and technical training and consultation with public and private sectors. However, it was pointed out by counterparts that some input was inadequate; that is, insufficiency of technology transfer from Japanese experts, training in Japan and technical staff. In addition, Japanese experts pointed out the budget for the operation was not enough.

After the Japanese cooperation, the budget for the Metrology Unit has been increasing favorably. In particular, the growth of the development budget was remarkable; M$683,000 in 1988 to M$3,000,000 in 1991. It resulted in the increase of the budget for calibration equipment. Regarding staff allocation, the number has been almost constant.

Looking into the project output, the number of measurement and calibration services sharply increased from 7,044 in 1988 to 13,147 in 1991. And four(4) measurement parameters and nine(9) inter-comparison parameters were set up by SIRIM after the Japanese cooperation period. Judging from the above statement, it can be said that during the period the "Efficiency" of the Metrology project has been retained satisfactorily.

2) Effectiveness

Up to the present time, the Metrology Unit has established forty-four(44) measurement parameters, including inter-comparison parameters. In terms of accuracy of measurement, it improved in five(5) parameters through the Metrology Unit's activities after the Japanese cooperation.

Questionnaire and interview results show that the Metrology project has established major standards and high-level measurement and calibration services.

Therefore, it can be said that the objectives of the Metrology project had been achieved. In other words, the project has been performed satisfactorily in terms of "Effectiveness".

3) Impact

Many of the beneficiaries recognize that their products have been improved in quality and upgraded in competitiveness in the international market throughout various metrology services provided by SIRIM. It can be said that SIRIM's activities in the field of metrology have been playing a significant role in promoting export in Malaysia in terms of improving competitiveness in the international market. SIRIM covers nearly one third of the local needs for metrology services in Malaysia. Such SIRIM's contribution to Malaysian industries is to be highly evaluated from the viewpoint of "Impact".

In addition, as pointed out by counterparts, the Metrology Unit's activities seem to have contributed greatly to the diffusion of metrication in Malaysia, as well.

The Metrology unit of SIRIM has been fostering private laboratories through the activities. In this regard, it can be said that the Metrology project contributed to upgrading the level of metrology services in Malaysia.

As an unexpected impact, some counterparts pointed out that local companies are becoming aware of the importance of securing product quality.

4) Relevance

SIRIM is the only institute in Malaysia which is obliged to set up various kinds of standards. The Metrology unit of SIRIM is still now providing measurement and calibration services to local companies and still indispensable for Malaysia's industrialization process. In this regard, it can be said that project "Relevance" is still retained. It can be said that this is, as pointed out by many counterparts, owing to the continuous collaboration in introducing new advanced equipment and expanding the coverage of measurement parameters.

However, many counterparts pointed out that measurement standards and services provided by SIRIM are becoming unable to fully cover the needs of Malaysian industries. As a result, beneficiaries who cannot be satisfied with the SIRIM's services cannot avoid receiving measurement and calibration services from other laboratories in Malaysia and, despite costs being higher than domestic services, in other countries.

5) Sustainability

The Metrology Unit's activities are now retaining validity. However, There are some demands for improving its contribution to Malaysian industries, as follows: i)shortening of turn around time for measurement and calibration services, ii)upgrading of measurement accuracy, and iii)set-up of new parameters. In order to deal with these subjects and reinforce the "Sustainability" of the Metrology project, appropriate countermeasures should be taken urgently to solve the major problems for SIRIM, such as the shortage of manpower, the latest measurement equipment and advanced technology.

iii. Fine Ceramics

a. Efficiency of Project Inputs

5.43 The project purpose was fully achieved. Counterparts were generally not happy with project inputs, especially with the number of staff trained in Japan, and also with the provision of staff by the Malaysian side.

Project achievement was rated above average, but only average in multi-lateral activities.

b. Effectiveness of Implementation

5.44 In general, Professionals gave a less favourable rating compared to SIRIM Counterparts with regards to effectiveness of implementation.

c. Impact of Project

5.45 It is difficult to measure the impact of a research project because whilst the number of papers and seminars organised may be an indication, it does not provide a more qualitative assessment. In this respect, an assessment by the Japanese experts would probably be more beneficial at this stage. Of course, if the Project could be monitored for "downstream" activities, such as development of industrial applications, a more focussed research programme which has spin-off effects, consultancies to industries, more multi-lateral research activities, high quality research publications at international seminars, etc, then perhaps these could be used to gauge the impact on host countries.

5.46 Needless to say, with the equipments located in Malaysia, the research capabilities should definitely be more advanced here than elsewhere in ASEAN.

5.47 In coming to an end of the Project (November 1992), it is generally felt that the Project's purpose had been achieved. But Malaysian researchers have much more expectations from such an initial development. Generally, the Project has contributed to an above average capability in FC research capability.

d. Relevance of Project

5.48 More than 80% of Counterparts feel that the goal and purpose of the FC Project is still valid.

5.49 Professionals see a 40:60 distribution between the research that should be invested between conventional and advanced ceramics.

5.50 The principal complaint seems to be that it was a basic research project whereas for the Malaysian counterparts, a more applied orientation would have been more beneficial (En Nik Kamil and En B. P. Chang, per comm, October 1992). The reason may be that Malaysian researchers are relatively better trained (almost all overseas) and the needs of industry are in applied research areas, rather than in basic characterisation.

e. Sustainability since Project completion

5.51 Professionals do not see the immediate relevance of advanced ceramics research in meeting Malaysian industry's needs.

5.52 Diffusion of the FC knowledge amongst SIRIM staff is good. However, more human resources need to be injected, recruited or trained overseas. One of the main concerns of all parties, ie Officials, Counterparts and Professionals appear to be the shortage of skilled professional resources.

5.53 SIRIM has, in the meantime, decided that the FC project should not only be geared towards research, but efforts should have wider effects. As such the FC Project would be merged with Plastics and Metals to form a Materials Technology Centre in 1993 in order that SIRIM can better serve industry. SIRIM's controller said that the future is in multi-disciplinary research and application of materials rather than in the conventional concentration of metals, plastics and ceramics. As such, the merger of these three areas would make SIRIM a more customer-oriented organisation providing solutions rather

than only techniques and research capability in a conventional materials approach.

5.54 As such, it would appear that the FC Project may not be sustained in the form that it was originally conceived to be. The contribution of the Project has been to enhance the capability of research. However, SIRIM feels that Malaysia's needs would best be served by utilising those skills in a more applied manner.

Malaysia (pp 5-8~10)

(3) Fine Ceramics Project

1) Efficiency

Regarding the "Efficiency" of the Fine Ceramics project, the project is evaluated positively. According to the questionnaire and interview surveys, counterparts thought the project was more efficient than Japanese experts did. However, counterparts were likely not to be satisfied with technology transfer from Japan and training in Japan, though equipment seemed to be donated sufficiently. That is partly because the period during which each Japanese expert dispatched was engaged in the project was too short to transfer technology satisfactorily, except for long term experts.

On the other hand, looking into the Malaysian side's input, counterparts and Japanese experts pointed out that staff allocation have been insufficient. However, the staff numbers seem to be increasing recently.

2) Effectiveness

Japanese experts thought that their counterparts acquired the basic knowledge of fine ceramics and mastered how to experiment on the study. In this regard, as almost all the counterparts recognize, it can be said the Fine Ceramics project has contributed to raise the level of fine ceramics research in SIRIM. However, the project has not succeeded in firmly establishing a powerful basic research system which would enable SIRIM to continue fine ceramics research activities by itself and shift applied research in the future. Japanese experts and professionals evaluated the "Effectiveness" of the project more critically than counterparts did.

The feature of the Fine Ceramics project is that the activities of the project were not defined within Malaysia. The project began as one of ASEAN projects, and multilateral activities, such as collaborative research workshop, training course and seminar, have been conducted. Fifteen(15) researchers from other ASEAN countries participated in the collaborative research workshops and the training courses since F.Y. 1990. These activities seems to have contributed to strengthening the technical basis and cooperation in the field of characterization analysis of fine ceramics in the ASEAN region.

3) Impact

At the beginning of the project implementation, fine ceramics research technology was quite a new one for Malaysia. The Fine Ceramics project certainly brought the advanced technology into Malaysia. In this regard, the project can be evaluated from the viewpoint of "Impact".

According to the past record of the project, some researchers from universities in Malaysia could have chances to join fine ceramics research in SIRIM as collaborators for a time. In addition, as mentioned earlier, multilateral activities through Fine Ceramics project have provided other ASEAN countries opportunities to study fine ceramics and upgrade their research level. In

this regard, it is certain that this project provided some impact not only to this country but also to the neighboring countries.

As an unexpected impact derived from the project, some people pointed out in the interview that the most effective activity conducted through the Fine Ceramics project was collaborative research together with researchers in other ASEAN countries. Researchers from other ASEAN countries seemed to be very much thankful for the good chance to study on fine ceramics with high-tech equipment in SIRIM and enthusiastically tackle their study. At the same time, their earnest attitude seemed to provide a good stimulus to SIRIM's staff.

4) Relevance

From the view point of the "Relevance" of the project design, it can be pointed out that the Fine Ceramics project had some disadvantages as follows:

Malaysia produces rare earth metal, which is one of the raw materials for fine ceramics. However, unfortunately, Malaysia doesn't have the technology forhighly purifying the material. Therefore, SIRIM has to import highly-purified raw materials from foreign countries in order to conduct the research activities. In addition, there exists no fine ceramics industry in Malaysia even at this moment.

Under such situation, it cannot be expected for the time being that fine ceramics technology developed in SIRIM will be connected directly with local production in Malaysia. When Malaysia can supply the raw materials for fine ceramics and the needs for fine ceramics technology come up among local industries in the future, the Fine Ceramics project will have real value for the first time.

5) Sustainability

In the 6th Malaysian Plan, five key technical aspects in industrial sector are identified; that is, automated technology process, advanced manufacturing technology, advanced materials, information technology and biotechnology. Fine ceramics is one of major research fields in advanced materials and is expected to potentially contribute to Malaysian industry in the future. It can be said that the Fine Ceramics project takes a leading place in the national plan. This will certainly encourage SIRIM's research activities on fine ceramics for the coming years.

However, there remains concern about technological-aspect "Sustainability".

As mentioned earlier, staff shortage was pointed out as a problem of the Fine Ceramics project by counterparts and Japanese experts. It can be said that the chronic staff shortage is a bottle-neck for the project to extend the activities and achieve the objectives more satisfactorily.

B. OVERALL INTEGRATED EVALUATION OF ALL PROJECTS

5.55 There is no doubt that all three Projects have helped to develop SIRIM's capability in all three areas of metal engineering, metrology and fine ceramics research. More than that, SIRIM has also been able to carry out one of its main functions which is to transfer technology to local SMI firms, and generally provide services to industry at large especially in the case of metrology. The research side of all the three Projects have set in motion the supporting role for SIRIM's services. For instance, in metrology, the maintenance of standards has been a key factor in supporting metrology services to industry. The effects have been less in the MITEC and Fine Ceramics Projects for reasons already discussed above.

5.56 It is obvious that the different types of respondents have given different impressions and views of the Projects. Generally, SIRIM Counterparts have given the highest ratings compared to their Beneficiaries. Professionals give the lowest ratings. Although Malaysian Officials were not given the same questionnaires, the qualitative interviews showed that they have not only a better grasp of the issues but already have a plan to deal with the problematic areas of service, technology transfer, sustainability of SIRIM, and organisational review to achieve their objectives, eg SIRIM Corporate Plan, 1992. That document represents a vision and definite objective for SIRIM over the next 5 years.

5.57 Without doubt, the private sector firms' assessment of SIRIM's services is probably based on their needs and requirements. As such, depending on who is interviewed, they may or may not give a balanced assessment which is based on both outputs as well as inputs. The short sighted views of some in industry have also been pointed out by some Professionals (see 3-22).

5.58 However, that is not to say that SIRIM did not have any weaknesses in its organisation or utilisation of its resources. The ability of SIRIM to service industry efficiently reflects on its management. As correctly pointed by some Professionals, historically SIRIM has been run much

like a government department -- out of touch with industry's needs, not geared towards serving industry, and staff not encouraged or fostered to aid industry. Professionals with insight into SIRIM say that all that has changed.

5.59 On the other hand, assessments by SIRIM Counterparts and Officials are based differently from that of Professionals and Beneficiaries, ie on their ability to serve industry subject to resources made available to them. As such, the divergence in opinions between the different parites is normal and should be expected. What is enlightening to see is that SIRIM and generally Malaysian Officials do understand the issues and are planning to do something about the weaknesses of the present system.

5.60 Of course, the interesting issue is how should Projects be designed in such a way that it is not obsolete and becomes irrelevant because of changes in the external environment. This issue will be taken up in the final section of this report.

5.61 The evaluation exercise also served to highlight SIRIM's concern. They provided extensive assistance to ensure that Counterparts were scheduled to be interviewed, made all the necessary arrangements and provided facilities for that exercise. Additionally, they also made available their lists of beneficiaries so that the Joint Evaluation Study Team could contact and make arrangements. A Letter of introduction was also furnished. Documents on relevant areas, especially about SIRIM's own activities were made available. Without the full cooperation of SIRIM, this evaluation exercise would definitely have been achieved much less.

Malaysia (pp 5-10~11)

(1) MITEC

MITEC is considered to be a typical "Service Providing" type technical cooperation project. The main beneficiaries were local small- and medium-scale metal industries, and the services were expected to be provided by the local staff trained by technology transfer from Japanese experts during the project period. This project seemed to have followed a common path of the "Service Providing" type project.

1) Initial Plan (1978)

The MITEC project was the first application of the project type cooperation scheme to SIRIM. The objective of the project was the promotion of the local small and medium-scale metal processing industries by establishing a Metal Industry Technology Center in SIRIM. As a typical Japanese technical cooperation project, it emphasized technology transfer. The project period was initially for 4 years. As was usually seen in the projects at that time, the assumptions were not well considered. Thus, it was assumed, de facto, that the services of MITEC would match the technical needs of beneficiaries at least during the project period and even following the period for a certain length of time.

2) Project Completion Evaluation (1984)

An evaluation team (completion evaluation) was sent by JICA in July 1982, one month prior to completion of the project period. The evaluation primarily concentrates on the achievement of technology transfer, which was considered to be insufficient due to the 18-month delay of the Center's building construction and subsequent shortage of staff training period. The services provided to the small- and medium-scale metal industries began to increase substantially since the completion of the Center, and thus the extension of the cooperation period for further staff training was strongly requested by the Malaysian side. As a result, a 2 year extension of the Japanese cooperation was agreed upon.

A joint evaluation was held in July 1984. According to the report, progress appeared to be made in achieving the main objective of the project, the promotion of the local metal processing industries through the technological services of MITEC, in various categories of the local beneficiaries.

A. Factories which have relatively low technologies:
The services provided by MITEC, such as prototype fabrication and trial production, training of the workers, advisory visit, etc., were most effectively utilized by this group. As a result, cases of new products fabrication, increase of parts delivery to government organizations or public corporations, and increase in number of contracts due to quality improvement were reported.

B. Factories which have moderate-level technologies:
Many positive effects, such as increase in self-supply rate of press-dies, improvement of production quality, reduced costs, improvement of acceptance rates, increase in contracts, etc., resulting from MITEC services were reported from this category of factories.

C. Factories which possess relatively high technologies:
Substitution of services in companies, which had been dependent on their parent companies, through utilization of high-level machines and professionals in MITEC were reported.

The report concluded that MITEC was in the stages of becoming self-reliant, while continuing its functions to support and promote local metal industries. However, the following concerns were also identified as remaining difficulties:

A. Although MITEC's hardware was set-up based on donations from Japan, its software was only beginning to function.

B. MITEC could handle daily services; however, it had limited capacity to handle unexpected problems.

C. The system to absorb new technological improvement was not yet established.

D. The budget for a system to repair and maintain the machines was not set up.

E. The training system of MITEC staff was not established.

Thus, it was recommended that continuous support of MITEC from the Japanese side be provided, given that the Malaysian side would provide sufficient self-sustaining efforts.

3) 1992 Evaluation

Since completion of the technical cooperation on the part of the Japanese with MITEC in August of 1984, there have been 2 major organizational changes in SIRIM with regard to MITEC. The first change was in 1986 when MITEC, the Malaysian Industrial Research and Development Center (MIRDC), and the Design & Fabrication Center were merged and MIDEC (Metal Industry Research Center) was formed. This organizational reform illustrates SIRIM's effort to catch up with changes in the industrial environment. Since the MITEC project is already over 8 years old and its machines and technology are becoming outdated, this amalgamation is intended to cut down on duplication and redundancy of these organizations and to reshape the services and research functions for this strategically important area.

In the same year, the Incubator Scheme was started. Under this scheme, it appears that various new aspects of technology transfer were tried through the provision of more integrated and long-term business management practices. This scheme also attempted to utilize the idle capacity of existing facilities, which had been one indication of the relative obsolescence of MITEC functions. The number of entrepreneurs assisted by this scheme was 10 in 1990, and 5 successfully completed the 2-year-program in the same year.

As the result of these changes, the newly born MIDEC was apparently reinforced with manpower and finance, and the record of services provided steadily grew.

The second organizational change took place in 1990, when the Advanced Manufacturing Technology Center (AMTC) was formed and the press-die section of MIDEC was absorbed by AMTC. This is a much clearer indication of SIRIM's shift in strategy regarding its services, from providing general technical services to customizing specialized R&D services. Accordingly, the activities of MIDEC changed with the establishment of the Foundry Technology Unit, which was done with the assistance of JICA in 1990.

By this time, the original MITEC became almost obsolete in terms of machinery and technology. Thus, although the sections of welding, press, and electroplating remained under the Metal Forming Unit and Metal Protection and Finishing Unit of MIDEC, some of the original machines were replaced by new ones and some were rented out under the incubation scheme. Particularly, the function of the press and electroplating section seemed to be the most outdated due to the lack of aftercare following initial Japanese assistance.

There is some professional opinion that the MITEC/MIDEC project did not have a viable strategy to serve industry throughout the project period. Thus, the effects of the project were minimal and the resources of MITEC/MIDEC were underutilized. Despite the increasing numbers of beneficiaries of MITEC/MIDEC service, this criticism is worthy of consideration.

The problems of MITEC/MIDEC are likely related to the role of SIRIM itself during the industrialization of Malaysia. As a governmental institution, SIRIM acted as a part of the bureaucratic system in the past. However, after the new comptroller was appointed in 1989, it displayed different characteristics, which were more positive and active towards the private sector. Behind this change, there were the unexpectedly rapid industrialization period beginning in 1986, induced by massive foreign investment from Asian countries, and the accompanying technological advancement in the private sector. Thus, the public sector's role, particularly for the SMI's, in keeping up with the speed of technological change in the competitive world markets and in acting as a bridge for technology transfer from the advanced world to the local SMI's has become increasingly important.

4) Future Prospect

It was reported by senior officials that the MITEC/MIDEC project focused on dealing with immediate concerns, and thus little research was conducted regarding future activities. However, due to the unexpectedly rapid industrialization in Malaysia, the technologies of the industrial sector have quickly become more advanced than SIRIM. It is predicted that the necessity for MITEC will disappear by the early 1990's.

However, another organizational reform is planned to take place in 1993, and an Advanced Materials Center would be created by merging three existing centers, the Plastics Technology Center, the Ceramics Technology Center, and MIDEC. In this reform, there will be a clearer future direction for SIRIM which, as stated in the "Corporate Plan '91-'95," would focus its major function towards advanced research and development. The most valuable assets of the MITEC project for SIRIM would appear to be its human resources. While some of the trained staff during the period of Japanese assistance are reported to have left SIRIM and to have begun their own businesses, most of the staff remains with SIRIM and engages in various professional work. SIRIM realized the importance of human resource development and allocated substantial resources for this purpose in the 1991-1995 Corporate Plan. It is no doubt that systematic and organizational training through project cooperation similar to the MITEC project seems to be one of the most effective methods of HRD and is indispensable during the initial stages of organizational development.

(2) Metrology

The Metrology (National Metrology Laboratory) project is considered to be an "Institution Building" type of technical cooperation project. This type of project had not been seen until recently among the Japanese technical cooperation projects, and this Metrology project was one of the earliest cases. A special characteristic of this type of project is the presence of dual project purposes: internal and external.

^) The Research Cooperation-Type Project(Fine Ceramics)

1) Initial Plan (1981)

In the late 1970's, Malaysia was in the process of moving from the yard/pound system to the metric system. At that time, Malaysia was also encouraging the export of manufacturing products instead of primary products. However, many of the export companies were provided with the various measurement standards of different foreign countries because of the low technical level of domestic calibration and measurement service standards. In order to improve this situation, Japan was requested to assist in the Metrology project. There were 5 areas of cooperation: Mass, Length, Volume, Temperature, and Electricity. The objectives of the project were as follows:

A. Establishment of calibration and measurement standards;

B. Providing calibration and measurement services.

The objectives were to be achieved through support of the existing National Metrology Laboratory. The project period was set for 4 years, with the following major initial assumptions:

A. Export promotion would remain an important policy direction;

B. the Malaysian government maintains a strong promotion policy of establishing metrology standards and a service system.

2) Project Completion Evaluation (1986)

An evaluation team (completion evaluation) was sent by JICA in September 1985. The overall evaluation of this team was positive. According to the report, the project showed smooth progress from start to end, and all of the technology transfer items were completed within the initially planned project period. In fact, the project achievements on technology transfer were rated more than 100% by the evaluation team members. Although the construction of the new Metrology Laboratory was delayed for about 2 years, there were no practical negative effects reported regarding project implementation. Thus, the first objective -- the establishment of calibration and measurement standards -- appears to have been accomplished satisfactorily.

Regarding the second objective of providing calibration and measurement services, the usefulness of the project could be seen by the rapidly increasing numbers of calibration and measurement tests provided by the Metrology Laboratory.

The evaluation team also pointed out several potential problems, though they were not decisive factors:

A. The environment of the Laboratory was not satisfactory enough in terms of temperature and moisture, vibration, dust, etc. to keep standard equipment in good condition.

B. It was not possible to maintain some equipment in Malaysia at that time, and services in Japan were required.

C. The number of counterpart personnel, such as research staff in the Metrology Laboratory, was not satisfactory. Expansion of numbers as well as leveling up of qualifications (e.g. at least 2/3 of research staff should be university graduates) is desirable.

D. In order to disseminate the results of the project, more active PR, seminars, training, etc. must be conducted.

The evaluation team recommended the following points:

A. JICA should take care of repair and adjustment of the donated equipment and machinery for a certain period of time;

B. In order to prevent the deterioration of transferred technology and knowledge, the sending of experts and receiving of trainees should be continued and conducted about once per year.

3) 1992 Evaluation

Since the completion of Japanese technical cooperation in 1986, there have been few organizational changes, such as the separation of the Measurement Standards Research Unit from the Measurement Services Unit in 1990.

According to the calibration and measurement service record of the Measurement Services Unit, the frequency of service has rapidly increased in all areas of service during and following completion of Japanese cooperation, despite a staff size which remained constant between 35 and 40 members. As a result, the work load grew heavier and service speed (turnaround time) longer by the year.

Judging from the performance of the Unit, the project has continued smoothly after termination of Japanese assistance. All of the professionals and officials interviewed mentioned the importance of the development of measurement and calibration standards in the 1980's and the contribution of the Metrology project to establish foundation of the standards in SIRIM.

However, a few of the interviewed professionals indicated that the level of standard variety and accuracy required by industry for calibration and measurement standards far exceed SIRIM's capacity. They strongly recommend the upgrading of measurement standards to respond to industrial needs.

Thus, it can be said that the Metrology project was successful in the early 1980's when it was establishing its foundations. However, once it began to act as an established system in the late 1980's, expectations increased along with industrial advancement and the demand level increased faster than its ability to fulfill this need.

4) Future Prospects

Presently, Malaysia is making efforts to assimilate its system of standards with the European Standard (i.e. ISO-9000). The primarily aim of this effort appears to be the promotion of exports to the European market, as well as the encouragement of the use by MNC's in Malaysia of Malaysian-made products. However, this objective requires a substantial effort in the area of measurement and calibration standards setting. Common understanding of the quality concept among local manufacturers is also essential. One professional suggests that service improvement on a regional level would become an important topic in the future.

(3) Fine Ceramics

The Fine Ceramics Project is considered to be a "Research Coorporation" type of technical cooperation project. This type of project can be divided into two groups. One is basic research projects which have no direct beneficiary, while the other is applied research projects which have some direct beneficiaries. The Fine Ceramics project is classified as the former, a basic research project. The basic research project is rarely provided in the form of project-type cooperation.

The Fine Ceramics Project has another special characteristic: the Japan-ASEAN science and technology cooperation scheme. Therefore, the exchange of researchers from ASEAN-member countries and the conducting of cooperative research were major objectives of the project.

1) Initial Plan (1987)

The Fine Ceramics Project is the first basic research type of technical cooperation project to be done in Malaysia. Its origin can be traced back to the proposal for materials science and technology cooperation between ASEAN and Japan made by the then Prime Minister of Japan, Mr. Nakasone, in 1983. After several negotiations between cabinet-level Japanese and ASEAN-member country officials, Malaysia decided to conduct a project on "Characterization of Fine Ceramics." The objectives of this project were as follows:

A. To strengthen the technological research base of fine ceramics in Malaysia; and

B. To accelerate the cooperation among ASEAN countries in the field of fine ceramics.

SIRIM was assigned as the counterpart organization for the Malaysian side, while NIRIM (The National Institute for Research in Inorganic Materials) was assigned as the resource organization in Japan. The scope of research cooperation covered the following range of topics:

A. To synthesize oxides, non-oxides and glass ceramics;

B. To identify and analyze the chemical, physical, and structural properties of ceramics;

C. To measure their physical properties;

D. To master the usage of experimental instruments; and

E. To analyze and interpret the obtained data.

Because this project was begun by top-level officials of Japan and ASEAN-member countries, there was little connection with local needs. In other words, there were no apparent existing local direct beneficiaries at project initiation.

2) Project Completion Evaluation (1991)

An evaluation team (completion evaluation) was sent by JICA in June 1991. It was reported that the overall delay in the schedule resulted primarily due to ambitious initial plans, based on insufficient preliminary studies on the situation in Malaysia. In particular, the shortage of assigned counterparts was reported to be the main cause of the delay and of the low implementation rate of training in Japan and Malaysia. The achievement of experimental research conducted during the project period appears to have been done fairly well, although

they remained distant from front-line research as a result of the initial start of the project in a vacuum.

The report stated that since it usually requires much time to establish the foundations for research activity, the achievements of the project can be judged as satisfactory in terms of the objective "to strengthen the technological research base of fine ceramics in Malaysia."

It was also revealed that although the initial image of the project was clearly basic research, the requests appear to have gradually shifted towards applied research, corresponding to the change in Controller and accompanying SIRIM policy changes. The Japanese side was well aware of the request, however, the initial plan was not changed much and the project maintained consistency during the project period. The report viewed this as a correct decision.

The second objective, ASEAN-level multilateral activities, was conducted primarily during the final stages of the project period in the form of 3 cooperative research projects, 2 training courses, and 1 Regional seminar. Those regional and multilateral activities, with the participation of high level researchers from other ASEAN countries, appear to have provided stimulus for the Malaysian staff. And as a result of these multilateral activities, it became clearer that the creation of information networks within the ASEAN region in the area of materials science would be necessary.

In January 1990, the Ceramic Technology Center was formed with its newly constructed building, and the former Ceramic Technology Section in the Research Unit was upgraded. However, the functions as well as the staff of the Center did not change much from the previous Section.

The evaluation recommended in its conclusion that the project cooperation period in the area of glass ceramics, which among the three areas had seen relatively good results, be extended an additional year. The remaining two areas (i.e. oxide and non-oxide ceramics research) were to be transferred to SIRIM by the end of the cooperation period, with their activities continued under the support of the Malaysian Government budget.

3) 1992 Evaluation

Since the ex-post evaluation closely followed the previous evaluation in 1991, the value of another evaluation is not as significant. Nevertheless, the differing view points provide new insights on understanding the project.

Judging the project from the point of view of effectiveness and efficiency, the first project objective to establish a technological research base for fine ceramics in Malaysia appears to have been effectively achieved, to a certain extent, and the inputs apparently were utilized efficiently in order to achieve the objective.

However, the second objective to accelerate cooperation among ASEAN countries in the field of fine ceramics did not show much advancement following completion of Japanese cooperation. Thus, both Malaysian and Japanese sides recommended follow-up, particularly for ASEAN collaborative research.

Looking at the project from the point of view of impact and relevance, it can be said that the impact on Malaysian industry remains minimal, while the relevance of the project to the needs of Malaysian industry is not clear because of the lack of direct beneficiaries. However, as seen earlier, this project was intended to be a basic research type of project and, as such, would require a relatively long gestation period before fruition. Nevertheless, the slowness appears to have resulted in frustration on the part of various parties, especially outside of SIRIM.

Regarding the sustainability of the project and the continuation of research activities, many weaknesses can be pointed out, such as hardware supply and maintenance, securing staff, expertise of managing research, financial support, etc. Particularly, one of the major elements of the project, the creation of a pool of researchers, was limited as the absolute number of professionals and trained experts remained small. Thus, in order to sustain research activities in fine ceramics, continuous human resource development is indispensable.

4) Future Prospects

There are divergent views on the future of fine ceramics in Malaysia. One active opinion is that fine ceramics is a potential future technology which Malaysia should pursue. SIRIM's plan of forming the Advanced Materials Center with the merger of three existing Technology Centers (MIDEC, the Plastic Technology Center, and the Ceramic Technology Center) appears follow this opinion. One of the recommended methods to accelerate the Center's activities is to create a network with world-established centers of excellence in the area of fine ceramics and to absorb advanced technology through this network.

Another more carefully reasoned and realistic opinion is that since Malaysia lacks even a materials supply for fine ceramics, it would be more feasible to shift its efforts to conventional ceramics areas. This area of research can expect easier commercial applications and more immediate effects, such as flexible joint pipes, high tension electricity transmission equipment, insulators and spark ceramics, etc.

(4) Comparison of the 3 Projects

The three types of projects were implemented in SIRIM under the Japanese project-type cooperation scheme. The three types of projects are characterized as follows:

1)	MITEC	Service Providing
2)	Metrology	Institution Building
3)	Fine Ceramics	Research Cooperation

Since the Japanese scheme does not differentiate between these project types, a uniform package was applied to the three projects, including the combination of sending experts (long term and short term), receiving trainees, and donating machinery and equipment for basically 5 years.

It would be useful at this point to compare the three projects with their evaluation results and discuss the validity of applying a uniform resource package on different types of the projects.

1) The Service Providing Project (MITEC)

The evaluation summary of the MITEC project is as follows:

A. It took nearly 6 years to establish a service providing system through technology transfer;

B. Soon after MITEC started to provide its services without Japanese cooperation, the needs of beneficiaries (e.g. local metal processing industries) changed rapidly, corresponding to massive foreign technology inflow and forcing SIRIM to react to the changes with two organizational reforms.

C. Nevertheless, initial machinery and technology have become obsolete after more than 10 years of operation and service is falling behind the needs of beneficiaries.

D. The services of MITEC/MIDEC have contributed, and is still contributing, to the technological improvement of local beneficiaries, but its role is becoming marginal.

This type of project, which used to and still accounts for the majority of Japanese technical cooperation projects, has the following characteristics:

A. The main objective of the project is to provide services for the beneficiaries;

B. Thus, the beneficiaries can be clearly identified (e.g. medium and small-sized metal manufacturers);

C. Technologies are usually transferred from the Japanese experts to their counterpart recipient organizations through OJT (Technology Transfer);

D. Counterparts are expected to provide technical services to the beneficiaries through various means, such as conducting seminars, training courses, consultations, etc. (Technology Dissemination);

E. When the needs of the beneficiaries change, there are difficulties to change services accordingly due to the inflexibility of hardware and software.

2) The Institution Building Project (Metrology)

The evaluation summary of the Metrology project are as follows:

A. The base of measurement and calibration standards in 5 areas are nearly established, and the service system also began operations within 4 years;

B. Due to the rapid change of industrial needs, demands on increasing standard parameters and providing more precise standards must be urgently fulfilled.

C. Service functions of calibration and measurement should be given out in the near future by accrediting the private laboratories, etc. because of manpower shortages.

This type of project, which began recently upon the requests from recipient countries shifting to more demands from the software side, including system design, standard setting, establishment of regulations, etc., has the following characteristics:

A. The project usually has dual objectives: internal (e.g. standard setting) and external (e.g. provision of services);

B. There are usually beneficiaries but they are sometimes general or vague (e.g. industrial standards for industry in general);

C. The internal objectives (e.g. setting measurement standards and improving them) require substantial effort and resource; and also require periodical system upgrading.

D. Initially, fulfilling the dual objectives appears to be possible. However, in order to increase technological levels, functional specialization (e.g. giving up the service function or delegating it to other organizations) will likely become necessary soon.

3) The Research Cooperation-Type Project(Fine Ceramics)

The evaluation summary of the Fine Ceramics project is as follows.

A. A group of fine ceramics researchers with basic dknowledge and experience has been established, althought their technological expertise needs to be improved.

B. Research on fine ceramics at SIRIM is not yet on a self-sustaining basis. More time is required to establish a powerful basic research system.

C. Fine ceramics-related research and experience is just beginning to flow in the ASEAN Region, but requires further external support.

D. The appropriate future direction of fine ceramics research is not yet clear, particularly whether the focus should be on basic or applied research, or even whether a shift should be made toward conventional ceramics.

This type of project, which is quite rare among Japanese technical cooperation, has the following characteristics:

A. The main objective of the project is to conduct either basic or applied research, and to establish the organizational foundation for the conduct of research.

B. Especially in the case of basic research, there is usually no specific beneficiary of this type of project. In the case of applied research, specific beneficiaries may be identifiable.

C. Topics of research in these types of projects tend to be new to the recipient country, particularly in the case of basic research. Therefore it usually takes longer for the project to mature than in the case of other types of projects.

D. Human resources are critical in these types of projects.

4) Conclusion

Many valuable lessons can be learned by comparing the three types of Japanese cooperation projects. Some of these are common to all three projects while others are specific to just one type of project. The major lessons are outlined below:

A. Common Issues

a. The project-type method of technical cooperation, in which there is a package of experts sent to the project, training scholarships and machinery donation, seems to be fairly effective for all types of projects. However, more flexible and timely application of inputs from both sides, as well as term extensions and follow-up cooperation, would help projects to be more effective.

b. The emphasis on human resource development and the concentration of effort on technology transfer from Japanese experts to local counterparts seems to be working well. However, there is a danger that a narrow view and over-emphasis on technology transfer may lead to a more general neglect of technology dissemination to local beneficiaries, which is the major objective of the projects.

c. Obsolescence commonly occurs in the machinery and technologies in a certain time after Japanese cooperation has officially ended. In other words, the utility value declines as the beneficiaries' needs undergo rapid change.

d. This issue relates to the system of long-term management of the project, such as the on-going improvement of services, the depreciation of machinery and equipment, service charges, staff training etc., and has to be considered more seriously at the initial planning stage.

B. Unique Issues

a. Service Providing Type

Five years is normally sufficient for the initial transfer of technology and the establishment of the service system. The development of practical management plans against technological obsolescence are needed, including the adoption of

appropriate systems of charges, the introduction of depreciation and corporate accounting system, the promotion of contract services, and the establishment of strong technological links with private sector firms etc. The establishment of an internal human resource development system is required with the expectation that there will be a high staff turnover. Eventually this type of project can be transferred to the private sector.

b. Institution Building Type

Five years are appropriate for the initial set-up of institutions and the formation of a system for the provision of services. However, given the public nature of the institution (e.g. in the control of standards) and the expected demand for the continuous improvement in services, it seems necessary to plan for periodic (e.g, every three years) after care and sizable system renewals (e.g. after ten years). Eventually the services of this institution can be separated and delegated to other organizations or the private sector.

c. Research Cooperation Type

Ten years or more seem to be required to support this type of project. Human resources are the key factor for success. Thus planning must consider how to retain human resources internally at least until the project starts to produce secondarily-trained human resources and there is a multiplier effect on research work. Organizational linkage with external (overseas) research centres seems to help in securing long-term development and technology transfer.

3.1.3 Contribution of the 3 Projects

(1) Contribution to SIRIM's Activities

1) Contribution of the 3 Japanese projects to SIRIM

6 CONTRIBUTION OF THE THREE PROJECTS

A CONTRIBUTION TO SIRIM's ACTIVITIES

6.1 Examining the impact of the three Projects on SIRIM's activities is not an easy exercise. Precise indicators have to be used. However, none exist for the moment. As such, this exercise will use whatever available published material or data obtained from this evaluation study to put forth some impressions of their impact.

6.2 Looking through SIRIM'S past Annual Reports, the three Projects appear to be very important indeed. In 1979 for instance, the MITEC project was prominently discussed in SIRIM's Annual Report. Similarly too, other Annual Reports have also reported extensively on the three Projects. An appropriate indicator of the importance of the MITEC and subsequently MIDEC Project is the proportion of staffing within SIRIM. Table 6.1 shows the total staffing for the period 1979-89. In terms of officer level staffing, MITEC's share was 8.9% in 1979, and gradually eroded to 5.9% in 1985. However, after the reorganisation the proportion of MIDEC staffing within SIRIM increased to almost 19%. For the total departmental staff, MITEC's share increased from 5.7% in 1979 to a high of 7.5% in 1983. Since 1984, MIDEC's share of staffing within SIRIM has increased to 20%. Thus the importance of MITEC and subsequently MIDEC within SIRIM cannot be doubted.

6.3 As to its contribution towards SIRIM's activities, this is much more difficult to measure directly. There are many spinoff effects of the MITEC Project, as mentioned by the Controller. Capabilities developed from the MITEC Project have permeated SIRIM in the sense that some of it was deployed, and other areas were amalgamated into MIDEC. For instance, in the area of technical services, SIRIM may have used some of the facilities and staff trained under MITEC to carry out such services. Incomes from Technical Services increased from $0.66 million in 1981 to an estimated $23 million in 1990. Of course, not the entire amount reported in 1990 is attributable (because more activities could have been added and their share increased) but contributions of engineering services and possibly information services were definitely part of the MITEC agenda. A 15% growth incomes received from services between 1981-90, and part of that can be attributed to MIDEC's contribution; the exact portion cannot be determined at this stage (Table 6.2).

6.4 MIDEC's capability can also be demonstrated in the fact that they are taking part in 10 IRPA (Intensification of Research in Priority Areas) projects.

Table 6-1

Importance of MITEC within SIRIM (Staffing), 1979-89

	MITEC/MIDEC		SIRIM		% SIRIM	
	A	Total	A	Total	A	Total
1979	12	31	135	545	8.9	5.7
1980	11	42	156	597	7.1	7.0
1981	17	50	190	675	8.9	7.4
1982	14	55	218	752	6.4	7.3
1983	13	56	217	751	6.0	7.5
1984	13	52	216	752	6.0	6.9
1985	14	52	238	790	5.9	6.6
1986	14	57	238	790	5.9	7.2
1987	43	152	228	741	18.9	20.5
1988	44	151	234	747	18.8	20.2
1989	49	156	237	762	20.7	20.5

Source: computed from SIRIM's Annual Report, various years
JICA & SIRIM, Joint Evaluation Report on MITEC, 1984 Annex B

Table 6.2: Income Earned, 1980-90

Year	Metrology	MIDEC	Technical Services
1980	22450		
1981	48000		657676
1982	120000		847364
1983	175000		885101
1984	172000		1020000
1985	342000		940107
1986	404000		960850
1987	388000		1020000
1988	406883		1200000
1989	410145	91000	1310000
1990	496265	181344	2300000
AVGR	36.29	99.28	14.92

Note: AVGR = Average Annual Growth Rate

Source: SIRIM, Corporate Affairs, 1992

6.5 As for Metrology Project, the contribution to SIRIM has also been quite remarkable. However, unlike MITEC, the significance is not in the staffing proportions; in staffing, the Metrology Unit has virtually stagnated in growth between 1982-90. But in areas such as the number of calibration, measurement and verification services provided and the incomes earned by the Metrology Unit, the real achievements of the Project are evident. For instance, in metrology services, SIRIM's Metrology Unit provided services to 289 cases in 1976 and 518 in 1977. In 1981, it was providing services to 1000 cases. By 1986 (end of Project) and 1991, the number of services have increased several fold -- 5,127 in 1986; 8,216 in 1990 and 13,147 in 1991 (Table 6.3).

6.6 These increases have also been matched by earnings of the Metrology Unit. Between 1980-90, incomes have increased from $22,450 to $496,265. The growth rate of metrology earnings was estimated at over 36% per annum over this period.

6.7 Incidentally, there have been relatively little organisational changes in the Metrology Unit except in 1990, when the R&D side have been separated from the metrology services. Overall, there has been continuation and upgrading of metrology facilities by SIRIM.

6.8 The Fine Ceramics Project contribution is definitely much less obvious partly because there is no existing industry to serve. But it should be noted that the equipments left over from the Project will enhance SIRIM's capability not only in advanced ceramics but also in conventional ceramics research.

6.9 Already SIRIM is moving into powder metallurgy which is going to make use of facilities from the Fine Ceramics Project (En Nik Kamil, per comm, October 1992). Powder metallurgy is an advanced materials area, and SIRIM will benefit tremendously from the FC Project facilities. Dr Hamzah Kassim mentioned that SIRIM is in the process of identifying advanced ceramics areas where SIRIM could move into in the near future.

6.10 Although some of the contributions of the Projects cannot be empirically quantified, nonetheless the impact on SIRIM has been significant, and the latent effects would still be evident in the years to come.

Table 6.3:

CALIBRATION & MEASUREMENT SERVICES OF SIRIM'S METROLOGY UNIT, 1976-91

Year	Length	Force & Presswork	Tempe-rature	Electri-city	Volume	Mass	Total
1976	86				190	13	289
1977			4	1	202	311	518
1978	4		3	58	46	2022	2133
1979	24		10	67	223	2250	2574
1980	81		86	65	145	622	999
1981	45	58	29	88	331	950	1501
1982	1600	58	69	88	334	987	3136
1983	420	116	49	170	451	773	1979
1984	282	119	137	154	994	1941	3627
1985							2697
1986	113	259	217	503	705	3330	5127
1987	160	364	440	840	1160	3628	6592
1988	165	373	362	622	1566	3956	7044
1989	336	482	536	803	1406	4374	7937
1990	350	518	583	924	1425	4416	8216
1991	2260	704	1378	1100	296	7258	13147

Note: SIRIM provided time services for 151 cases in 1991

Source: SIRIM, Corporate Affairs, 1992

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2) Future Direction of SIRIM and Japanese Cooperation

A. Future Direction of SIRIM

The future direction of SIRIM is shown in the "Corporate Plan 91-95" of SIRIM. It clearly states that two major areas of activities, R&D of industrial technology and the establishment of measurements and standards, will be sustained in the future. However, in order to improve service to industry, drastic management reform leading to corporatisation is to be completed by 1996.

In the area of R&D, SIRIM's future research is to focus on advanced technology areas in order to be relevant to the needs of industry. In the same thinking, the AMTC (Advanced Manufacturing Technology Centre) was established in 1990 and the Advanced Materials Centre is going to be formed in 1993 by amalgamating three existing centres, the Ceramic Technology Centre, the Plastic Technology Centre, and MIDEC.

SIRIM is now targeting to become the National Centre of Excellence in various areas such as composite materials, advanced manufacturing technology, product design etc. In order to achieve this target, SIRIM has to always keep one step ahead of industry. To achieve this, a contract research programme is also going to be enthusiastically promoted.

Another function of SIRIM, the establishment of measurements and standards, is quickly expanding as a type of service provided. Demand from the industrial sector in this area is growing rapidly in terms of standard parameter numbers as well as precision levels, along with the speedy growth in the export of manufactured products. However, due to the shortage of experienced staff at SIRIM, calibration and measurement services are not expanding fast enough to keep up with the growth in demand.

In order to clear away the existing bottlenecks and achieve the above targets, SIRIM is planning to conduct a radical management reform, which is the so-called "corporatisation". This includes manpower development, business operations reform, financial restructuring etc. The target year to complete corporatisation is 1996, with various reform measures are to be taken.

B. Japanese Cooperation

As seen in the previous chapters, Japanese technical cooperation projects have fulfilled vital roles in laying the foundations of SIRIM's functions for about fifteen years from the late '70s till the present. The MITEC project was the original founder of SIRIM's technology transfer activities for the local SMIs specializing in a strategically important sector. The metrology project was also the founder of SIRIM's other basic function, measurement standards. The Fine Ceramics project was the initiator of future material research, which indicated one of the future directions of SIRIM's activities. As an offspring of the MITEC, the Foundry project is on-going. Therefore it can be said that Japanese technical cooperation projects have been leading SIRIM's activities since its founding.

For the future cooperation, several areas can be identified in relation to the past cooperation projects. Relating to metal processing technology, it may be useful to reinforce the die section of the AMTC. In the metrology area, the second phase or grading up of the existing system of standards would seem to promise a large impact. Cooperation possibilities also exist in the ceramics area, such as continuous support of fine ceramics for industrial applications, or the shifting to conventional ceramics, or by taking the middle way of industrial ceramics or porcelain.

(2) Contribution to Malaysian Industrialization

1) Important Policy Changes

Two important elements of Malaysian industrialization throughout the 1970s to 1980s are the promotion of foreign investment and the participation of the Malays in the industrial sector (the Bumi-putra policy). The role of foreign investment has grown with successive stages of industrialization, namely primary import substitution in the 1960s, export promotion in the 1970s, secondary import substitution in the early 1980s, and secondary export promotion in the late 1980s and onward.

The main thrust of the intervention by the government with its Bumi-putra policy in the the industrial sector has changed with the advancement of industrialization. Namely, this refers to infrastructure construction in the 1960s, the establishment of rules, institutions and incentives in the

early 1970s, regulations and controls in the late 1970s, direct intervention in the heavy industries, such as HICOM, in the early 1980s, and deregulation and promotion of foreign investment in the late 1980s onward.

2) The Contribution of Japanese Cooperation Projects

B CONTRIBUTION TO MALAYSIAN INDUSTRIALISATION

6.11 It is much more difficult to examine the impact of the three Projects on Malaysia's industrialisation than it is to examine the Project's impact on SIRIM because of the nature of the task. In a sense, special indicators are necessary, eg what is the proportion of all beneficiaries of the three Projects as compared to the total number of local SMIs or potential users of SIRIM's services, the precise benefits that were derived from enjoying specific services, etc. Such a task is well beyond the scope of this very modest evaluation exercise. Special studies may have to be undertaken to determine the precise nature of the impact.

6.12 SIRIM's role in the industrialisation is to assist industries in becoming more efficient, adopt higher technology and quality in their products, and upgrade their manufacturing process. SIRIM intends to provide also the soft side of technological development (meaning in developing expertise) rather than only on the hard side, ie developing the hardware part (eg robotics). However, SIRIM cannot possibly do large scale training; that is left to other organisations and the private sector. SIRIM intends to concentrate on technology transfer and technical services to industry at large. It is within this context that SIRIM's role in industrialisation should be examined.

6.13 Available indicators are really only in the provision of services of SIRIM in those three Project areas to industry at large. How much of an impact that makes to industrialisation is really anybody's guess. But SIRIM's contribution to industrialisation cannot be doubted. In any case, the data on service provisions have largely been presented in this report. For the sake of convenience, a summary of the issues and data is reproduced here.

6.14 According to Dr Hamzah, SIRIM is serving about 2,000 firms in Malaysia. About 70% of these are local SMIs. From the lists which were made available to the Joint Evaluation Study Team, a large majority are beneficiaries of the metrology programme.

6.15 In the area of metal engineering, the impact of the Project is not high because essentially its outputs was not ahead of industry's needs. AS such there was little which SIRIM could contribute to enhancing the technological capability of local SMIs. And because of a very active external environment, SMIs progressed very much with the assistance of multinational companies through partnership programs of different forms and variety.

6.16 SIRIM is in the process of trying to move ahead of industry in this regard by focussing on pro-active research. Future research issues especially in advanced materials would be the

focus of a reorganised MIDEC. And this will come in the form of a Materials Technology Centre. Already, one of the off-shoots of MIDEC has been the creation of the AMTC. And MIDEC will change again.

6.17 As such, the changes and impact are minimal today, if yesterdays inputs are used to gauge today's results. However, SIRIM's management is determined to change that situation.

6.18 In metrology, the increase in the number of metrology services over the years (Table 6.3) to industry is a very good measure of its impact. Additionally, the fact that there has also been increase in the number of international inter-comparison standards, traceability, research programmes with more metrology institutions also means that the potential for the metrology side is also very great.

6.19 The increasing use of the manufacturing quality standards ISO9000 also requires the use of technical measures and standards. And SIRIM has been designated the national institution to accredit firms seeking to obtain that certification. Metrology services contribute in its own way to such quality standards. As such, the impact can also be measured in that respect. If data were available on the proportion of manufactured exports to manufacturing output, then perhaps it would be more obvious (ie either value added or total sales volume, but must be in the same units for both items).

6.20 Dr Ahmad Tajuddin mentioned that IBM has set up an International Purchasing Office in Malaysia must also mean that Malaysian made products have acquired a quality status which they are comfortable with. Additionally, many other high technology firms are buying from many firms in Malaysia, although not all of these are local established firms.

6.21 Metrology's impact is not only in the availability of standards and services. It is also concerned ultimately with the reduction of costs and turnaround time for manufacturers who would otherwise need to send their machines to be calibrated abroad. As such, the benefits of an improved metrology service would ultimately improve profits for firms established in Malaysia.

6.22 In the case of Fine Ceramics, the impact on the Ceramics Industry is small. The Project has been mainly focussed on research, and therefore in terms of developing researchers within Malaysia, there are some benefits. However, what industry needs at this point is the ability of local firms taking advantage of available markets. And SIRIM Ceramics Technology Centre is providing some assistance. However, that is mainly in conventional ceramics rather than in advanced ceramics area. There is no advanced ceramics industry in Malaysia so to speak as yet.

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The role of Japanese cooperation projects have to be understood within the context of the Malaysian industrialization process. The first project in SIRIM, MITEC, was planned at the time of highly regulated foreign investment and the promotion of the domestic manufacturing sector. It was imlemented during the heavy industry promotion period through HICOM. Accordingly, the MITEC project was expected to contribute firstly to the promotion of the local metal processing industry, particularly Bumi-putra companies, and to the creation of parts and tools suppliers to support the HICOM project. These initial intentions were appropriate and MITEC started to contribute to the technological improvement of local SMIs in the early 1980s. Howwever, the industrial environment changed rapidly in the late 1980s. Massive foreign investment in-flows with advanced production technologies led to a quick change in the technological levels of the related SMIs, the main clients of MITEC, and MITEC's own technological levels were not able to keep pace.

The second project, Metrology, was also planned within the context of the continuing export promotion drive in the late 1970s. Since new foreign investment and the corresponding export growth speed slowed down in a relative sense in the early 1980s, due to the policy of promoting domestic heavy industries, the Metrology Project was given a preparation period during its implementation stage. When Japanese cooperation was completed, massive foreign investment began to flow in and the demand for measurement and calibration started to grow tremendously. Therefore it can be said that the timing of the Metrology Project was perfect. However, as seen before, since the speed of demand growth for SIRIM's services is exceeding capacity in terms of quantity and quality, the improvement of standards and service levels of SIRIM seems to be urgently required.

The third project, Fine Ceramics, has a very a different background, as it was planned as a result of an initiative taken at an ASEAN summit meeting. It has not been clear why the Fine Ceramics project was taken up by Malaysia at that time. The project seemed to be early in the context of Malaysian industrialization as there was no existing industrial base in the sector in Malaysia at the

time the project was initiated. Apparently as a result, it became a basic research project. The Fine Ceramics project provided a good experience to SIRIM in a future role in R&D. By the early 1990s, advanced research started to show more relevance for future Malaysian industrialization, as can be seen in the Corporate Plan 91-95 and particularly the concept of the Advanced Materials Centre.

3) Future Prospects

The future prospects of the three projects for Malaysian industrialization depend mainly on SIRIM's policy on utilizing its existing hardware and software assets. The MITEC/MIDEC project seems to have contributed to some extent to the local industries' growth, and is presently acting as a minor service centre. The advanced part of press-die making has been absorbed by the AMTC. The remaining parts of MIDEC are also expected to be transformed as a part of the planned AMC. These changes indicate SIRIM's continuing efforts to catch up and lead the changing industrial sector's needs. However, the ways in which the AMTC and the to-be-established AMC can contribute to local industry will depend on SIRIM's management policy implementation.

The Metrology project seems to have growing potential along with the progress of export-oriented industrialization in Malaysia. The anticipated assimilation of Malaysian standards with the European ISO 9000 standards, and with those of the US and Japan, provides large potential to the project, provided that SIRIM is able to continue improving its present levels of standards and service. For the future expansion of the Metrology project, it would be recommended that the service function be delegated out from SIRIM.

The Fine Ceramics project seems to have vague potential in the future. In particular, its direct future contribution to the industrial sector seems to be little, although SIRIM recognizes its long-term future importance. The expected creation of the AMC, which will include the Ceramics Technology Centre, is worth paying attention to. One of the future difficulties of Fine Ceramics is to continue the basic research on its own. It is far from being an independent research unit in terms of manpower, equipment, funds and research capacity. Thus, it seems critical that steps be taken prior to the deterioration of existing assets to either intensively support the basic research function or to alter the functions of the project to encompass the development of expertise in conventional ceramics or in the industrial application of the acquired basic research expertise.

3.2 LESSONS AND RECOMMENDATIONS

3.2.1 Lessons Learned

8 OVERALL RECOMMENDATION

8.1 This section will focus on recommendations for the joint evaluation study. Two main sections follow. The first is on the lessons learnt from the three Projects. The second is what should be formulated in future technical cooperation.

A LESSONS LEARNED

i. Project Planning and Implementation

8.2 One of the main issues that would affect project planning and implementation is the change in assumptions that were first made about a particular project; thus this affects project design, and the flexibility that projects can be changed to suit changing circumstances. The change in external environment can make certain projects obsolete, if they are not properly designed. Although this was not the case in the three Projects, the importance of the external environment was pointed out by several persons. And the change in those environments may have nothing to do with the performance, efficiency and effectiveness of partner organisations (eg SIRIM). The clearest case was when the country was in a recession, funds originally budgetted were cut. The other situation was of course the fast changing needs of local SMIs with regards to metal engineering and metrology services.

8.3 It should be acknowledged that not every change in the external environments can be anticipated. However, if the major environmental trends can be identified, they can be incorporated into the project design. Hence, it may be important to carry out a small study before technical assistance is given in order to be able to aid in formulating the project design. In this small study, it may be better to formulate the log frame contents -- assumptions and indicators. In this way, when the project is launched, then there is already an evaluation mechanism to be adopted, modified and changed or reviewed.

8.4 The necessity to build in evaluation mechanisms from project design and to ensure that it gets translated to implementation. More of this discussion later. This evaluation study encountered some problems, especially verifiable indicators because in the original project no mechanism for data collection for evaluation was built into the project. And because SIRIM themselves does not yet have a database for their beneficiaries, there was actually a lack of data for analysing the impact of the different projects. And whilst there is a good statistical reporting system in Malaysia, the level of detail and specificity is not available from the Department of Statistics. Hence, this ex-post evaluation exercise suffers from this initial failing. Future projects

should attempt to incorporate evaluation mechanisms from the start. Both funding and partner organisations must allocate sufficient resources for such purposes.

8.5 Another area of some concern is the change in management emphasis and perspective during and even after the project is completed. This is really the prerogative of the government and management of the partner organisation. If the proposed small study could also examine the needs of the partner organisation in fair detail, then this would enable both governments to better design projects such that the need to change projects mid-stream is minimised.

8.6 One of the constraints of the JICA type funding is that it is a government to government type. In order for the funding to be more effective, ie serve industry needs, private sector participation is necessary. If this could be included in the TOR of future projects, it would improve their impact, relevance and sustainability.

ii. After Project Completion

8.7 One of the main issues that came up is the problem of the lack of equal attention on follow up programmes. Malaysian Counterparts and Officials feel that more care should have been taken to provide follow up programmes. Follow up programmes should focus on training and upgrading the knowledge and expertise gained by Counterparts, especially in more advanced techniques and technology, etc.

8.8 The critical issue which should be addressed is that of project sustainability. Of the three Projects, the one which is on its way to being a sustainable venture is the Metrology Project. There is potential in the metal engineering sector but this has yet to be fully exploited at the moment. For the Fine Ceramics Project, the project completion activity which is planned revolves around a follow up programme which is more application-oriented.

8.9 Additionally, to allocate sufficient resources for continuing project evaluation so that partner organisations and funding agencies get to understand the benefits and problems of the project.

8.10 As mentioned elsewhere, special studies may be needed if detailed impact studies are needed. More detailed discussion on this can be found in the next section.

iii. Project Evaluation

8.11 Based on the experience with this Joint Evaluation Study, it is important to emphasize the need for incorporating an evaluation mechanism in Projects.

8.12 The need for evaluation in projects is already clearly stated in JICA (1990) Preliminary Guidelines in Evaluation Methods and Procedures.

8.13 The most important task is to first set up the Logical Framework specifying the most important assumptions, verifiable indicators and also the various stages of project implementation. It should be stated that all the three Projects have had very extensive inputs from both governments. That is important and should be continued. However, in order that evaluation be done properly, an evaluation mechanism should be set up.

8.14 It should be borne in mind that as one moves from efficiency to sustainability, the nature of indicators that are required change. At the level of efficiency, it might be alright to report on project inputs and outputs, ie within the control of both funding and partner organisations.

8.15 However, at the level of effectiveness, the impact of beneficiaries should already be the main focus on the evaluation indicators. As such, it is recommended that future projects should have include a component to collect baseline data on beneficiaries. Ahd a mechanism for updating on a regular basis data on beneficiaries should be implemented as well.

8.16 At the level of impact, it would appear that based on these three Projects, a slightly wider statistical base is needed. Malaysia has quite a good statistical base for manufacturing industries compared to many other Third World countries. However, if specific industry data is needed, then specific requests should be made through the formal channels for more detailed data, ie other than those which are already published. Based on the consultant's experience, such data cannot be made available within a short time frame such as the one formulated for this Joint Evaluation Study. As such, it is only possible if estimates are obtained from published sources.

8.17 If more detailed impacts analysis are required, the only way is to launch a specific study. It is not likely that the current institutional setups will permit a more detailed examination of a Projects' impact. Nonetheless, if only estimates are required, then the established statistical sources or published data will suffice.

8.18 As for areas such as relevance and sustainability, they involve more qualitative information which are best obtained from interviews or questionnaire surveys, especially with Officials, Professionals and Beneficiaries. Depending on the emphasis of each Project, the sampling ratios for each category of respondent would have to be suited to the study.

8.19 It is important to emphasise the collection of data at every stage of the technical assistance and cooperation programme, ie from project design and formulation to implementation, and ex-post project evaluation. In this manner, the entire process can be studied in much greater detail.

B FUTURE TECHNICAL COOPERATION

8.20 The Malaysian government welcomes technical cooperation to assist in its industrialisation programme. Apart from SIRIM, the Ministry of Science, Technology and Environment (MOSTE) has a few other portfolios, ie institutes such as Malaysian Microelectronics Systems (MIMOS), the Technology Park, and Malaysian Remote Sensing Centre which also welcome technical cooperation (En Ghazali Ahmad, MOSTE, per comm, November 1992). The MOSTE would like to be able to get foreign technical assistance to develop those organisations, much like the benefits which SIRIM has derived from JICA projects.

8.21 Additionally, the government has also got a research agenda which is known as IRPA. Research into technology areas would be better coordinated if they could be focussed in areas where IRPA is also funding research. The lead organisation for this is the MOSTE.

8.22 It should be borne in mind that the Malaysian government is keen to discuss with any government to develop more technical cooperation projects in areas which are of immediate and strategic interests for Malaysia's development.

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It would be useful here to draw general lessons and recommendations which can be summarized according to the project phases, based on the evaluation results of three projects. These would be the points for improvement in the future project-type technical cooperation projects in the industrial field for both the Japanese and Malaysian sides.

(1) Project Planning Phase

A. Planning According to the Project Types

As identified in this study, there are different types of projects, such as "Service Providing" type, "Institution Building" type, and "Research Cooperation" type. The "Service Providing" type project puts priority on the beneficiaries, thus the major concerns are grasping the needs of beneficiaries, responding to changes, and maintaining the hardware and services so as not to be outdated. For the "Institution Building" type project, the major theme is to achieve dual objectives in balance, such as establishing a standard system and providing measurement services. It requires periodical aftercare for the continued upgrading of the established system. The "Research Cooperation" type project usually requires a longer gestation period than other types, and special attention should be paid to human resource development.

It is important to identify the different types of projects in order to improve the effectiveness of project-type cooperation, and thus it is recommended that the appropriate project term, design of cooperation means, allocation of resources, method of follow-up, etc., be planned differently according to the characteristics of the project types.

B. Application of the Logical Framework

It is recommended that the Logical Framework be applied at the planning stage of the project, so as to rationally organize the logical sequence of the project goal, purpose, outputs, and inputs. In particular, it is essential to set achievement targets and their indicators, and to clarify important assumption for achieving the targets in each level. By such arrangements, the project management would have powerful tools to monitor the project situation correctly and to steer the project direction properly throughout the project implementation and evaluation period.

C. Conducting the Baseline Survey

It is also important to conduct a baseline survey paying particular attention to the state of the beneficiaries before implementation of the project in order to have a quantitative record of the basic conditions. This set of data would be extremely valuable for future project phases of implementation and evaluation

in providing the objective base data, which was usually lacking in past projects.

D. Assessing the Receiving and Resource Organizations

Since the policy changes of the receiving organization affect the activities and achievement of the project, it is strongly recommended that the past history and the policy changes of the receiving organization concerned, be assessed beforehand, as well as the future policy direction of the top management in order to predict future organizational changes as much as possible. It is also important for the receiving organizations to be aware of the characteristics, capacity and cooperation policy of resource organizations, in order to prevent unrealistic expectations during the implementation period, and to prepare the way continued good relations with them after the cooperation terminates.

E. Necessity of Sector Survey

When planning a specific project, it is necessary to assess the past macro sectoral trend (e.g. industrial sector) and the future prediction (for at least 10 years). Through this macro assessment, the project management of both sides should fully recognize the surrounding conditions and important assumptions of the project so that the relevance of the project's goal and purpose would not be lost in the near future.

F. Establishing the Monitoring System

At the project design stage, a monitoring system of project implementation should be included as a part of the project activities, and the necessary budget should be secured. By this arrangement, the data for the logical framework indicators would be recorded periodically, and accumulated during and even after the project cooperation period.

(2) Project Implementation Phase

A. Special Consideration on Human Resources Development

Three projects have been suffering from a chronic shortage of experienced staff. The shortage of qualified engineers and technicians in Malaysia is extremely serious at the moment and it would seem that a side effect to the success of technology transfer is that a number of counterparts intensively trained in a project leave to fill positions elsewhere. Under these circumstances, it would be more appropriate to train relatively large numbers of the people and accept that a certain portion leave than to train a small number of counterparts intensively and try to prevent their movement.

Thus, it has been recommended that it would more desirable for the Japanese side to place priority on a wider range of HRD and to

support the establishment of an internal staff training system rather than trying to concentrate on technology transfer to a limited number of counterparts.

Meanwhile, the Malaysian side should also put priority on HRD, and the human resources potential target should not be limited to within the section or the organization but should also include relevant outside organizations. The Malaysian side should fully utilize the opportunity of Japanese technical cooperation for the training of capable people on a wider basis, regardless of whether they come from the private or public sector.

B. Close Monitoring on Beneficiaries Needs

In a project with beneficiaries, it is essential for the project staff to be in close contact with the beneficiaries, and to maintain a monitoring system through which an evaluation of the beneficiaries is continuously reported. This helps the project management not only to be close to the beneficiaries' needs, but also to provide information on the changes in the customers' needs and to show the direction of future service change. This kind of monitoring effort is indispensable when the services of the project are changed.

C. Establishing a Dynamic Project Management System

A technical cooperation project, by nature, has a tendency for initially introduced machinery and technologies to quickly become outdated or irrelevant depending on the time element involved. In order to cope with this problem and to keep the project up-dated, it is necessary to establish a dynamic project management system. Nevertheless, this aspect of the project has been relatively neglected due to the strong emphasis on technology transfer in past Japanese technical cooperation projects. In other words, the project management aspects are considered to be matters for the recipient side and thus tend to be easily dependent on the existing system of the recipient organization.

However, if the project aims at promoting more beneficiary oriented services thus being more adaptable to their needs, it is necessary to re-examine the management method carefully and make efforts to be a more competitive organization. For this purpose, the introduction of the private sector's management methods and the relating of appropriate means for technical cooperation should be examined by the Japanese side; meanwhile, on the Malaysian side efforts towards organizational management improvement are needed.

D. Monitoring and Project Completion Evaluation

During the project implementation period, it is recommended to continue monitoring log-frame indicators, and feed the information back to the management periodically. With the help of this data,

the management can adjust the allocation of resources allocation and the activity priority, so that the targets of the outputs and the purpose would be achieved properly. At the final stage of the technical cooperation, a project completion evaluation should be conducted jointly. This evaluation should be altered from the usual style, which examines mainly technology transfer aspects in terms of project inputs and outputs, and should put more emphasis on the total achievement of the project, by examining project purpose attainment, project relevance change and project sustainability.

(3) After Project Completion Phase

A. Organizational Adaptation to the Environmental Change

Once the technical cooperation is completed, the operation and management of the project is transferred to the recipient organization. However, it is usually difficult to be self sustaining immediately and thus certain continuous support is necessary. The Japanese technical cooperation provides several schemes after project completion, such as after-care and follow-up, which can be utilized according to the needs of the recipient.

If the project successfully acquires the self-sustaining capacity with a set of Japanese technical cooperation, adaptation to the environmental changes and continuous evolution of the project organization would be possible. However, whether the project can adapt properly or not depends on the level, magnitude and speed of the changes. In rapid and structural industrial condition changes like in Malaysia, it would be difficult for many projects to acquire the sufficient self-sustaining capacity with the initial inputs during the limited project period. Therefore, a proper supporting system should be established after completion of the project cooperation period, together with a frequent exchange system of information and monitoring data.

B. Cooperation with Outside Organizations (Twinning)

One of the important assets of the project for the recipient organization is the relationship with the resource organizations in Japan, with whom the experts were recruited and the training of counterparts were conducted. It is recommended that effort should be made by the project management to maintain a good relationship with them after project completion in order to be able to receive continuous assistance from them.

Moreover, it would be recommendable to develop relations with other foreign advanced research institutions or private companies (Twinning), and to promote the exchange of technological information and researchers. Successful involvement in the international professional networks would greatly help to maintain and up-date the technological and human resource levels of the project.

C. Conducting Ex-post Evaluation

It is recommended that ex-post evaluations be conducted after project completion at regular intervals (every 3 years) by the recipient organization, and to accumulate the data on the indicators of the log-frame and changes of the initial assumptions. Five evaluation items should also be checked and the results should be periodically fed back to the management of the project. The Japanese side should support and encourage the ex-post evaluations technically and financially, which would also help maintain information on past Japanese cooperation projects.

D. Accumulation of the Project Activity Records

Presently, the accumulation of project activity records and their maintenance after the project cooperation period is handled by the recipient organization without any uniform system. Thus, the quality of the records depends on organizational or even individual capacity. Particularly, if an organizational change takes place, there is a danger of losing the recording continuity, and of missing the past records, which would affect the availability of consistent project data for the ex-post evaluation. In order to prevent this, it is necessary to maintain the monitoring system, which is supposed to be established at the project's initiation. Meanwhile, a continuous effort should be made by the recipient side to accumulate relevant documents and information systematically.

i. Japanese technical cooperation to SIRIM

8.23 At the level of SIRIM, they are discussing with world experts to work with SIRIM researchers (Dr Hamzah Kassim, per comm, October 1992). Currently the areas which are being discussed involve: automation, advanced materials, composite materials, other high technologies, and instrumentation.

8.24 Additionally, there is also a need for despatch of more short-term experts who can impart technology transfer on specialised technologies. Areas which the Controller has identified include powder metallurgy, ceramics composite and carbon fibre technology, metrology, certain testing facilities, high

precision metal engineering sector, and R&D in industrial technology (Dr Ahmad Tajuddin, per comm, October 1992).

8.25 A more comprehensive list of these could be obtained from SIRIM because they have undertaken a special study to examine areas of high technology which SIRIM should move into (Dr Ahmad Tajuddin, per comm, October 1992). ADL has assisted SIRIM in identifying the strategic future research areas.

8.26 It should be noted that SIRIM has been nominated to be the Centre for Excellence for advanced manufacturing technology, advanced materials, eg fine ceramics and automated engineering. These three areas are very likely to require technical assistance.

8.27 A continuous training programme for SIRIM's research and technical staff is also envisaged to be necessary for all future projects. One of the major problems identified by officials is the lack of skilled manpower. At the moment, SIRIM is undergoing a major recruitment exercise, expanding its staffing from the present 750 to over 1000. This is essentially to address the problem of manpower shortages. And with this huge increase, training would be a critical factor which would be needed. Hence, there is a need to consider offering training programmes for SIRIM staff. Areas of training should be discussed directly with the management of SIRIM.

8.28 Joint research projects could also be launched with SIRIM researchers. Currently, SIRIM has the interest to pursue this matter more carefully (Lam Teng Chee, SIRIM and Dr Mohinder, per comm, October 1992). The areas of research cooperation could spread to beyond the three projects under evaluation.

8.29 With respect to the three (3) JICA projects, several are being discussed. In the area of metal engineering, there is a need to train AMTC staff. Upgrading of equipments provided during the MITEC project is necessary if SIRIM is to stay ahead of industry and be able to continue to serve industry well.

8.30 In the area of metrology, more primary standards should be set up in SIRIM. As such, SIRIM is currently discussing with the NRLM on future cooperation. There is an urgent need to upgrade metrology services at SIRIM. Currently, Phase II is being discussed with JICA.

8.31 A follow up to the Fine Ceramics Project is also being discussed under separate arrangements.

ii. Industrial sector

8.32 The Industrial Technology Plan of Action made recommendations which have been accepted by the Malaysian government on the development of industrial technology. It is thus recommended that future technical assistance could use this document as an indicator of what projects the government is likely to seeking assistance and cooperation for. The key strategic thrusts are as follows:-

1 To provide leadership to strengthen the institutional and support infrastructure for industrial technology development

2 To ensure widespread diffusion, and application of technology, leading to enhanced market-driven R&D to adapt and improve technologies

3 To build competence for specialisation in key emerging technologies

4 To strengthen the institutions and mechanisms for continual development and the elevation of technical proficiency of the human resource base

5 To elevate S&T awareness and appreciation to provide the most conducive climate possible for invention, innovation and technological advancement.

8.33 A closer examination of all the 42 recommendations should form a good basis for understanding what might be needed for Malaysia at this point.

8.34 Areas where key sectors are being focussed in the Industrial Technology Action Plan are:

a Electronics
b Advanced Manufacturing, eg light aircraft
c Advanced Materials, eg composites
d Information Technology
e Biotechnology

8.35 These are sectors where the government would be very keen to develop and secure a good knowledge base.

8.36 SIRIM has also attempted to identify areas which have a strategic value, ie more in areas of future applications. A consultant has been engaged for this purpose (Dr Ahmad Tajuddin, per comm, October 16, 1992). As such, this research finding could also be another entry point for future technical cooperation.

8.37 Technical cooperation and assistance is welcomed in areas such as the development of Malaysia's Technology Park. Additionally, it has been mentioned earlier that the MOSTE would welcome technical cooperation and assistance in its other institutes, eg MIMOS and the Malaysian Remote Sensing Centre. Specifically for industry, special effort need to be made to impart technology to local SMIs.

8.38 Amongst areas which could be funded include: manpower and skills training. Malaysia has the necessary infrastructure, but lack the numbers of professionals and also in a few specialised areas, the shortage of skills is evident. Singapore has a good programme where young people are selected and sent for training in institutes which have been specially set up to produce more trained technicians.

8.39 Malaysia will continue to welcome foreign technical assistance which will help achieve the objectives of Vision 2020 of becoming a developed nation in the next century.

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