FINAL EVALUATION REPORT ON JOINT EVALUATION STUDY OF JAPANESE TECHNICAL COOPERATION PROJECTS IN MALAYSIA

FINAL EVALUATION REPORT

ON

JOINT EVALUATION STUDY

OF

JAPANESE TECHNICAL COOPERATION PROJECTS

IN

MALAYSIA

March 31st, 1993

prepared by

ECONOMIC PLANNING UNIT, PRIME MINISTER'S DEPARTMENT

and

JAPAN INTERNATIONAL COOPERATION AGENCY

OBJECTIVES AND CHARACTERISTICS OF THIS REPORT

The Economic Planning Unit (hereinafter referred to as "the EPU"), Prime Minister's Department in Malaysia and the Japan International Cooperation Agency (hereinafter referred to as "the JICA") agreed to conduct a joint evaluation study of the following three technical cooperation projects carried out in Malaysia in cooperation with Japan (hereinafter referred to as "the Study").

i) Metal Industry Technology Center Project
(hereinafter referred to as "the **MITEC project**")

ii) National Metrology Laboratory Project
(hereinafter referred to as "the **Metrology project**")

iii) ASEAN Project on Characterization of Fine Ceramics
(hereinafter referred to as "the **Fine Ceramics project**")

The objectives of the Study are:

i) To identify the achievements and problems of the target projects,

ii) To share common understanding of the results, and

iii) To feedback the results to the improvement of planning and implementing the future projects in Malaysia.

The Study covered not only the whole cycle of projects from screening, preliminary survey, to implementation, but also the ex-post situation of the project operation.

This repot, "Final Evaluation Report," was compiled by the Japanese Study Team (mentioned in "1.2 STUDY TEAM," page 1-2), based upon the "Presentation Report on joint Evaluation Study of Japanese Technical Cooperation Projects in Malaysia," prepared for the joint seminar which was held in Malaysia on January 19th, 1993 and discussions in the seminar. The Final Evaluation Report consists of three chapters, i)BACKGROUND, ii)INFORMATION FOR EVALUATION, and iii)OVERALL EVALUATION AND RECOMMENDATION;

i) The first chapter, **BACKGROUND**, explains how the joint evaluation study was executed, including the summary of the Projects.

ii) The second chapter, **INFORMATION FOR EVALUATION**, provides data regarding the verifiable indicators specified in Log Frames and the analyzed results of the questionnaire and interview survey together with reports and materials collected through the joint evaluation study.

iii) Based upon the fact findings in the second chapter, the last chapter, **OVERALL EVALUATION AND RECOMMENDATION**, evaluates the Projects from the view point of the improvement in planning and implementing the future projects in Malaysia.

The paragraphs marked by the hatched bars in the second and third chapters are taken from the "Draft Evaluation Report" produced by the Malaysian Study Team (mentioned in "1.2 STUDY TEAM," page 1-2).

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APPENDIX

1 BACKGROUND

1 BACKGROUND

1.1 METHODOLOGY

The methodology for the Joint Evaluation Study is to utilize a logical framework (log frame) approach. Details of the log frame approach are contained in JICA (1990) titled Preliminary Guidelines on Evaluation Methods and Procedures. The essence of the log frame is to evaluate a project through 4 stages: project inputs, outputs, purpose, and goal. At each stage, important assumptions of the project are made.

The followings are the key evaluation items for the project:

a. Efficiency

Efficiency of the project is concerned with the transformation of project inputs into outputs in terms of time, cost and use of other project resources.

b. Effectiveness

Effectiveness is to examine the degree to which the project is being realized, i.e. by comparing the original targets with the results actually achieved, and to analyze factors and conditions leading to the difference.

c. Impact

Impact of the project examines the developmental effects brought about by the project. Impacts -- positive, negative, expected or unexpected -- should be evaluated against the overall development within the country as a whole.

d. Relevance

Relevance is also known as project rationale and examines the relevance of the project at the time of project preparation up till implementation, in accordance with the change in project circumstances.

e. Sustainability

Sustainability is concerned with the likelihood to which the objectives of the project are continued after the project assistance is over.

In this particular Joint Evaluation Study, the means for conducting the evaluation is to conduct interviews and carry out a survey of various categories of people who were involved or have benefited from the three projects.

Four categories of respondents have been defined.They are:

a. Malaysian counterparts and staff (hereinafter referred to as "the **Counterparts**"), who worked or who are currently working for the Projects, principally from three units within SIRIM, i.e. the Measurement Center of the Standards Division, MIDEC/AMTC and Ceramics Technology Center from the Research & Technology Development Division

b. Malaysian officials (hereinafter referred to as "the **Officials**") who have been in supervising positions on the Projects, and includes the EPU, Ministry of Science, Technology and Environment (MOSTE), and also from SIRIM

c. Professional persons (hereinafter referred to as "the **Professionals**") who are specialists in the relevant fields and can provide an opinion on the industry

d. Beneficiaries of the Projects (hereinafter referred to as "the **Beneficiaries**"), such as companies enjoying the specific services offered by the three units in SIRIM

For this project, interviews were carried out with all categories of respondents. Additionally, survey questionnaires were sent out to other Beneficiaries and Professionals.

The JICA has also commissioned a related study in Japan on the experts who were attached to the Projects and also found out their opinions and their experiences.

1.2 STUDY TEAM

Each agency, EPU and JICA, hired a group of consultants and formed a study team in order to execute the Study. (hereinafter referred to as "the Study Team")

The Malaysian side comprise of the following members:

a. En. Mohamad b. Zainol Abidin
Director, External Assistance Section, EPU

b. En. K. Thillainadarajan
Principal Assistant Director (Bilateral),
External Assistance Section, EPU

c. Puan Harvinder Kaur
Principal Assistant Director
Industry Section, EPU

d. En. Mohd. Sani b. Mistam
Assistant Director (Bilateral)
External Assistance Section, EPU

e. Puan Siti Khamnah Hashim
Research Officer, Corporate Affairs Division,
Corporate Planning Unit, SIRIM

f. En. Ghazalie Abdullah
Assistant Director, Science & Technology Division
Ministry of Science, Technology and Environment

g. En. Chang Yli Tan
Managing Director, PE Research Sdn Bhd

h. Cik Chong Chiew Kieok
Consultant, PE Research Sdn Bhd

On the other hand, the members of the Japanese side are as follows:

a. Mr. Yoshio Koyama
Economic Development Specialist,
Institute for International Cooperation Agency, JICA

b. Dr. Yoshio Hara
Professor Emeritus, Tokyo Institute of Technology
Professor of Sociology, Toyo Eiwa Women's University

c. Mr. Yoshitaka Fujita
Staff, Evaluation and Post Project Monitoring Div.,
Planning Dept., JICA

d. Mr. Toshiya Maeda
Manager, Planning Div.,
Overseas Project Management Consultants, Ltd.

e. Mr. Kenji Hiramatsu
Partner, Management Consulting Div., TOHMATSU & Co.

Ms. Naomi Okada, Assistant Director, Foundation for Advanced Studies on International Development, tentatively joined this evaluation study as a specialist of evaluation methodology.

1.3 WORK PROCEDURE

The Study has been carried out, as shown on page 1-6.

The questionnaire and interview survey was conducted in Malaysia between September 26 and November 2nd, 1992.

Below is the specific work of the survey.

- September 26 -- October 2

Briefing at SIRIM regarding corporate plan and general activities in SIRIM. Discussion at EPU. Visits to the project sites. General discussion with the different units regarding the evaluation. Detailed meetings were also scheduled with each unit to discuss activities since project funding had been completed, indicators which could be used for evaluation, etc.

- October 5 -- 12

Detailed discussion among the Study Team on the log frame, designing the questionnaires, organizing survey logistics, finalizing on the indicators for the log frame, obtaining the mailing list for beneficiaries, counterparts, professionals, and Malaysian officials. Letters of introduction were drafted and sent out. Finalizing on the schedule for interviews with counterparts, printing out the mailing lists, monitoring schedule, etc.

- October 14 -- 17

Interviews with SIRIM counterparts from all three units, i.e. the Metrology Unit, MIDEC/AMTC, and Fine Ceramics. Sending out by courier the survey questionnaire to selected respondents and also through quick mail service.

- October 19 -- 24

Interviews conducted with beneficiaries and professionals, principally from the private sector. Interviews conducted with the Controller of SIRIM, the Director of Research & Technology Development Division.

- October 25

Review of questionnaires and reassessing the survey situation.

- October 26 -- 30

Meeting in EPU to report on the progress of the survey and study. Further

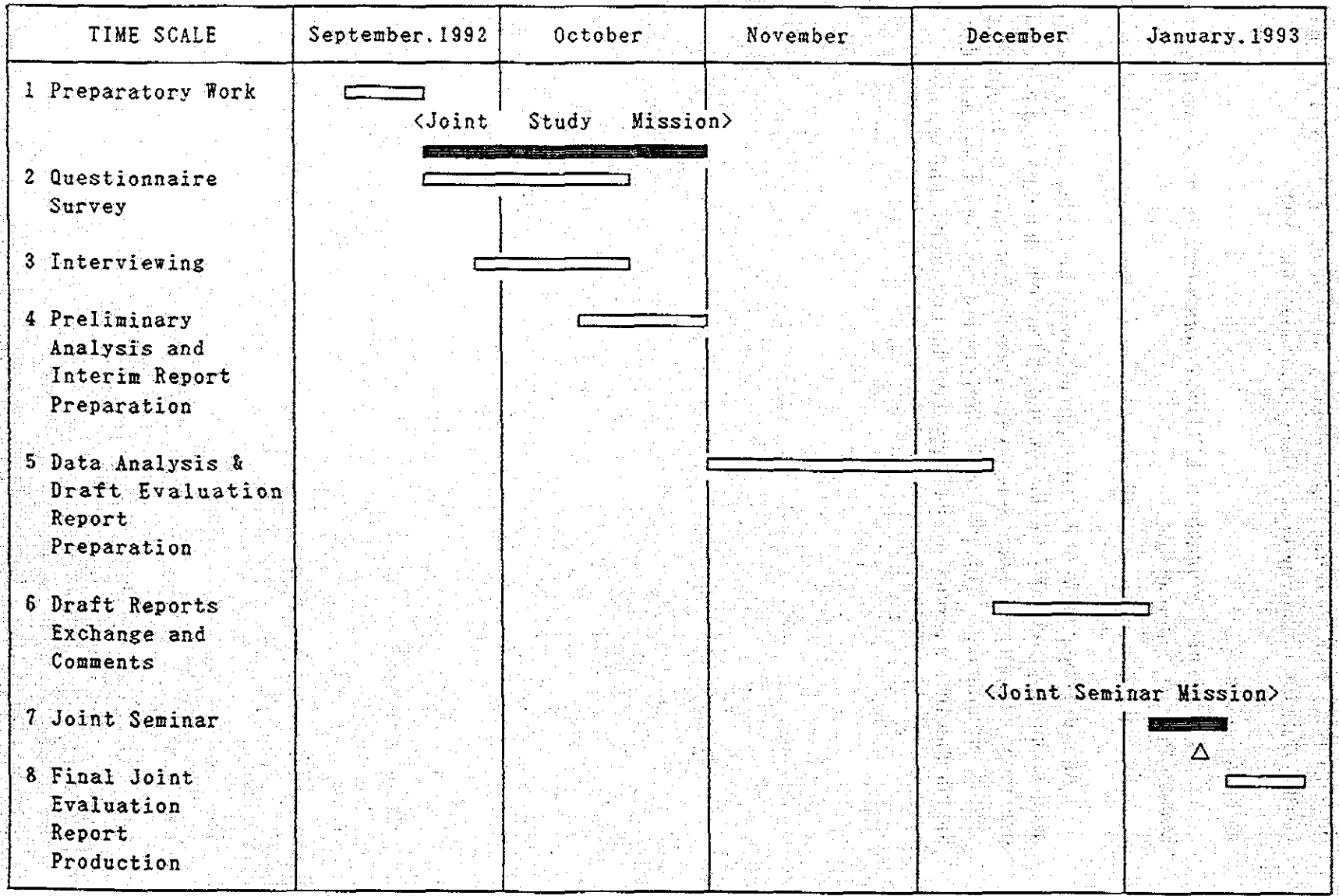
interviews with Malaysian officials from SIRIM, MOSTE, MITI, and other professionals. Preparing the Interim Report, and final discussion on the survey. Closing date for the survey to be extended to November 1992.

● November 2

Interim report presentation at EPU with representatives from both the Malaysian and Japanese sides.

After the completion of the survey in Malaysia, the Malaysian and Japanese sides separately and independently analyzed the collected data and prepared their own report, a draft joint evaluation report. Then the both sides exchanged the reports for comments. This joint evaluation presentation report was compiled for the seminar by the Japanese side, based on the both sides' draft reports.

Work Procedure



1.4 PROJECT SUMMARY

1.4.1 Metal Industry Technology Center (MITEC) Project

The MITEC Project was aimed at improving technology of small and medium scale metal industries in Malaysia in order to support the growth of them, and concerned with technology transfer with four main areas of technical assistance, that is; electroplating, presswork, welding and die-making.

Additionally, the supporting services by SIRIM to small and medium scale metal industries were also included in the Project: advisory visits to local industries, testing and inspection, prototype fabrication and trial production, technical consultancy and information services and training courses and seminars.

The Project was started in 1978 and Japanese assistance was completed in 1984. After that, the Project had undergone several changes within SIRIM. MIDEC (Metal Industry Development Center) was formed in 1986. It was an amalgamation of three units within SIRIM: the MITEC project; the MIRDC (Malaysian Industrial Research and Development Center) and the Design & Fabrication Unit (D&F). In that capacity MIDEC was to last for four years.

In 1990, there was another reorganization of MIDEC. It was split into four different units: MIDEC (same name), AMTC (Advanced Manufacturing Technology Center), General Workshop (general machining; no precision work) and Product Design Center (non-engineering industrial design). Hence, the original MITEC had been reorganized, and its resources had been redeployed into different units within the Research & Technology Development Division of SIRIM.

It should be noted that although the original MITEC project had been reorganized, its activities are still continuing within SIRIM, albeit in different form and context.

1.4.2 National Metrology Laboratory Project

The National Metrology Laboratory Project aimed at establishing calibration and measurement standards and high level calibration verification services in five parameters (i.e. mass, length, volume, electricity and temperature) in SIRIM, in order to improve calibration measurement technology in Malaysia.

This project was started in 1981 and assistance by the Japanese government ended in 1986.

As similar to the other projects the Japanese government provided machinery and equipment, paid for technical training of Malaysian counterparts in Japan and also sent short and long term experts to Malaysia to train Malaysian counterparts. The Malaysian government on its part built a new building for the Metrology Unit. The main functions of the project were to set up national metrology system, and for SIRIM to provide technical and training services to the rest of the industry.

1.4.3 ASEAN Project on the Characterization of Fine Ceramics

In 1983, the ex-Japanese Prime Minister Mr. Nakasone proposed the cooperation program 0l1 Materials Science and Technology between ASEAN countries and Japan. The objective of this program is to strengthen the basis and to contribute to the upgrading of the level of research on Material Science and Technology of ASEAN countries are rich in natural resources.

This Project is aimed at strengthening the technological basis for the characterization of fine ceramics within the ASEAN region, and has three sub-programs:

- ○ Research on the processing technique of oxides
- ○ Research on the processing technique and structural analysis of non-oxides
- ○ Research on glasses with rare-earth oxides

So, the research activities planned for the Project are:

- ○ To synthesize oxides, non-oxides and glass ceramics,
- ○ To identify and analyze the chemical, physical and structural properties of ceramics,
- ○ To measure their physical properties,
- ○ To master the usage of the experimental instruments, and
- ○ To analyze and interpret the obtained data.

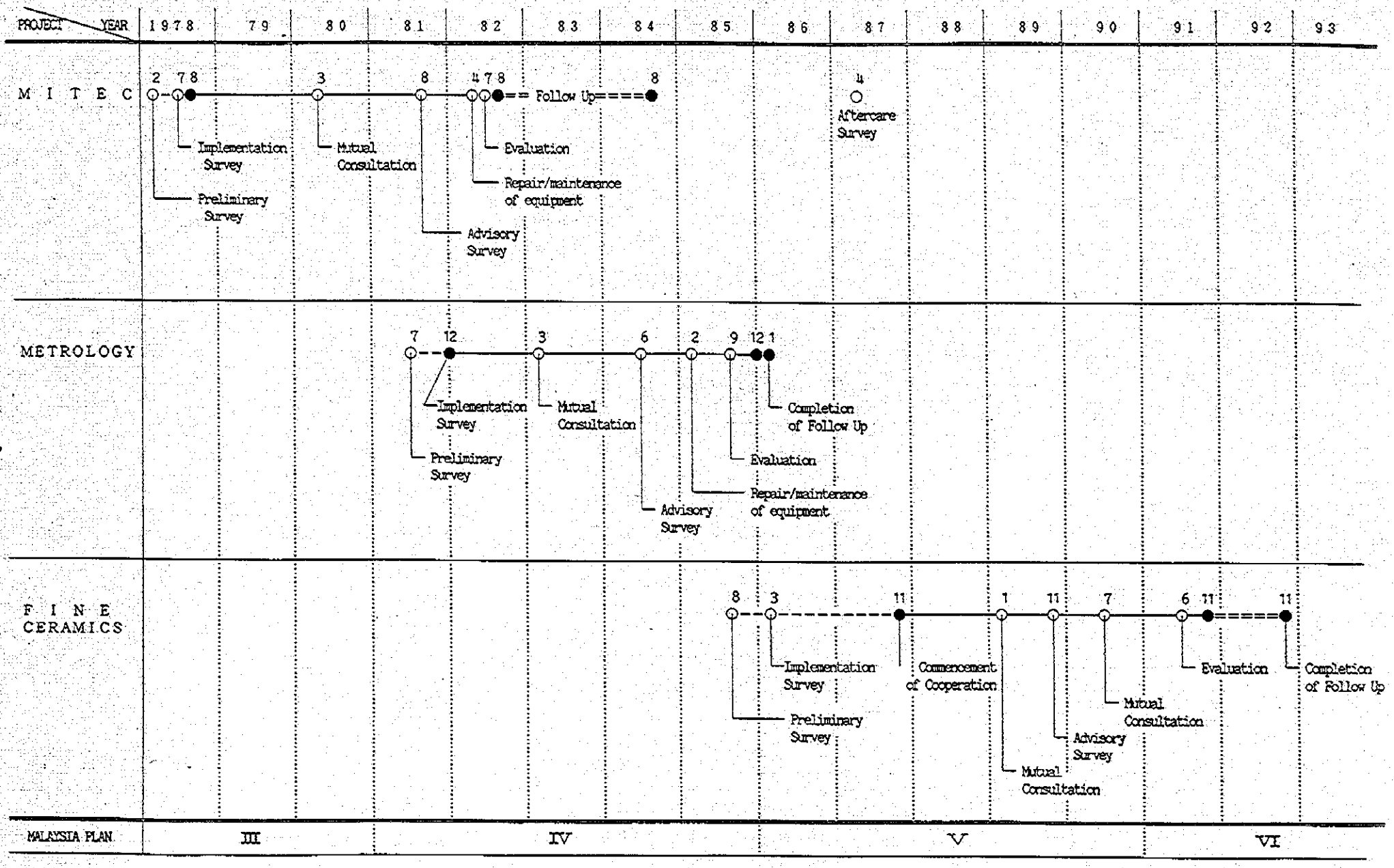
This Project has been absorbed into the research program on Advanced Ceramics in SIRIM's Ceramic Technology Center (CTC).

The nature of technical assistance is the same as that of the other two projects, i.e. the Japanese government providing machinery and equipment, scholarships to Malaysian counterparts and sending short and long term experts to Malaysia.

Being an ASEAN level project, researchers from other ASEAN countries also received training in Japan and several came to Malaysia for training -- i.e. trained by Malaysian (i.e. SIRIM) research personnel.

This project began in 1986, and is due to be completed in November, 1992 after a one-year extension was given for research on glass ceramics.

ACCOMPLISHMENT OF JAPANESE COOPERATION



2 INFORMATION FOR EVALUATION

2.1 LOGICAL FRAMEWORK

This section provides information from the logical framework on each project. Log frame consists of three principal areas, i.e. basic component of project (such as development goal, project purpose, output and input), indicators defining these components, and important assumption (external factors inhibiting/contributing to these components attainment). Although log frame should be designed in the initial planning of project and then resumed on occasion, the log frame of each project is made for the first time in this study, by summarizing information from the existing JICA reports on each project and discussing among the study team.

2.1.1 MITEC project

(1) Log Frame

1) Development Goal : **The growth of small and medium scale metal industries in Malaysia**

In the light of Malaysian economic development policy, it is necessary to promote supporting industries which play a major role in industrialization. In this context, the growth of small and medium scale metal industries are one of major supporting industry in Malaysia, is identified as the goal of the project.

2) Project purpose : **The improvement of technology used in small and medium scale metal industries in Malaysia**

To achieve the above goal, it is crucial to improve the quality of products and consequently strengthen their competitive ability in the market. Therefore, the project must be aimed at the improvement of technology in small and medium scale metal industries.

3) Output : **A. The services of MITEC to the beneficiaries**
B. Technology transfer to SIRIM staff

A. Various kinds of services such as itinerant guidance were to be rendered to small and medium scale metal industries, especially in the following areas.

a. electroplating
b. presswork
c. welding
d. die-making

B. In order for SIRIM's staff to be able to offer such services as above, technical training of the staff was needed.

4) Input : **A. Japanese side**
B. Malaysian side

To implement the above output, the followings were to be carried out and expected to match the needs of the Project;

A. by the Japanese Government
   a. Provision of equipment
   b. Receiving counterparts as trainees
   c. Dispatch of experts

B. by the Malaysian Government
   a. Budgeting
   b. Staffing
   c. Supply of building and facilities
   d. Provision of equipment

(2) Indicators

2.10 The contribution of Japanese Government are shown in Table 2A-1, 2A-2 and 2A-3. Table 2A-1 shows the contribution of Japanese Government during the Project period, which was amounted to approximately ¥ 564 million.

2.11 As shown in Table 2A-2, a total of 35 counterparts received training in Japan, 6 counterparts from die-making division, 5 counterparts each from electroplating and presswork divisions, 4 counterparts each from welding, test and inspection, and information divisions, and the remainder 2 counterparts from the administration.

2.12 Table 2A-3 shows that a total of 10 long-term and 27 short-term Japanese experts were despatched during the Project period. Among the long-term experts, 2 of them were Chief Advisors, 2 experts each for the welding, presswork and die-making divisions, and 1 expert each for the electroplating and information divisions.

2.13 During the Project period, Malaysian Government has contributed approximately $8.8 million to the Project. However, more fund were allocated by the Malaysian Government after completion of the Project. The amount has increased from $0.95 million in 1985 to $3 million in 1992. The details of these allocations are shown in Table 2A-4.

2.14 The continuous support from Malaysian Government is indicated by the number of personnel in MITEC/MIDEC as shown in Table 2A-5. The current number of research officers, assistant research officers and technicians/draftmen/ laboratory assistants in MIDEC and AMTC are shown in Table 2A-6.

2.15 Various types of services were provided by the Project. Some of these services offered during the Project period were advisory visits or consultancy services (Table 2A-7), tests and inspections (Table 2A-8), income generated from some of the services given (advisory/test & inspection/consultancy) are shown in Table 2A-9, fabrication services and trial productions (Table 2A-10), and training courses, workshops and seminars (Table 2A-11).

2.16 Table 2A-12 shows some of the services offered by MIDEC from 1986 to 1989 while the training activities (courses, workshops, seminars and lectures) carried out from 1981 to 1989. Other than that, industrial trainings and industry requested trainings were also conducted by MIDEC to the industry. More details of these training actvities are presented in Table 2A-13.

2.17 In the comparison of the percentage of workers in small, medium and large-size industries over 1974, 1979 and 1987 (Table 2A-14), the data showed that there was an increase in the medium-size industries from 1979 (28.4%) to 1984 (31.4%). The large-size industries only achieved 0.1% increase to 54.3% between 1979-87.

2.18 Other relevant indicators to gauge the achievement of project purpose would include the number of SMIs (especially in metal engineering industries) set up annually from before the project period (say 1975) till today. Other similar indicators could include their annual turnover or sales, the percentage of local content, the quality of products manufactured, their investments in automated equipment or high precision engineering machines.

2.19 Unfortunately such indicators are just not available from the standard published sources of industrial data. And it should be added that if such data were required then a special study may have to be designed to collect and compile such information.

2.20 Hence, if indicators had to be used to make a judgement over the success of implementation of the Project, then it is difficult to make a conclusive statement on the attainment of the Project's goal due to the shortage of empirical data.

Malaysia (pp 2-2～3)

1) Development goal

1-1 Sales amount of small and medium scale metal industries
1-2 No. of small and medium scale metal industries
1-3 Increase in local content in the procurement of MNCs
: Unfortunately, the above indicators are just not available from the standard published sources of industrial data. In order to obtain such data, an additional study may have to be designed to collect and compile such information.

2) Project purpose

1-1 Improvement in product quality
1-2 Increase in local content of Proton-Saga
1-3 Increase in number of engineers and technicians
: The above indicators to gauge the achievement of project purpose are also not available, same as above indicators for 1) Development Goal.

3) Output

1-1 Number of services
1-2 Number of training courses/seminars conducted and participants that attended
1-3 Number of publications and exhibitions
: The above indicators of service performance show that each project activity consistently expanded in each year of the project's implementation and that since then such growth has almost been sustained. (refer to Table 2A-7, 8, 9, 10, 11, 13, 15 in Appendix 1.1)

2-1 Increase in number of qualified technical staff in SIRIM
: The number of technical staff was increasing as planned during the implementation period and there were 38 staff at the time of the project's completion (1984). (refer to Table 2A-5' in Appendix 1.1)

2-2 Number of staff trained by counterparts in SIRIM
: This indicator is not available from the database of SIRIM.

4) Input

1. Japanese side
1-1 Number of experts dispatched
: About 10 long-term (6 in the original plan) and 27 short-term Japanese experts were dispatched to Malaysia under the project. (refer to Table 2A-3 in Appendix 1.1)

1-2 Number of counterparts trained in Japan
: 35 counterparts including 7 highly qualified and senior staff finished the training program in Japan. (Planning was done every fiscal year.) (refer to Table 2A-2 in Appendix 1.1)

1-3 Provision of machineries and equipment
: Machineries and equipment equivalent to approximately JPY 564,000,000 (FOB basis) in total were provided by the Japanese Government. (refer to Table 2A-1 in Appendix 1.1)

2. Malaysian side
2-1 Provision of machineries and equipment
: Equipment equivalent to approximately M$ 1,845,000 in total were provided by the Malaysian Government. (refer to Table 2A-16 in Appendix 1.1)

2-2 Building and facilities
: Repair and improvement work on the building and facilities was conducted by the Malaysian Government. The work finished in June 1981 with a delay of 1 year and 7 months. The amount expended in the work was approximately M$ 2,200,000.

2-3 Staffing

: Overall, the staff were deployed after 1980 as it had been planned. At the time of project completion, there were 52 personnel. (refer to Table 2A-5, 5' in Appendix 1.1) After the organizational change in MITEC such as divisional mergers and closings, MIDEC and AMTC (die-making div.) currently have 110 staff in total. (refer to Table 2A-5, 5', 6 in Appendix 1.1)

2-4 Budget

: The Malaysian Government budgeted and expended the aggregate amount of M$ 9,751,327 for the implementation of the project. Such budgetary considerations have been continuously taken by the Government. (refer to Table 2A-4 in Appendix 1.1)

(3) Important Assumption

2.8 The Project was implemented based on an important assumption that technological improvement in metal industries would stimulate the growth in SM metal indusries. Thus, the goal of the Project is to foster the growth of SM metal industries in Malaysia.

Malaysia (pp 2-2)

1) Development Goal :

Small and medium scale metal industries are still play an important role in the Malaysian industry.

--- It is multinational industries that have been taking a leading part in Malaysian industries. However, they have less relations with local industries, especially small and medium scale ones. Reinforcing such local supporting industries particularly small and medium scale metal industries was presumed to be a critical matter in Malaysia.

However, in fact in the late 1980s, a massive foreign investment with advanced production technologies led the quick change of technological levels of relating SMIs.

2) Project purpose :

A. The improvement of technology is still one of the major factors for the growth of small and medium scale metal industries in Malaysia.

--- Small and medium scale metal industries in Malaysia were expected to grow up, acquiring such a high technological skills that would have enabled them to subcontract with large or multinational industries for their products. However, in fact SMIs are expected to acquire more advanced technologies rapidly due to requirements from multinational industries.

B. MITEC (MIDEC/AMTC) is a major institution that contributes to the technological improvement of small and medium scale metal industries in Malaysia.

--- MITEC (MIDEC/AMTC) was expected to be a major institution which contribute to the technological improvement of small and medium scale metal industries in Malaysia. However, several organizations for training skills/technique (e.g. CIAST, GMI--German Malaysian Institute-- and PSTC--Penang Skill Technology Centre, etc.) are competitive with MITEC(MIDEC/AMTC) partially.

3) Output : **The Services of MITEC (MIDEC/AMTC) match the technological needs of beneficiaries.**

--- According to the project purpose, the technological level of MITEC was supposed to be at higher than that of small and medium scale industries so as to lead them and meet their demands.

MITEC, however, have already dropped behind small and medium scale metal industries, which are improving their technology faster than expected.

4) Input : **The input provided by both the Japanese side and the Malaysian side were assumed to match the need of the project.**

--- Well planned input could expect satisfactory output during the period from 1978 to 1984. Since completion of Japanese side technical cooperation, there have been two major organizational reform to catch up the industrial environmental changes.

LOG FRAME for METAL INDUSTRY TECHNOLOGY CENTRE PROJECT

NARRATIVE SUMMARY	INDICATORS	(ACCOMPLISHMENT)	IMPORTANT ASSUMPTION	(ACTUAL SITUATION)
DEVELOPMENT GOAL 1.The growth of small and medium scale metal industries in Malaysia	1. Sales amount of small and medium scale metal industries 2. Number of small and medium scale metal industries 3. Increase in local content in the procurement of MNCs	Not available from the standard published sources of industrial data	1. Small and medium scale metal industries are still play an important role in the Malaysian industry	1. A massive foreign investment with advanced production technologies led the quick changes of technological levels of relating SMIs.
PROJECT PURPOSE 1. The improvement of technology of small and medium scale metal industries in Malaysia	1. Improvement in product quality 2. Increase in local content of Proton-Saga 3. Increase in number of engineers and technicians	Not available from the standard published sources of industrial data	1. The improvement of technology is still one of the major factors for the growth of small and medium scale metal industries in Malaysia 2. MITEC (MIDEC/AMTC) is a major institution that contributes to the technological improvement of small and medium scale metal industries in Malaysia	1. SMIs are expected to acquire more advanced technologies rapidly due to requirements from MNCs with advanced technologies. 2. Several institutions for training skills/ techniques (e.g. CIAST, GMI and PSTC) are partially competitive with MITEC (MIDEC/AMTC)
OUTPUTS 1. The services of MITEC to the beneficiaries (1) Advisary visits (2) Test & Inspection services (3) Technical consultancy/Information services (4) Prototype fablications & Trial productions (5) Training courses & Seminars	1-1 Number of the services	1-1 Advisary/consultancy: 1981: 78, 1983: 167, 1988: 194 1-1 Test & Inspection: 1981: 45, 1983: 1266, 1988: ? 1-1 Prototype fablications & Trial productions: 1981: 3, 1983: 60, 1988: 181	1. Services of MITEC (MIDEC/AMTC) match the technological needs of beneficiaries	1. MITEC have already dropped behind small and medium scale metal industries, which are upgrading their technology levels faster than expected.
	1-2 Number of training courses / seminars conducted and participants attended	1-2 Training courses (participants): 1981: 1 (13), 1983: 12 (182), 1988: 24 (233)		
	1-3 Number of publications and exhibitions	1-3 Publications: 1981: 4, 1983: 16, 1988: ? Exhibitions: 1981: 1, 1983: 3, 1988: ?		
2. Technology transfer to SIRIM staff	2-1 Incerase in number of qualified technical staff in SIRIM	2-1 Technical staff in SIRIM: 1981: 35, 1983: 41, 1988: 126 (MIDEC)		
	2-2 Number of staff trained by counterparts in SIRIM	2-2 Not available from SIRIM's data		
INPUTS 1.Japanese Side	1-1 Number of experts dispatched	1-1 long-term :10 + short-term :27 = 37	1. Input provided by Japanese side match the needs of the Project	1. Input were almost sufficient as to match the needs of the between 1978-1984.
	1-2 Number of counterparts trained in Japan	1-2 35 in total		
	1-3 Provision of machineries and equipment	1-3 J¥ 564,000,000		
2.Malaysian Side	2-1 Provision of machineries and equipment	2-1 M$ 1,845,000	2. Input provided by Malaysian side match the needs of the Project	2. Input were almost sufficient as to match the needs of the between 1978-1984. Since completion of Japanese cooperation (1984), there have been continuous effort such as two major organizational reform to catch up the industrial environmental changes
	2-2 Building and facilities	2-2 Repair and improvement work (M$ 2,200,000) (finished with a delay of 1 year and 7 months)		
	2-3 Staffing	2-3 1979: 31, 1984: 52, 1992: 110		
	2-4 Budget	2-4 M$ 9,751,327 for implementation of the project		

2.1.2. Metrology Project

(1) Log Frame

1) Development Goal : **Improvement of Malaysian calibration and measurement technology**

The development goal of the project was determined as the improvement of techniques in metrology. Technology in metrology formed one of the grounds that could lead to industrialization in Malaysia.

2) Project purpose:
A. Establishment of calibration/measurement standards
B. Establishment of high level calibration/measurement services

To carry out the above goal, the following was necessary, so that specified as purposes of the project.
- Establishing the standard of calibration/measurement
- Offering calibration/measurement services of high quality

3) Output :
A. Establishment of calibration/verification system in SIRIM
B. Maintenance and control of calibration/measurement equipment
C. Offer calibration / verification services to government institutions and the private sector
D. Offer technical training/consultation to the Government institutions and the private sector

The above was presumed to be the accomplishment of the project in each of the following fields.
a. Mass
b. Length
c. Volume
d. Electricity
e. Temperature

4) Input : **A. Japanese side**
B. Malaysian side

To implement the above output, the followings were to be carried out and expected to match the needs of the Project;

A. by the Japanese Government
a. Provision of equipment
b. Dispatch of experts
c. Receiving counterparts as trainees

B. by the Malaysian Government
a. Supply of Building and facilities
b. Staffing
c. Budgeting

(2) Indicators

2.24 During the Project period (1981 - 1986), the Japanese Government has contributed in three forms, namely, equipment (amounted to Y303 million; Table 2B-1), training of Malaysian counterparts in Japan (12 staff; Table 2B-2), and despatch of Japanese experts to SIRIM (23 experts despatched; Table 2B-3). The Malaysian Government contributed two buildings, manpower (45 staff; Table 2B-4) and other facilities needed for the implementation of the Project.

2.25 After the completion of the Project, Malaysian Government continued to support the Metrology Centre for the calibration/measurement activities. Table 2B-5 shows the financial allocation by the Malaysian Government from 1988 to 1992 in development, operation and R & D categories. Table 2B-6 shows the growth of manpower of the Metrology Centre. Table 2B-7 presents the list of major equipment provided by the Malaysian Government after the completion of the Project. The allocations for the procurement of equipment from 1988 to 1992 were shown in Table 2B-8.

2.26 In the Project, 5 parameters were being emphasized. There are length, mass, volume, temperature and electricity. At present, 3 new parameters were added, that is, force, pressure and frequency.

2.27 During the Project period, the Project succeeded in establishing a calibration/measurement/verification system in SIRIM. After which, services were provided to industry. Table 2B-9 shows the accuracy achieved at the end of the Project period and in 1992.

2.28 At present, there are a total of 76 types of calibration facilities for 8 parameters are available in the Centre, that is, 8 facilities for Length, 7 facilities for Mass, 3 facilities for Volume, 9 facilities for Force, 5 facilities for Pressure, 7 facilities for Temperature, 34 facilities for Electricity and 3 facilities for Frequency. The range and accuracy of these facilties are shown in Table 2B-10.

2.29 Table 2B-11 presents the number of equipment calibrated by the Metrology Centre from 1988 to 1991. The income from the calibration services provided by the Centre from 1981 to 1991 were shown in Table 2B-12. As shown in Table 2B-12, before the Project period, the ratio of the calibration income to the Unit's operation expenditure was only 8.8% for 1980 and 15.5% for 1981. This ratio has increased tremendously during the Project period, from 31.8% in 1982 to 59.1% in 1986. The ratio dropped to 50.7% in 1987 and it was 55.4% in 1990. However, it should be noted that the current ratios are in order of magnitude higher than before the project period.

2.30 A total of 31 standards were achieved during the Project period (Table 2B-13). That is, 4 (Primary, Secondary, Tertiary and Working) standards for Mass, 4 standards (similar to that of mass) for Length, 1 standard for Industrial Engineering, 1 standard for Frequency and Acoustic, 10 standards for Electricity, 4 standards for Temperature and 7 standards for Volume. In 1992, 4 additional standards are achieved. That is, 2 standards in Electricity and 1 standard each in Temperature and Frequency & Acoustic.

2.31 During the Project period, the Metrology Centre did not conduct any training courses although it was originally one of the intended outputs for the Project. However, in 1988 to 1990, the Metrology Centre managed to conduct 1 training course per year for the three years consecutively in the "Flow" parameter to Petronas Berhad. In 1990, the Centre also provided consultancy job to establish the Electrical Calibration branch in Penang (Table 2B-14).

2.32 As for the improvement of measurement accuracy, the Metrology Centre also carried out intenational inter-comparison of standards achieved. After the completion of the Project, 10 intenational inter-comparison standards were achieved. Out of these, 3 standards are in the Mass (compare with New Zealand) and Electricity (compare with Japan) parameters, 2 standards for the Temperature (compare with U.K) parameter and 1 standard each for the Length and Radiation/Ionisation parameters (Table 2B-15).

2.33 In the process of improving the metrology in Malaysia, the Metrology Unit also put in their effort to accredit calibration laboratories. Again, this is a new activity initiated by the Unit after the completion of the Project. In 1991, only 1 calibration laboratory was accredited (in 3 parameters - Length, Pressure and Industrial Engineering). In 1992, 3 laboratories were accredited, 1 each in Pressure, Electricity and Temperature (Table 2B-16). Some of the field(s) of testing of laboratories accredited before 1992 are shown in Table 2B-17.

2.34 Thus, there has been a very significant improvement in most of the indicators used in this evaluation exercise. It is our preliminary conclusion that the Metrology Project has made a significant impact on the Malaysian metrology system.

1) Development goal

1-1 Improvement in product quality
: The indicator are not available from the standard published sources of industrial data, while from the results of the Questionnaire Survey, most of beneficiaries of the Project admitted that it had been improved.

1-2 Number of accredited laboratories
: 11 labs have already been accredited by SIRIM (refer to Table 2B-16 in Appendix 1.2), and the number is still increasing.

1-3 Number of international inter-comparison standards
: In total, nine international inter-comparison standards have been established since 1987. (refer to Table 2B-15 in Appendix 1.2)

2) Project purpose

1. Improvement in accuracy
: In comparison of accuracy in each field (targeted and non-targeted) between the present and the period of project implementation, the following was found out;

Length	no change
Temperature	no change
Mass	little improvement
Electricity	little improvement
Volume	unknown
Pressure	
(not targeted by the project)	improvement

(refer to Table 2B-9 in Appendix 1.2)

2. Number of parameters for calibration/measurement established
: In addition to the 5 fields targeted by the Project (i.e. Mass, Length, Volume, Electricity and Temperature), there existed 2 more fields such as Pressure and Frequency during the period of project implementation. Although force and Acoustic have been added so far since the project's completion, the number of parameters does not seem to be sufficient for the standards. (refer to Table 2B-9 in Appendix 1.2)

3) Output

1. Number of calibration/measurement standards established (legal/industrial) in SIRIM
: Approximately 31 in total:
4 for each of mass, length, temperature
7 for volume
10 for electricity
2 for others
From the project's completion (1986) to the present, the following four fields have been added:

2 for electricity
1 for temperature
1 for frequency of acoustic
(refer to Table 2B-13in Appendix 1.2)

2. Number of calibration/verification services provided
: In the year of the project's completion (1986), it was about 3.4 times as many as that of the first year of the project (1981). It is still increasing. (refer to Table 2B-11, 12 in Appendix 1.2)

3. Income in M$ from metrology services
: During the project's implementation (1981-86), it was constantly increasing and its percentage of operating costs went up from 15.5 % to 59.1% (about 4 times augmentation). Since then, it has been keeping at about 50% of operating expense. (refer to Table 2B-11, 12 in Appendix 1.2)

4. Number of trainings/consultations by SIRIM in metrology
: No output during the implementation of the project. During the period from 1988 to 1990, trainings and consultations were conducted once a year. (3 in total)

4) Input

1. Japanese side
1-1 Number of experts dispatched
: 5 long-term Japanese experts (4 experts in the original plan) and 20 short-term Japanese experts (20 in the original plan), therefore, 25 Japanese experts (17 in the original plan) were dispatched under the project in total. (refer to Table 2B-3' in Appendix 1.2)

1-2 Number of counterparts trained in Japan
: 12 persons in total (1 for mass, 1 for length, 3 for volume, 3 for temperature, 3 for electricity and 1 for others) (refer to Table 2B-2 in Appendix 1.2)

1-3 Provision of machineries and equipment
: refer to Table 2B-7 in Appendix 1.2

1-4 $ spent on equipment
: Approximately JPY 303,000,000 in total (refer to Table 2B-1 in Appendix 1.2)

2. Malaysian side
2-1 Building and facilities
: The construction of a new building was finished in Feb. in 1985. The cost of construction was about JPY 300,000,000. (In the original plan, the construction was supposed to be completed in 1983.) (refer to Table 2B-5'in Appendix 1.2)

2-2 Staffing
: About 2/3 of personnel that had been planned were deployed with little change in its number during 1982-1990. (refer to Table 2B-4, 6 in Appendix 1.2)

2-3 Budget

: Total budgeted amount during 1981-1985 was JPY 595,000,000. The budget allocated for Research and Development has been increasing in recent years. (refer to Table 2B-5, 5', 8 in Appendix 1.2)

(3) Important Assumption

2.22 The project was implemented based on the important assumptions that strong support would be provided by both Malaysian and Japanese Governments where the Japanese Government would provide the equipment and technical assistance needed for the implementation of the Project while the Malaysian Government would provide the facilities and manpower for the Project.

Malaysia (pp 2-13)

1) Development goal :

Continuous needs exist for calibration and measurement for industrialization.

--- Strong demand for calibration was forecasted because an improvement in metrology is essential to Malaysian industries. The forecast has now been proven right.

2) Project purpose :

A. No changes in the status of calibration/verification labs of SIRIM.

--- There would not be such a big change as to lower SIRIM's status as the authority on metrology even though some competitive institutions emerged. To date, no competitors have come out.

B. No change in SIRIM's metrology activities

--- There has not been any particular change in SIRIM's metrology activities.

C. The Malaysian Government still has a strong intention to improve the metrology standards and services in Malaysia.

--- The Malaysian Government was expected to keep up its motivation to improve the metrology standards and services. Its motivation is becoming stronger.

D. Exportation still being emphasized in Malaysian Policies

--- Export was encouraged in Malaysia under governmental policy. It was expected that the Malaysian Government would still maintain export-oriented policies. Still now, Malaysia aims to be an export-oriented and industrially advanced country.

E. There has been an expansion of calibration measurement services in Malaysia over the past few years.

--- Calibration/measurement services were expected to expand in Malaysia. The services have actually been expanding even in recent years.

3) Output :

A. The metrology Unit's activities still being emphasized by SIRIM.

--- It was assumed that SIRIM would continue to concentrate on metrology Unit' activities. SIRIM increasingly focuses on them.

B. Calibration functions are encouraged in Malaysia where more accredited institutions labs are established to carry out calibration activities.

--- It was presumed that increasing the number of accredited institutions/labs would raise the capacity for calibration in Malaysia. In fact, 11 labs have accredited by SIRIM, and the number is expected to increase.

C. Calibration and measurement requirements are pertinent for domestic production and exportation.

--- Requirements in calibration and measurement were supposed to be appropriate so as to apply to domestic and export products.

4) Input :

The input provided by both the Japanese side and the Malaysian side match the needs of the Project.

--- Well planned input could expect satisfactory output during the period from 1981 to 1986. Since the completion of Japanese side technical cooperation, SIRIM has continued various efforts to sustain the Project's output.

LOG FRAME for THE NATIONAL METROLOGY LABORATORY PROJECT

NARRATIVE SUMMARY	VERIFIABLE INDICATORS	(ACCOMPLISHMENT)	IMPORTANT ASSUMPTIONS	(ACTUAL SITUATION)
DEVELOPMENT GOAL 1. Improvement of Malaysian calibration and measurement technology	1. Improvement in product quality	1. Not available from the standard published sources of industrial data. From questionnaire results, most of beneficiaries admitted it improved.	1. Continuous needs exist for calibration and measurement for industrialization	1. The needs are continuously existing and more increasing.
	2. No. of accredited labs.	2. 11 labs (and still increasing)		
	3. No. of international inter-comparison standards	3. 9 in total since 1987		
PROJECT PURPOSE 1. Establishment of calibration/ measurement standards 2. Establishment of high level calibration/measurement services	1. Improvement in accuracy	(1986 to 1992) 1. length and temperatire —— no change mass and electricity —— improved volume —————— unknown pressure(non-targetted)—— improved	1. No change in the status of calibration / measurement/verification labs of SIRIM	1. No competitors come out.
	2. Number of parameters for calibration /measurement established	2. 4 fields of parameter were added: pressure and frequency (till 1986) force and acoustic (since 1987)	2. No change in SIRIM's metrology activities	2. No particular change
			3. Malaysian Gov't still has the strong intention to improve the metrology standards and services in Malaysia	3. The intention is becoming stronger.
			4. Exportations still being emphasized in Malaysian policies	4. Malaysia still aims to be an export-oriented and industrial advanced country.
			5. There is an expansion of calibration/ verification services in Malaysia over past year	5. The services have actually been expanding even in recent years.
OUTPUTS 1. Establishment of calibration/ verification system in SIRIM 2. Maintenance/control of calibration/ measurement equipment 3. Offer calibration/verification services to government institutions & private sectors 4. Offer technical training/ consultation to government institutions & private sectors	1. Number of measurement standards established (legal/indust.) in SIRIM	1. 31 standards (till 1986): mass 4, length 4, volume 7, electricity 10, temperature 4, others 2 4 standards (since 1987): electricity 2, temperature 1, others 1	1. The Metrology Unit's activities still being emphasized by SIRIM	1. SIRIM increasingly focuses Metrology Unit's activities.
	2. Number of calibration/verification services provided	2. 1981: 1,501; 1986: 5,127; 1990: 8,216	2. Calibration functions are encouraged in Malaysia where more accredited labs/ institutions are established to carry out calibration activities	2. 11 labs. have already accredited by SIRIM, and the number is expected to increase.
	3. Income in M$ from metrology services	3. 48 404 496 (M$1,000)	3. Calibration/measurement requirements are pertinent for domestic productions and exportations	3. The requirements have actually been expanding.
	4. Number of trainings/consultations by SIRIM in metrology	4. 1981-1987: none 1988-1990: onece a year (3 in total)		
INPUTS 1. Japanese Side	1-1 Number of experts dispatched	1-1 long-term: 5 + short-term: 25 = 30 (plan: 4 + 13 = 17)	1. The inputs provided by Japanese side match the needs of the Project	1. Input were almost sufficient as to match the needs between 1981-1986.
	1-2 Number of counterparts trained in Japan	1-2 12 in total (mass:1+ length:1 + volume:3 + electricity:3 + temperature:3+ 1)		
	1-3 Provision of machineries and equipment 1-4 $ spent on equipment	1-3) 1-4) J¥ 303,000,000	2. The inputs provided by Malaysian side match the needs of the Project	2. Input were almost sufficient as to match the needs between 1981-1986. Since completion of Japanese cooperation, SIRIM has continued various efforts to sustain output of the Project.
2. Malaysian Side	2-1 Building and facilities	2-1 New building (J¥ 300,000,000) (completed in 1985. 2 with a delay)		
	2-2 Staffing	2-2 1981: 28; 1986: 37; 1990: 36 (plan:45)		
	2-3 Budget	2-3 J¥ 595,000,000 (1981-1985)		

2.1.3 Fine Ceramics Project

(1) Log Frame

1) Development Goal :
The improvement of fine ceramics technology research in Malaysia and other ASEAN countries

This project was founded out as one of ASEAN-Japan technological cooperation projects in material science area. Its development goal was to advance technology research on fine ceramics not only in Malaysia but in other ASEAN countries.

2) Project Purpose :
A. Strengthening the technological basis for the characterization of fine ceramics in the ASEAN region through the establishment of a fine ceramics research centre in SIRIM
B. Strengthening and accelerating cooperation in the technological field of characterization of fine ceramics among ASEAN countries

Through the above goal formation, the purposes of the project were set: to build a base of research on fine ceramics with the technology center in SIRIM and promote technological collaboration among ASEAN countries.

3) Output : **A. Research activities**
B. Multilateral activities
C. Development of fine ceramics researchers

Output A was deductively determined from the above project purpose A. Output B was deductively determined from the above project purpose B. And output C was consequently determined through the activities of output A and B.

4) Input : **A. Japanese side**
B. Malaysian side

To implement the above output, the following were to be carried out and expected to match the needs of the Project;

A. by the Japanese Government
a. Dispatch of experts
b. Receiving counterparts as trainees
c. Provision of equipment

B. by the Malaysian Government
a. Building facilities
b. Staffing
c. Budgeting

(2) Indicators

2.39 During the Project period, a total of 27 experts were despatched by the Japanese Government to Malaysia. Out of these, 5 were long-term experts and 22 were short-term ones. Among the 5 long-term experts, one of them was the Project Coordinator, 2 were experts in glass ceramics, and 1 each for oxide and non-oxide ceramics. Among the 22 short-term experts despatched, 13 were involved with operation of equipment, and 3 each for oxide, non-oxide and glass ceramics. Table 2C-1 presents the breakdowns.

2.40 As shown in Table 2C-2, thirteen Malaysian counterparts were sent for training in Japan during the Project period. Among them, two were sent to receive training in the operation of equipment, two trainings were offered by the Singaporean Government in multilateral research and three each for oxide, non-oxide and glass ceramics. Table 2C-3 presents the list of participants receiving training in Japan, duration of their stay and the research activities they have participated.

2.41 In this Project, the Japanese Government has spent approximately M$7.57 million for the purchase of equipment, counterpart training, expenditure on experts despatched, multilateral activities with other ASEAN countries, and on consultative teams. The data on these expenditure are presented in Table 2C-4. Table 2C-5 presents the list of equipment contributed by the Japanese Government.

2.42 In this Project, the Malaysian Government contributed the manpower, floor space and facilities for the implementation of the Project. Table 2C-6 shows the expenditure borne by Malaysian Government, which amounted to M$242,000 during the Project period. The expenditure were spent on traveling and transportation, consumables and supplies, equipment and accesories, and professional services.

2.43 The number of technical staff engaged in the Project is shown in Table 2C-7. In this Project, two lecturers from local universities, that is, University of Malaya and University of Science Malaysia, were engaged in the research activities. Thirteen research officers and one technician were involved in the implementation of the Project.

2.44 In the operation of typical basic equipment in the three components, the Evaluation Report by Japanese experts noted that counterparts in every component showed certain degree of understanding in the procedure and common sense in the explanation given by Japanese counterparts on the equipment tested.

2.45 According to the Report, Malaysian counterparts did not seem to acquire full understanding of the technical skills and knowledge on the operation of those equipment. This conclusion was arrived by no further question being raised when explanation was given on the operation of the equipment.

2.46 In terms of the level of technical skills, knowledge and ethics on research work, the experts think that Malaysian counterparts are still far from ideal. Malaysian counterparts need to learn to identify and solve the problems, improve the operating procedure of the equipment and fully utilize the practical experience.

2.47 However, the experts also mentioned that it takes long time for one to acquire sufficient basic knowledge in the operation of these equipment. Malaysian counterparts were rated 90/100 in the skills of equipment operation and knowledge/understanding of the operation.

2.48 During the Project period, a total of 3 collaborative research were conducted, one each in the oxide, non-oxide and glass ceramics. ASEAN participants involved in these collaborative research were those from Thailand, Indonesia and Phillipines. The research duration of these activities are presented in Table 2C-8.

2.49 The collaborative research under oxide ceramics was to prepare and characterise the properties of Lanthanum modified Lead zirconate. The collaborative researcher was Dr. Laddawan Pdungsap from Mahidol University, Thailand.

2.50 The collaborative research under non-oxide ceramics was to sinter and characterise Silicon carbide ceramics. The collaborative researchers participated in the programme were Ms Chutima Tantigate from Thailand, and Ms Naniek Sulistarihani from Indonesia.

2.51 The collaborative research under glass ceramics was to prepare and characterise Rare-earth-doped Aluminosilicate glass. The research was carried out by Ms Juanita Banal Salvador from Phillipines.

2.52 Another activity of the Project that benefitted participants from other ASEAN countries was the training of junior researchers. Table 2C-9 presents the number and the nationality of junior researchers who participated in the training in instrumentation and characterisation of ceramics during the Project period. The instrumentation training was conducted from 19 November 1990 till 15 December 1990 while the characterisation of ceramics was carried out from 13 May 1991 till 11 June 1991.

2.53 The other Project activity that involved other ASEAN participants was the ASEAN-Japan Regional Seminar on Fine Ceramics which was conducted at Shangri-la Hotel, Kuala Lumpur. In this Seminar, twenty-five technical papers and three poster papers were presented. A total of sixty participants from ASEAN and Japan, including those from universities, research institution and private sectors attended the Seminar.

2.54 Malaysian researchers also participated in multilateral activities of other ASEAN countries. Table 2C-10 shows the list of researchers who have participated in the multilateral activities.

Malaysia (pp 2-35~37)

1) Development goal

1-1 Number of applied research projects in Malaysia and other ASEAN countries
1-2 Number of people engaged in fine ceramics research in Malaysia and other ASEAN countries
1-3 Allocation of funding for fine ceramics research by Malaysia and other ASEAN countries
: The above indicators are not available from the published sources, except those of SIRIM.

2) Project purpose

1-1 Establishment of other research fields
1-2 Development of research activities in the three components
2-1 Number of seminars carried out at ASEAN level after the Project period
2-2 Number of collaborative research at ASEAN level after the Project period
2-3 Number of trainings carried out by SIRIM to other ASEAN countries after the Project period
: The above indicators are not available from the published sources, except those of SIRIM.

3) Output

1. Research activities
1-1 Number of synthesis experimented with in the three components
1-2 List of experiments conducted (succeeded or failed) in the three components
1-3 New chemical, physical and structural properties of oxides, non-oxides and glass ceramics analyzed
1-4 List of measurements of physical properties for all successfully synthesized oxides, non-oxides and glass ceramics
; The above indicators are not available from SIRIM's database.

1-5 Supervisor's comment on the operational skill of equipment of SIRIM staff
: The evaluation report by Japanese experts noted that SIRIM's staff in every component showed certain degree of understanding in the procedure and common sense in the explanation given by Japanese experts on the equipment tested, so that they were rated 90/100 in the skills of equipment operation and knowledge/understanding of the operation, in the basic level. But the staff did not seem to acquire full understanding of the technical skills and knowledge on the operation of those equipment. And in terms of the level of technical skills, knowledge and ethics on research work, the staff are still far from ideal, and need to learn to identify and solve the problems, improve the operating procedure of the equipment and fully utilize the practical experience.

2. Multilateral activities
2-1 Number of collaborative research and the researchers from other ASEAN countries

: (refer to Table 2C-8 in Appendix 1.3)

1990	once	2 researchers
1991	once	2 researchers
1992	once	2 researchers
Total	3 times	6 researchers

2-2 Number of trainings and seminars conducted and participants attended

: (refer to Table 2C-8, 9 in Appendix 1.3)

Trainings	1990 once	Operation of equipment	5 persons
	1991 once	Analysis of ceramic powder	4 persons

: ASEAN-JAPAN Regional Seminar was held in October 1991 with 59 participants from Malaysia and 22 (7 from Japan and 15 from other ASEAN countries) participants from other countries. (81 participants in total) (refer to Table 2C-8, 9 in Appendix 1.3)

3. Number of trained researchers in the three components in SIRIM

: Total number of researchers including contract research officers and science research officers is gradually increasing. However, it is still insufficient to carry out research activities in each field. (refer to Table 2C-7, 7' in Appendix 1.3)

4) Input

1. Japanese side

1-1 Number of experts dispatched

: 6 Japanese experts for long-term dispatch and 24 for short-term dispatch were impartially posted in each field. (refer to Table 2C-1' in Appendix 1.3)

1-2 Number of counterparts trained in Japan

: About 16 persons in total (3 for oxide ceramics, 4 for non-oxide ceramics, 3 for glass ceramics and 6 for others) (refer to Table 2C-2A', 2B in Appendix 1.3)

1-3 List of equipment provided

: Equipment equivalent to approximately M$ 4,200,000 was provided by the Japanese Government. (refer to Table 2C-3B in Appendix 1.3)

1-4 Sponsorship for other ASEAN researchers in collaborative research

: The Japanese Government sponsored multilateral activities for about M$ 300,000 in total. (refer to Table 2C-3A in Appendix 1.3)

2. Malaysian side

2-1 Staffing

: Number of researchers in each component (as of Nov. 1991)

Oxide : 1 person
Non-oxide : 3 persons
Glass : 2 persons

(refer to Table 2C-7, 7' in Appendix 1.3)

2-2 Budget
: Expenditure : M$242,000 (from Jan. 1989 to 17th Nov. 1991)
(refer to Table 2C-6 in Appendix 1.3)

2-3 Building and facilities
: The construction of CTC (Ceramics Technology Center) was completed in May 1991.

(3) Important Assumption

2.37 The important assumption behind the implementation of the Project was that the results of fine ceramics research would be useful to the industry of Malaysia and other ASEAN countries. Thus, the goal of the Project was to improve fine ceramics technology research in Malaysia and other ASEAN countries.

Malaysia (pp 2-35)

1) Development Goal :
The results of fine ceramics research are useful to Malaysian industry as well as ASEAN countries.
--- To determine the development goal, the usefulness of research on fine ceramics in ASEAN countries was identified. This assumption is still held.

2) Project purpose :
A. No major changes in the technology level of fine ceramics research
B. No major changes in the needs of improving the technology level of fine ceramics research in Malaysia.
C. Sharing of the results and experience of research activities are being sustained.
--- No major changes both in the technology level of fine ceramics research and in the needs for the improvement of the technology were assumed. This assumption is still held.
The benefits from the research were presumed to be continuously shared over the project. Even now sharing the results of research work is being sustained and continued.

3) Output :
A. The results of the fine ceramics research would be useful to Malaysian industry.
--- The results of the project such as research activities were considered to be useful for the Malaysian industry as a whole. Although the results are not put to practical use yet, the potential for full use should be emphasized.

B. The results of the fine ceramics research would be useful to industry in other ASEAN countries.
--- Multilateral activities during the project implementation were found to be effective and worthwhile for other ASEAN countries.
This assumption is still held, as well as the above A.

C. No difficulty in the recruitment of fine ceramics researchers.

--- Despite the above assumption, it has been rather difficult to recruit researchers in the fine ceramics field since the beginning of the project.

4) Input : Input provided by both the Japanese Government and the Malaysian Government were expected to meet the needs of the project.

--- Well planned input could expect satisfactory output.

LOG FRAME for ASEAN PROJECT ON CHARACTERIZATION OF FINE CERAMICS

NARRAITIVE SUMMARY	INDICATORS	(ACCOMPLISHMENT)	IMPORTANT ASSUMPTIONS	(ACUTUAL SITUATION)
DEVELOPMENT GOAL 1. The improvement of fine ceramics technology research in Malaysia and other ASEAN countries	1. Number of applied research projects in Malaysia and other ASEAN countries 2. Number of people engaged in fine ceramics research in Malaysia and other ASEAN countries 3. Allocation of fundings for fine ceramics research by ASEAN countries each year	1. 2. 3. } Not available from published sources	1. The results of fine ceramics research would be useful to the industry of Malaysia as well as other ASEAN countries	1. The results are expected to be useful in the future. However, it takes a long time to put to practical use.
PROJECT PURPOSE 1. Strengthening the technological basis for the characterisation of fine ceramics in the ASEAN region through the advanced ceramics research programme of the Ceramics Technology Centre 2. Strengthening and accelerating the cooperation in the technological field of characterisation of fine ceramics among ASEAN countries.	1-1 Establishment of other research fields 1-2 Development of research activities in the three components 2-1 Number of seminars at ASEAN level 2-2 Number of collaborative research at ASEAN level 2-3 Number of trainings at ASEAN level	1-1 1-2 } Not available from published sources (except SIRIM's data) 2-1 2-2 2-3	1. No major changes in the technology level of fine ceramics research 2. No major changes in the needs of improving the technology level of fine ceramics research in Malaysia 3. Sharing of the results and experience of research activities would be sustained.	1. 2. } The technology level remains in basic level, so that upgrading of the level is continuously needed. 3. Sharing of the results and experience of research activities has been sustained.
OUTPUTS 1. Research activities (1)Synthesis of oxides, non-oxides and glass-ceramics (2)Identification and Analysis of the chemical, physical and structural properties of the 3 components (3)Measurement of physical properties (4)Analysis and Interpretation of data collected (5)Mastering the operation of research equipment	1-1 Number of synthesis experimented in the three components 1-2 List of experiments conducted (succeeded or failed) in the three components 1-3 New chemical, physical and structural properties of oxides, non-oxides and glass ceramics identified 1-4 New chemical, physical and structural properties of oxides, non-oxides and glass ceramics analysed 1-5 List of measurements of physical properties for all successfully synthesized oxides, non-oxides and glass ceramics 1-6 Supervisor's comment on operational skills of equipment of SIRIM staff	1-1 1-2 1-3 1-4 1-5 } Not available from SIRIM's database 1-6 From the evaluation report by Japanese experts, they were rated 90/100 in basic level.	1. The results of fine ceramics research would be useful to Malaysia's industry.	1. The results are expected to be useful in the future. However, it takes a long time to put to practical use.
2. Multilateral activities (1)Collaborative research (2)Regional trainings/seminars	2-1 Number of collaborative research and researchers from other ASEAN countries 2-2 Number of trainings/seminars conducted and participants attended	1990 1991 1992 2-1 Research 1 1 1 (researcers) (2) (2) (2) 2-2 Trainings 1 1 – (participants) (5) (4) (-) Seminars – – 1 (participants) (-) (-) (81)	2. The results of fine ceramics research would be useful to the industry of other ASEAN countries.	2.
3. Development of fine ceramics researchers	3. Number of researchers	3. 1989 1989 1990 1991 6 7 6 6	3. No difficulty in the recruitment of fine ceramics researchers	3. It has been difficult to recruit researchers since beginning of the Project.
INPUTS 1. Japanese Side	1-1 Number of experts dispatched 1-2 Number of counterparts trained in Japan 1-3 Provision of machineries and equipment 1-4 Expenditure for multilateral activities	1-1 long-term:6 + short-term:24 = 30 1-2 16 in total (oxides:3 + non-oxides:4 + glass:3 + others:6 1-3 M$ 4,248,000. 1-4 M$ 2,321,000.	1. The inputs provided by Japanese side match the needs of the Project	1. Input were almost sufficient as to match the needs of the Project
2. Malaysian side	2-1 Staffing 2-2 Budget 2-3 Building and facilities	1988 1989 1990 1991 2-1 6 7 10 11 2-2 M$ 234,000. 2-3 Ceramics Technology Centre ('91.5)	2. The inputs provided by Malaysian side match the needs of the Project	2.

2.2 QUESTIONNAIRE/INTERVIEW SURVEY

2.2.1 Survey Implementation

In this study, a total of eight different sets of questionnaires prepared for each of the three projects -- for counterparts, beneficiaries, professionals concerned with each sector and Japanese experts assigned to each project, were sent/delivered to participants and then analyzed after collection. As well as this, some interviews were conducted with SIRIM's top officials, officials from MSTE, MITI, etc, and also with professionals.

The following "Chart 1" shows the number of questionnaires sent out as against those received and the number of interviews conducted.

<Chart 1>

QUESTIONNAIRES

	MITEC	METROLOGY	FINE/CERAMICS	TOTAL
COUNTERPART	22	18	7	47
*(Head/S.R.O.)	(4)	(4)	(1)	(9)
(R.O.)	(4)	(5)	(4)	(13)
(A.R.O.)	(4)	(9)	(2)	(15)
(Technician)	(7)	(0)	(0)	(7)
(others)	(3)	(0)	(0)	(3)
BENEFICIARY	7	25	0	32
[sent out]	[21]	[88]	[11]	[109]
PROFESSIONAL	1	5	1	7
[sent out]	[5]	[5]	[5]	[15]
JAPANESE EXPERT	5	3	6	14
TOTAL	35	51	14	100

INTERVIEWS

OFFICIAL (SIRIM)				4
(others)				3
PROFESSIONAL	1	0	1	2
JAPANESE EXPERT	2	2	2	6
TOTAL				15

* S.R.O.:Senior Research Officer
R.O. :Research Officer
A.R.O.:Assistant Research Officer

4.1 This chapter discusses the views of Malaysian Officials and Professionals who were interviewed for this study. The full list of persons interviewed (using the free format style) are as follows:-

EPU: En K. Thillainadarajan, Principal Asst. Director
Puan Harvinder Kaur, Principal Asst. Director

SIRIM: Dr Ahmad Tajuddin Ali, Controller
Dr K S Ong, Director of Industrial Research
Mr Lam Teng Fatt, Director of Standards
Dr Hamzah Kassim, Director of Corporate Affairs

MOSTE: Dr Mohinder Singh, Director of Science & Technology
En Zainuddin
En Ghazalie Abdullah, Assistant Director

MITI: Dr. Abdullah Tahir, Director

FMM: Dato' Soong Siew Hoong, MISIF President
Dato Mustafa Mansur, Ceramics Industry Association

UTM: Dr. Mohamed Amin Alias, Associate Professor

4.2 It should also be added that several Professionals were also interviewed, but these were done through the survey questionnaire which have partly been discussed in Chapter 3. However, it should be added that as many of the relevant views expressed by both Professionals and Officials have been recorded either in this or the previous chapter.

4.3 The views and opinions of various professionals and officials were sought as part of the evaluation process. It should be borne in mind that the interview process and even formats are different between the structured survey (Chapter 3), and the free format questions and answers for some Professionals and Malaysian Officials.

4.4 It should be borne in mind that there were very few Professionals and Malaysian Officials interviewed, and the opinions expressed here are merely culled from the interviews. As such, these should not be regarded as views from industry or officials, but rather as information for feedback on the projects or the role of SIRIM, etc.

4.5 Reporting of the views and opinions and Professionals and Officials are separated. The format is to discuss the three projects, and then more generally SIRIM's role and other related matters with industrialisation, SMIs, etc.

2.2.2 MITEC Project Results

3.4 In general, most Counterparts think that MITEC has succeeded in enhancing the technological capability of local SMIs in Malaysia in 1984. However, most Beneficiaries did not want to comment on MITEC's success in this area; perhaps this could be due to their limited knowledge of the Project.

i. MITEC: Efficiency of Project Inputs

3.5 No problem was encountered with Japanese inputs in the MITEC project. All inputs were provided according to schedule and amounts indicated. Japan provided technical assistance worth approximately Y564 million or about MR$5.64 million (ie based on MR$1 = 100Y).

3.6 No problems were encountered on the Malaysian side in complementary inputs. During project period, Malaysian government contributed approximately MR$8.8 million over the project period. As such, the Malaysian inputs are fairly substantial.

3.7 The Malaysian Counterparts (ie SIRIM staff) feel that there were enough project inputs during the project period, with two main concerns: more training in Japan could have been provided and communication problems were encountered between Japanese experts and Malaysian Counterparts due mainly to language skills of both may have prevented a more beneficial transfer of technology. However, it remains to be seen if Japanese experts who participated in the MITEC Project agree with this kind of assessment.

3.8 Overall concensus that project outputs were satisfactorily achieved and that generally the Project had succeeded in its outputs. 90% of all Counterparts said that there were enough Project inputs (Table 3A-1).

ii. MITEC: Effectiveness of Implementation

3.9 Malaysian Counterparts feel that the achievements of the MITEC project was high at the end of the project period in 1984 (Table 3A-2). Additionally, technology transfer was also high (Table 3A-3). Similarly too, the attainment of technological improvement in 1984 was fairly high (mean score of 3.9 overall out of 5). The highest score was for electroplating (4.14) and lowest was for presswork (2.43).

3.10 However, MITEC's effectiveness is low today. In general, all ratings were lower for today than for 1984 (Table 3A-4). 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.

3.11 However, there was one dissenting opinion among the Counterparts. This person felt that "outsiders" (meaning beneficiaries) were ignorant of MITEC's or SIRIM's services to local SMIs, and that the MITEC can be considered successful.

3.12 Beneficiaries who were interviewed were selected from a list which came from SIRIM. Presumably they have been enjoying SIRIM's services and facilities. Those interviewed say that they have benefitted from MIDEC's services, and have found them to be useful. However, the usefulness to local SMIs were rated slightly lower (Table 3A-5). Some expressed the need for SIRIM to upgrade its facilities; they note that the equipment, especially electroplating have not been changed since the MITEC project.

3.13 Tables 3A-6 and 3A-7 show the number of Beneficiaries who have been in contact with SIRIM through using services and had staff trained by SIRIM. It should be emphasized that these numbers are obtained from the survey and does not indicate the actual numbers of services or training conducted by SIRIM or MITEC/MIDEC.

iii. MITEC: Impact on Industry

3.14 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. They rated its impact as slightly above average (Table 3A-8).

3.15 One of the unexpected outcomes was the reorganisation 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.

3.16 For the few beneficiaries who provided answers as to how much they used SIRIM's services in this sector compared to their overall spending on metal engineering, the ratio was 72%-80%. This indicates that those who answered (only 6 respondents) may have been dependent on SIRIM's for this service (Table 3A-9).

3.17 Then again, one beneficiary felt that as far as electroplating is concerned, the impact was minimal.

iv. MITEC: Relevance of Project

3.18 All Counterparts, Officials and Professionals interviewed say that the goals and purpose of the MITEC project are still relevant and valid, ie the improvement of technology for and the growth of the SMIs in Malaysia, especially those in the metal engineering sector.

3.19 A very high percentage of the Counterparts, beneficiaries and professionals say that services offered by SIRIM are still relevant to the current technical needs of local SMIs. About 50% of all Counterparts and beneficiaries felt that changes to the Project Design are necessary. All professionals felt that the Project design should be changed (Table 3A-10).

3.20 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.

3.21 Very few of the Beneficiaries indicated that they utilised the technological services of other institutes either within or outside of Malaysia (Table 3A-11).

3.22 Beneficiaries say that MIDEC's services need to be changed if they are to suit industry's requirements. Upgrading is important especially in areas such as electroplating, presswork and welding. The main phenomena seems to be that the external factor has contributed much more to the technological improvement of SMIs than SIRIM's services in this regard.

v. MITEC: Sustainability since Project completion

3.23 Overall, the performance of MIDEC in meeting the technological needs of local SMIs was rated at only about average (Table 3A-12). However, the ratings were not consistent in the sense that higher overall ratings were given but individual ratings were not even quite so high. Overall, Professionals gave MIDEC ratings the lowest scores compared to Beneficiaries and Counterparts.

3.24 SIRIM's Counterparts gave an above average rating for the adequacy of resources provided for MIDEC's activities. Between the different sectors, presswork had the lowest rating (2.00-2.57) while test and checking obtained the highest (ie rating of 3.29-3.50).

Malaysia (pp 3-1~4)

(1) Electroplating

The following are based on the results from questionnaires responded to by 5 counterparts currently assigned to Electroplating and 3 beneficiaries currently using SIRIM's electroplating.

1) Efficiency

With regard to Project Input, all responded that training in Japan, budgeting, personnel and facilities were sufficient and most (80%) felt Japanese equipment and technology transfer were also sufficient.

The Project's achievement in providing services to MITEC beneficiaries during the period from 1978 to 1984 was highly rated (between 4.0 and 4.4), as was technology transfer in 1984 (4.4).

All counterparts felt Project Output (i.e. services and technology transfer) justified Input by both the Japanese and Malaysian governments during the period from 1978 to 1984.

2) Effectiveness

The level of attainment of technological improvement of the SMIs in Malaysia as a result of the Project in 1984 and again, today, were highly rated by counterparts (4.2 and 4.0, respectively).

Counterparts rated the support given by SIRIM's activities toward the technological requirements of local SMIs in Malaysia as above average (3.8).

Beneficiaries assessed the usefulness of SIRIM's services to themselves as average (3.0).

3) Impact

All counterparts felt the Project had contributed to the growth and technological improvement of local SMIs in Malaysia since 1984, and it had played a critical role for them (4.0).

All beneficiaries responded that SIRIM contributed to their growth. However, its importance was rated over wide range (2.0 - 4.0). Besides these assessments, they also answered that there was no increase in product quality after using the services of SIRIM.

Regarding the unexpected outcome of the Project, respondents commented that they could enhance the awareness of quality control and the work ethic through training in Japan.

4) Relevance

All counterparts admit that the Project's purpose and development goal (i.e. the technological improvement and growth of local SMIs in Malaysia) are still valid and the services to beneficiaries are relevant and helpful given the current needs of local SMIs in Malaysia.

40% of counterparts answered that there have been major changes in the development of local SMIs in Malaysia to warrant

a change in the Project design, and the one of the changes is SMIs' move toward higher technology (e.g. fully automated systems). However, only 50% of the counterparts felt SIRIM had adapted to these new needs.

Two of the beneficiaries (66.7%) responded that SIRIM's services are still relevant to their current needs. One beneficiary commented that although his company required technological upgrading to further development, SIRIM had never sought to meet this need, and he was forced to use the technological services of other organizations in Malaysia.

5) Sustainability

Counterparts assessed the performance of MIDEC/AMTC in meeting the technological needs of local SMIs in Malaysia to be above average (3.6), however, all beneficiaries rated it average (3.0).

Counterparts rated MIDEC/AMTC resources (i.e. equipment, human resources, funding and facilities) as above average (3.0-3.7).

(2) Presswork

The following results are based on information from questionnaires responded to by 4 counterparts assigned to Presswork, 2 Japanese experts belonging to Presswork and one beneficiary using SIRIM's Presswork.

1) General

Three of counterparts (75%) and the Japanese experts assigned to Presswork felt the Project had succeeded in enhancing the technological capability of local SMIs in Malaysia in 1984.

2) Efficiency

With regard to Project Input, three counterparts (75%) evaluated the equipment and training in Japan as insufficient due to a shortage of equipment, obsolete technology, and insufficient training, while most of the Malaysian Input (i.e. budget/funding, human resources and facility) were rated as sufficient.

One Japanese expert commented that the period of training in Japan and amount of technology transfer were too limited.

Counterparts assessed the Project's success in providing MITEC services toward beneficiaries, advisory visits, test and inspections, and technical consulting during the period from 1978 to 1984 as below average (2.3 to 2.8), rating it slightly lower than the Japanese experts (3.3).

Three of the counterparts (75%) and the Japanese experts felt the Project Output (i.e. services and technology transfer) justified Input by the Japanese and Malaysian governments during the period from 1978 to 1984.

3) Effectiveness

The level of technological improvement attained by SMIs in Malaysia in 1984 and again, today, due to the Project were assessed as moderate (3.3 and 3.0, respectively) by counterparts, with the former rated slightly lower (2.5) by Japanese experts.

Counterparts rated the support of MIDEC/AMTC activities toward technological requirements of local SMIs in Malaysia as above average (3.5).

Beneficiary highly assessed the usefulness of SIRIM's services (4.0).

4) Impact

All counterparts noted that the Project had contributed to the growth and technological improvement of local SMIs in Malaysia since 1984, although this had not been so important for them (3.0 and 2.8, respectively). The Japanese experts rated the importance of the Program to higher (4.0 and 4.0, respectively). Beneficiary highly evaluated SIRIM's contribution to their growth and its importance (4.0), but also noted that there was no increase in quality of product following the use of SIRIM's services.

Among unexpected outcomes, counterparts commented that there had been no effort to maintain and improve the Project after Japanese experts departed.

5) Relevance

All counterparts responded that the Project's purpose and development goal (i.e. the technological improvement and growth of local SMIs in Malaysia) were still valid, and 75% of them answered that the services to beneficiaries were relevant to the current needs of local SMIs in Malaysia.

Three counterparts (75%) and beneficiary answered that changes in the development of local SMIs in Malaysia had been significant enough to warrant a change in the Project's design and services toward SIRIM. For example, it was suggested that the share of local content and the number of components manufactured locally by SMIs be increased. Counterparts also pointed out the need to upgrade the technology of local SMIs in Malaysia.

However, SIRIM's adaptation to the changes was recognized by only two of counterparts (50%) and its level was rated only moderate (3.5). The beneficiary who responded to the questionnaire have been using the technological services of other organizations in Malaysia.

6) Sustainability

Counterparts assessed MIDEC/AMTC's performance as above average (3.3) in meeting the technological needs of local SMIs in Malaysia.

The beneficiary answered that the services of MIDEC/AMTC are still relevant to current technical needs and assessed them as average (3.0).

As for MIDEC/AMTC resources, counterparts rated equipment as 1.5, human resources as 2.5, and facilities as 2.0 and noted that they needed to be improved immediately.

(3) Welding

The following results are based on the information from questionnaires responded to by 2 counterparts assigned to Welding, and 1 Japanese expert at Welding and 2 beneficiaries who are currently using Welding in SIRIM.

1) General

All counterparts and Japanese expert assigned to Welding assessed the Project a success in enhancing the technological capability of local SMIs in Malaysia in 1984, although limited to the basic ones.

2) Efficiency

With regard to the Project Input, all counterparts felt equipment from Japan and budgets, human resources, and facilities provided by the Malaysian government were sufficient. However one counterpart (50%) responded that training in Japan and technology transfer from Japan were not satisfactory.

Japanese expert evaluated the Project Input from Japan and Malaysia sufficient.

The Project's success in providing MITEC services to beneficiaries, testing & inspection services and training courses & seminars from 1978 to 1984, were rated as below average (2.5 and 2.5, respectively) by counterparts, while the former was rated as poor (2.0) by Japanese expert.

All counterparts and Japanese expert responded that the Project Output (i.e. services and technology transfer) justified the Input by the Japanese and Malaysian governments during the period from 1978 to 1984.

3) Effectiveness

The level of technological improvement attained by the SMIs in Malaysia due to the Project in 1984 as compared to today were assessed by counterparts as moderate (3.0 and 3.0, respectively), while the former was rated more positively by Japanese expert (4.0).

Counterparts rated the support of MIDEC/AMTC activities toward the technological requirements of local SMIs in Malaysia as average (3.0), and insisted that SIRIM's technological capabilities be improved.

Beneficiaries assessed SIRIM's services as useful (3.0 - 5.0).

4) Impact

All counterparts felt the Project has contributed toward the growth and technological improvement of local SMIs in Malaysia since 1984, although it had not been so important for them (3.0 and 3.0, respectively). All beneficiaries felt SIRIM had been a contribution to them although one rated the contribution poorly while another rated it highly (2.0 and 4.0, respectively). They responded there was no increase in product quality following the use of SIRIM services.

All counterparts felt there had been negative impacts. For example, one counterpart responded that the low cost of the services had pampered SMIs by increasing their expectations and distorting the value of technology.

5) Relevance

All counterparts responded that the Project's purpose and development goal (i.e. technological improvement and growth of local SMIs in Malaysia) was still valid, and that services to beneficiaries are relevant to the current needs of local SMIs in Malaysia.

One of the counterparts (50%) and one of the beneficiaries (50%) responded that changes in the development of local SMIs in Malaysia were significant enough to warrant a change in the Project design and SIRIM services, and pointed out the need to upgrade activities in terms of technology and experiences in SIRIM.

Although SIRIM's adaptation to these changes was recognized by all counterparts, the level of adaptation was rated below average (2.5). One of the beneficiaries responded that SIRIM hasn't managed to address these changes. Another beneficiary (50%) reported that he had used the technological services of other organization outside of Malaysia.

6) Sustainability

Counterparts assessed MIDEC/AMTC's performance in meeting the technological needs of local SMIs in Malaysia as average (3.0). Beneficiaries responded that SIRIM services are still relevant to existing technical needs and gave it an average rating (3.0).

With regard to MIDEC/AMTC resources, counterparts rated equipment as fair (3.5) due to replacements to new models while human resources were rated below average (2.5) due to difficulties in recruiting.

The counterparts commented that they needed to continue increasing their level of technology and to move into more advanced areas in order to cope with the current needs of industries, and that therefore the Project needed to be continued. One of the counterparts wanted to have their technical expertise transferred to other third world countries who did not require high levels of technology.

(4) Die-making

The following results are based on the information from questionnaires responded to by 5 counterparts who were assigned to Die-making, 2 Japanese die-making experts, and one beneficiary currently using Die-making in SIRIM.

1) General

All counterparts and one Japanese expert assigned to Die-making assessed the Project a success in enhancing the technological capability of local SMIs in Malaysia in 1984, limited to basic ones.

2) Efficiency

With regard to the Project Input, three of the counterparts (60%) evaluated the training in Japan as insufficient, and two (40%) of them noted human resources were insufficient.

One of the Japanese experts (50%) evaluated the training in Japan as insufficient and attributed the counterpart's lack of knowledge and experience to the fact that they were being lectured to rather than trained.

With regard to the Project's success from 1978 to 1984 in providing MITEC services to beneficiaries, counterparts rated advisory visits and test & inspection services lower than other services (3.0 and 2.6, respectively), although Japanese experts rated all services highly (average 4.1).

Counterparts and Japanese experts highly rated the success of technological transfer to counterparts from 1978 to 1984 (4.4 and 3.5, respectively).

All counterparts and one Japanese expert responded that the Project Output (i.e. services and technology transfer) justified the Input by the Japanese and Malaysian governments during the period from 1978 to 1984.

3) Effectiveness

The level of technological improvement of local SMIs in Malaysia in 1984 due to the Project was basically assessed positively (4.0), while the Project contribution toward improvement today was rated slightly lower (3.6) by counterparts. Japanese experts gave the former an average rating (3.5).

Counterparts evaluated MIDEC/AMTC support toward the technological requirements of local SMIs in Malaysia highly (4.4), while Japanese experts gave it a lower rating (3.0).

Beneficiary rated SIRIM's services as useful to their technological improvement (average:4.0).

4) Impact

All counterparts responded that the Project had contributed to the growth and technological improvement of local SMIs in Malaysia since 1984, and that it had been important for them (3.8 and 3.8, respectively). Beneficiary also responded with a high rating (4.0) that SIRIM had contributed to their growth and that it had played an important role for them. However,

beneficiary felt there had been no increase in product quality following the use of SIRIM services.

All counterparts and Japanese experts responded that there had been no negative impacts although there were some unexpected outcomes. For example, one counterpart commented that senior staff had left to join a private company.

5) Relevance

All counterparts responded that the Project's purpose and development goal (i.e. technological improvement and growth of local SMIs in Malaysia) were still valid, and that services to beneficiaries were relevant to the current needs of local SMIs in Malaysia.

Two of the counterparts (40%) responded that changes in the development of local SMIs in Malaysia had been major enough to warrant a change in the Project design, for instance a change from simple-die to progressive-die, etc.

SIRIM's adaptation to the changes was recognized by all counterparts, and its level was rated as above average (3.5). Some counterparts felt it was important to obtain better equipment and the advice of Japanese experts in order to improve SIRIM's technological capability so they would have technology which was more advanced than the SMIs.

Beneficiary responded that SIRIM services in die-making were still relevant to the current technical needs of the company, but that it had become increasingly necessary to upgrade technology in electroplating and that SIRIM had not adapted to this change.

6) Sustainability

Counterparts evaluated the performance of MIDEC/AMTC in meeting the technological needs of local SMIs in Malaysia as above average (3.8). However, some commented that they have often faced technical problems from SMIs which cannot be solved. The beneficiary assessed it as average (3.0).

With regard to MIDEC/AMTC resources, counterparts rated them highly for the most part (3.3 - 3.7), but some commented that more space for activities and training staff (e.g. training in CIAST) was required.

(5) General

The following section is based on information from interviews with 7 officials (4 from SIRIM and 3 from other organizations), and 1 professional.

Please note that all statements are made from the interviewee's point of view.

1) Officials

4.9 It is recognised that outputs of the MITEC Project are behind industry needs (Was it poor project design or industry developing too fast?). And this Projectis not doing any future research, only in solving today's day to day problems. That would be changed. A new Advanced Materials Centre bringing together Plastics, Ceramics and Metals under one roof is going to be implemented soon.

4.10 MITEC was already outdated by 1990, and SIRIM has already moved to other areas, such as AMTC, an advanced foundry, other more advanced areas are being planned, eg powder metallurgy, ceramics composites, carbon fibres, etc.

Malaysia (pp 4-2)

MITEC is in the midst of a transition period. The project was doing well during its implementation period. However, the following facts caused the decline in MITEC's contributions toward technological development.

A. Technology advancement was not completely achieved at MITEC due to insufficient resources such as a lack of new equipment

B. Small and medium-sized industries have been surpassing MITEC in terms of technological improvement since 1990

SIRIM has therefore decided to conduct major changes, ramifying the MITEC organization into several function-based institutions (AMTC, MIDEC and Design Center, etc.) in order to improve technological support system and organizational improvements.

2) Professionals

4.31 It would appear that MITEC did not have a strategy to serve industry, much less SMIs. From an industry viewpoint, there is still a very low usage of MIDEC's services and resources -- that is low impact on SMI development. As such, MIDEC's resources are very much underutilised.

4.32 MITEC's original purpose is also not clearly stated -- was it meant to serve industry (what types, SMIs?) or to carry out research?

4.33 Perhaps it was not taken into account, but today's external environment (with regards to SMIs) change very fast. And if SIRIM wishes to serve industry, there is a lot of catching up. to do.

Malaysia (pp 4-5)

The problems with MITEC can be pointed out as follows:

A. SIRIM's imperfect understanding of the actual needs of the industry

B. SIRIM's insufficient Public Relations activities

C. SIRIM's poorly defined strategy to support industrial development

D. MITEC/MIDEC's ambiguous organizational objectives -- either to support small and medium-sized industries or to encourage technological advancement

The afore-mentioned may have prevented SIRIM from making the best possible use of MITEC/MIDEC.

2.2.3 Metrology Project Results

i. Metrology: Efficiency of Project Inputs

3.25 Counterparts for the Metrology Project did not give as high rating to project inputs as the Counterparts for the MITEC Project. Although almost three-quarters rated Japanese inputs on equipment as enough, only 47% rate training in Japan as enough. The rating on the Malaysian side was similar. Only slightly more than a quarter of Counterparts said that staffing was adequate. And about 50% said that facilities were enough. It would appear that Counterparts had a higher expectation of project inputs by both sides (Table 3B-1).

3.26 Their principal comment was that Japanese inputs were insufficient especially the number of trainings in Japan. Japanese consultants should have spent longer. However, the standards that were established were above average.

3.27 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).

3.28 In terms of standards achieved, Counterparts rated electricity highest (mean score of 4 out of 5), while volume was lowest (3.44). As for calibration and measurement services, mass and electricity were among highest (4.14), while length, volume and temperature were rated lower (3.75). Table 3B-2 has the details.

3.29 All Counterparts said that the project had succeeded in attaining its objectives. This opinion was shared also by the Malaysian Officials interviewed in SIRIM.

ii. Metrology: Effectiveness of Implementation

3.30 The Metrology Project has contributed significantly to Malaysia's metrology requirements in 1986. However, by 1992, the metrology requirements of industry were being exceeded by standards achieved by the Project. This does have some implications on sustainability as the importance of external environment on the project is evident here also.

3.31 Accuracy levels have improved significantly for most parameters. In parameters such as mass, pressure, electrical voltage, resistance, time and acoustic, there have been quite good achievements. However, in others such as length, temperature, electrical current, inductance and capacitance, there has been no change between the end of the Project period, and today (see Table 2B-9).

3.32 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 (Table 3B-3).

3.33 On the measurement standards, only about 30% of Counterparts and Professionals said that the Project had been effective in contributing to Malaysia's metrology requirements (Table 3B-4). However, the views of beneficiaries and Counterparts were quite different. In general, professionals rated the effectiveness of the Project higher than Counterparts.

3.34 For instance in mass, all Counterparts were of the opinion that the Project did not contribute to metrology needs whereas 66% of Professionals felt that the Project had. In length, all the professionals answered affirmatively, whereas less than half of Counterparts agreed with this statement. Similarly, in the case of temperature, only 25% of Counterparts agreed that Project had contributed to the metrology needs whereas two-thirds of professionals said the same (Table 3B-4). Hence, it is entirely possible that the sample size of metrology professionals is too small, and not all of them answered all specific questions.

3.35 Additionally, beneficiaries have say that in more than 60% of cases that SIRIM's standards meet beneficiaries' needs. In volume, only 28% of respondents say that SIRIM's standards meet their needs (Table 3B-5).

3.36 SIRIM's contribution to Malaysia's metrology requirements was also tabulated from the questionnaire surveys and interviews. In general Professionals rated below average the upgrading of skills in SIRIM, performance of metrology unit. The principal problem areas appear to be for mass and temperature standards where rating (on a scale of 1-5) was quite low, ie mass and temperature (Table 3B-7).

3.37 On their rating of SIRIM's activities, Professionals were of the view that SIRIM is average only on establishment and maintenance of standards and traceability, but below average in areas such as monitoring local metrology labs, dissemination of new measurement techniques, consultancy services and providing training (Table 3B-8). Even calibration and measurement services were rated slightly below average.

iii. Metrology: Impact on Industry and Malaysia

3.38 Professionals and Counterparts have somewhat different opinions on the importance of SIRIM in upgrading metrology skills in Malaysia. Overall, Professionals rated SIRIM's contribution as below average (2.66 mean score), whereas Counterparts gave a mean rating of 3.75 (Table 3B-9). Beneficiaries were in-between and gave a rating of 3.31 (Table 3B-11).

3.39 On the question of contribution to the industrialisation process, there is again a variation of opinions. The Counterparts' opinions tend to rate SIRIM/Project's contribution much higher (4.11) than compared to Professionals (3.4) and Beneficiaries (3.32). In fact, both Professionals and Beneficiaries have fairly similar ratings for this topic (Tables 2B-10 and 2B-11).

3.40 Areas where the impact of metrology have made some differences is in making products more competitively domestically and overseas, and increasing product quality (Table 3B-11). And more than two-thirds of Counterparts and Professionals stated that there has been an increase in international inter-comparison standards (Table 3B-10).

3.41 In the area of industry spending on calibration equipment, it was estimated based on the small sample size that SIRIM captured only about 36% of the calibration and measurement market (Table 3B-12). It should be emphasized that with only 17 beneficiaries, this is most certainly not a representative sample.

3.42 It is heartening to note that the Controller himself is aware of such a situation when he stated in an interview that SIRIM's metrology is behind that of industry (Dr Ahmad Tajuddin, per comm, October 16, 1992). He acknowledged that SIRIM cannot possibly provide all the metrology services required by industry because of limited resources. However, he sees a need to upgrade SIRIM's metrology facilities and services to serve industry better.

iv. Metrology: Relevance of Project

3.43 All parties interviewed agreed overwhelmingly that the goal and purpose of the Metrology Project is still valid (Table 3B-14).

3.44 However, a majority of both Professionals and Counterparts feel that there should be a change to the Project design. Counterparts feel that SIRIM has made adaptations to meet the changes, but those changes are only slightly above average (mean score of 3.4; Table 3B-14).

3.45 An average of about 20% of beneficiaries use other labs in Malaysia besides SIRIM. And about 8-16% use foreign labs outside of Malaysia for their calibration and measurement services (Table 3B-15).

3.46 In assessing the service proficiency and performance of various metrology labs, SIRIM received a score of 3.72 compared to 4.2 for SISIR and 4.0 for SEEL by beneficiaries. The difference in rating was much higher for Professionals. They gave SIRIM an average score of 2.6 against an average of about 4 for other foreign labs (Table 3B-13).

3.47 Beneficiaries reported that sending their equipments for metrology services cost more compared to if they were to send it to SIRIM. For instance, for comparable equipment, it would cost about 40% more to send it to Singapore than it would to SIRIM. It would be 100% more if equipments were to be sent to the US, and 200% more if they were to be sent to UK, an average of 400% if they were to be sent to Japan. However, these are based on very small samples, eg 1 case each for the US and UK, and three (3) cases each for Japan and Singapore.

v. Metrology: Sustainability since Project completion

3.48 All Malaysian and especially SIRIM Officials are very aware of the immediate and strategic importance of metrology. In all interviews conducted for this study, Officials stressed the importance of metrology to industrialisation. And as can be seen from Tables 3B-10 and 3B-11, beneficiaries and professionals also emphasize that importance.

3.49 Counterparts opined that SIRIM provides quality service in both the maintenance of standards and provision of calibration services. Howeverr they generally feel that not enough resources have been allocated to their Unit in all areas mentioned, ie equipments, human resources and facilities (Table 3B-17).

Malaysia (pp 3-4~8)

(1) Mass

The following results are based on data and comments from questionnaires responded to by 3 counterparts assigned to Mass, 1 Japanese Mass expert and 7 beneficiaries who are currently using Mass in SIRIM.

1) General

All counterparts and the Japanese expert assessed the National Metrology Laboratory Project as a success in meeting the needs of metrication and requirements of metrology in Malaysia in 1986.

2) Efficiency

With regard to the Project Input from Japan during the period from 1981 to 1986, 66.7% of counterparts felt technology transfer was insufficient (several attributed it to a language barrier).

With regard to Malaysian Input up until 1986, all counterparts pointed out that human resources were insufficient. In addition to these assessments, the Japanese expert found Malaysian facilities and funding (particularly for operations) to be insufficient.

The Project's success in establishing measurement standards in SIRIM in 1986 was rated 4.3 by counterparts and 5.0 by the Japanese expert.

The Project's success in establishing calibration/ verification services in SIRIM in 1986 was rated similarly.

3) Effectiveness

Counterparts rated the impact of the Metrology Project on meeting Malaysian metrology requirements in 1986 as a 4.0, while the Japanese expert rated it a 5.0. The contribution to the metrication programme in 1986 was rated similarly.

The Metrology Project's success in meeting Malaysian metrology requirements today was rated a 4.3 by counterparts and the Japanese expert.

All counterparts who responded to the questionnaire felt the measurement standards provided by the Metrology Project did not meet the needs of metrology in Malaysia in 1992.

All counterparts agreed that there had been improvement in measurement and calibration accuracy since 1986.

66.7% of the counterparts felt the calibration/verification services met the needs of metrology and industrialization in Malaysia today. Some of the counterparts noted that the services provided by SIRIM cover 70% of their needs.

Most beneficiaries responded that SIRIM's calibration and measurement services were useful to their company, although several poorly rated these services (average 3.7).

85.7% of the beneficiaries responded there needed to be an improvement in turn-around time, and 42.9% felt information on calibration and service proficiency needed to be more user friendly and accurate and provided in a timely manner.

4) Impact

All counterparts responded that the Metrology Project had contributed to the industrialization process since 1986, and rated its importance as above average (4.0), as did the beneficiaries (3.5).

All counterparts and the Japanese expert responded that the Metrology Project had had some impact on the development of private metrology laboratories in Malaysia.

Counterparts rated the impact of the Metrology Project on upgrading metrology skills in Malaysia as average (3.0) while the Japanese expert rated it above average (4.0).

Beneficiaries rated the impact of the Metrology Unit/ Measurement Center activities on upgrading metrology technology in Malaysia as average (3.6).

83.3% of the beneficiaries felt the Metrology Unit/ Measurement Center activities had improved the metrology technology within their companies and rated it above average (3.6).

All counterparts and the Japanese expert responded that the Metrology Project had resulted in an increased international inter-comparison of standards maintained by SIRIM.

In addition, several of the counterparts noted that there had been some unexpected outcomes, such a increased appreciation of the role of measurement and metrology.

33.3% of the beneficiaries said production costs had increased by using calibration and measurement services, and all of them felt product quality had also increased.

85.7% of the beneficiaries responded that products had become increasingly more competitive compared with other domestic companies, while 60.0% of the beneficiaries said products were becoming more competitive with foreign countries due to the use of calibrated measurement equipment in production.

All beneficiaries responded that the measurement standards provided in the Metrology Project met the companies' metrology needs.

5) Relevance

All counterparts felt the purpose and goal of the Metrology Project were still valid.

All counterparts felt the Output (measurement standards and calibration/verification services, etc) of the Metrology Project were not sufficient to meet the needs of meteorology in Malaysia today. Some counterparts noted reasons such as lack of high accuracy/technology and lack of technical know-how.

All counterparts said changes in Malaysia's industrialization process were significant enough to warrant a change in the Metrology Project design, such as more advanced equipment. The Metrology Unit/Measurement Center adapted to these changes by purchasing advanced equipment, and more flexible calibration services in fees (e.g. contract services), etc.

16.6% of the beneficiaries said the company's current needs for SIRIM's Metrology Unit/Measurement Center services are different from what they were 5 years ago.

42.9% of the beneficiaries responded that they utilize the calibration/measurement/consultation services of other organizations or labs in Malaysia. 28.6% of them were utilizing organizations overseas. They were primarily using other organizations for services not provided by SIRIM.

6) Sustainability

Counterparts rated the Metrology Center's performance in meeting the current needs of Malaysia's Metrology System as above average (4.0) and rated the contribution to disseminating metrication technology in Malaysia today as positive (4.3).

Counterparts rated the ability of the metrology standards maintained by the Metrology Unit/Measurement Center in meeting the needs of industry today as a 4.0, and the services as also a 4.0.

Counterparts rated resources for the Metrology Unit/Measurement Center's activities as follows -- equipment, 3.3, funding, 3.0-4.0, human resources, 2.0, and facilities, 2.3.

(2) Length

The following results are based on information from questionnaires responded to by 3 counterparts assigned to Length and 11 beneficiaries who are currently using Length in SIRIM.

1) General

All counterparts assessed the National Metrology Laboratory Project as having been a success in meeting the needs of metrication and requirements of metrology in Malaysia in 1986.

2) Efficiency

With regard to the Project Input from Japan during the period from 1981 to 1986, some counterparts felt training in Japan was insufficient and the consultancy period was too short. Additionally, some counterparts mentioned that a language barrier exists between counterparts and Japanese experts.

With regard to Malaysian Input, some of counterparts felt human resources were insufficient and space was too limited.

Counterparts rated the Project's success in establishing SIRIM's measurement standards in 1986 as a 3.0. They rated the establishment of calibration/verification services as average (3.3).

3) Effectiveness

The success of the Metrology Project in attaining Malaysia's metrology requirements in 1986 and the contribution of the metrication programme were rated the same 4.3 by counterparts.

Counterparts also highly rated (4.0) the impact of the Metrology Project in extending Malaysia's metrology requirements.

33.3% of the counterparts felt the measurement standards set by the Metrology Project met the needs of metrology in Malaysia in 1992.

All counterparts agreed that there had been an improvement in the measurement/calibration accuracy since 1986. They also agreed that the calibration/verification services provided by the Metrology Project met the needs of metrology and Industrialization in Malaysia today.

Most beneficiaries felt SIRIM's calibration/measurement services were useful to their company, although some rated the services poorly. (average 3.9)

With regard to calibration/measurement services, 81.8% of the beneficiaries felt there was a need to improve turn-around time, and 36.4% of them responded that information needed to be more adequate and timely, and that more user information on calibration and service proficiency were needed.

4) Impact

All counterparts responded that the Metrology Project had contributed to the industrialization process since 1986, and

gave an above average rating of 3.3 to the importance of the contribution. The beneficiaries also rated it above average at 3.5.

66.7% of counterparts responded that the Metrology Project has had an impact on the development of private metrology laboratories in Malaysia.

With regard to the importance of the impact of the Metrology Project on upgrading metrology skills in Malaysia, counterparts rated it above average at 3.7.

Beneficiaries rated the importance of the impact of the Metrology Unit/Measurement Center activities on upgrading metrology technology/skills in Malaysia average (3.1).

80% of the beneficiaries responded that the Metrology Unit/Measurement Center activities are having an impact on upgrading metrology technology/skills within their companies, and rated its importance as above average (3.9).

All counterparts responded that the Metrology Project had resulted in increased international inter-comparison of standards maintained by SIRIM.

In addition, several of the counterparts noted that there were some unexpected outcomes such as an increased awareness of accuracy.

63.6% of the beneficiaries said production costs had increased as a result of using the calibration/measurement services while 70% of them said product quality had increased.

77.8% of the beneficiaries said their products had become more competitive compared to domestic companies, while 75% also responded that their products had become more competitive compared foreign companies due to the use of calibrated measurement equipment during production.

All beneficiaries agreed that the measurement standards provided by the Metrology Unit/Measurement Center met their metrology needs.

5) Relevance

All counterparts responded that the purpose and goal of the Metrology Project continues to be relevant.

66.7% of counterparts said the Output (i.e. measurement standards and calibration/verification services, etc) of the Metrology Project were insufficient to meet the current needs of metrology in Malaysia.

66.7% of counterparts responded that the major changes in Malaysia's industrialization process warranted a change in the Metrology Project design, such as the implementation of more advanced equipment. However, they noted that the Metrology Unit/Measurement Center had adapted to these changes by using more advanced (faster and more scannable) equipment such as lasers.

Only 12.5% of the beneficiaries responded that their current needs for SIRIM's Metrology Unit/Measurement Center services are different from 5 years ago.

54.5% of the beneficiaries utilize the calibration, measurement and consultation services of other organizations or labs in Malaysia, while 36.4% of them utilize organizations overseas.

The reasons cited by beneficiaries who utilize organizations other than SIRIM were that they have faster turn-

around time.

50.0% of the beneficiaries requested that SIRIM provide calibration services which they currently do not offer.

6) Sustainability

Counterparts assessed the performance of the Metrology Unit/Measurement Center in meeting the current needs of Malaysia's metrology system as below average (2.7). They rated the contribution in the diffusion of metrication in Malaysia today as above average (4.0).

Counterparts rated the metrology standards maintained by the Metrology Unit/Measurement Center in meeting the needs of today's industry a 3.3. They rated services a 3.7.

With regard to resources for the Metrology Unit/Measurement Center's activities, counterparts rated equipment and funding as average to above average (3.0 - 3.5). However, they rated the condition of equipment, facilities and human resources as poor.

(3) Volume

The following results are based on information from questionnaires responded to by 7 counterparts assigned to Volume, 2 Japanese experts at Volume and 5 beneficiaries who are currently using Volume in SIRIM.

1) General

All counterparts and Japanese experts assessed the National Metrology Laboratory Project as a success in meeting the needs of metrication and the requirements of metrology in Malaysia in 1986.

2) Efficiency

With regard to the Project Input from Japan during the period from 1981 to 1986, 57.1% of the counterparts responded that training in Japan (training primarily offered to officers only) and technology transfer were insufficient. In addition, Japanese experts responded that the equipment from Japan was difficult to operate in Malaysia where voltage is 220 and where there are no suppliers for equipment parts.

With regard to Malaysian Input until 1986, all counterparts pointed out that there is a deficiency of human resources. 57.1% of the counterparts responded that facilities were inadequate, and 40.0% of them said funding was insufficient. In addition to these assessments, Japanese experts pointed out that human resources and funding were both inadequate at this time.

The Project's success in establishing measurement standards within SIRIM in 1986 was rated slightly above average (3.3) by counterparts and 3.5 by Japanese experts.

The Project's success in establishing calibration/verification services was rated 3.7 by counterparts and 3.5 by Japanese experts.

Counterparts rated the Project's success in 1986 in establishing training services as poor (2.3).

3) Effectiveness

Counterparts rated the Metrology Project's contribution toward attaining Malaysia's metrology requirements in 1986 as a 3.3 while Japanese experts rated it a 3.5. counterparts rated the contribution to the metrication programme in 1986 a 3.9 while Japanese experts rated it a 3.4.

The expansion of Malaysia's metrology requirements today due to the impact of the Metrology Project was rated 3.4 by counterparts.

42.9% of the counterparts responded that the measurement standards provided in the Metrology Project did not meet the needs of metrology in Malaysia in 1992.

All counterparts agreed that there has been an improvement in the measurement/calibration accuracy since 1986.

71.4% of the counterparts felt calibration/verification services offered by the Metrology Project meet the needs of metrology while 66.7% of them felt they meet the needs of industrialization in Malaysia today.

With regard to usefulness of SIRIM's calibration/measurement services, some of the beneficiaries rated them poorly while others rated them as above average (average 3.3).

With regard to calibration/measurement services, 60.0% of the beneficiaries noted that turn around time needed to be improved, while 40.0% specifically mentioned the need to improve accuracy and timeliness of information. 60.0% felt user information on calibration was inadequate and 40.0% felt there was a need to increase service proficiency.

4) Impact

All counterparts responded that the Metrology Project had contributed to the industrialization process since 1986, and rated its importance as above average (3.7), while beneficiaries rated it between 1.0 and 5.0 (average 3.6).

Most counterparts responded that the Metrology Project has had some impact on the development of private metrology laboratories in Malaysia.

Counterparts rated the importance of the impact of the Metrology Project on upgrading metrology skills in Malaysia as above average (3.8) as did Japanese experts (3.5), while beneficiaries rated it as slightly below average (2.8) with responses ranging from 1.0 to 4.0.

83.3% of the counterparts and both of the Japanese experts felt the Metrology Project had resulted in an increase in international inter-comparison of standards maintained by SIRIM.

60.0% of the beneficiaries felt the Metrology Unit/Measurement Center activities had had an impact on upgrading metrology technology/skills of their companies, and rated its importance as above average (3.3).

25.0% of the beneficiaries noted that production costs had increased as a result of using calibration/measurement services, while 75.0% of them felt product quality had increased.

60.0% of the beneficiaries responded that their products had become more competitive compared with other domestic companies, while 25.0% of beneficiaries said their products had become more competitive compared with foreign companies since using the calibrated measurement equipment during production.

All beneficiaries agreed that measurement standards provided by the Metrology Unit/Measurement Center met the companies' metrological needs.

5) Relevance

All counterparts and several of the Japanese experts responded that the purpose and goal of the Metrology Project continued to be valid today.

71.4% of the counterparts felt the Output (i.e. measurement standards and calibration/verification services, etc) of the Metrology Project were insufficient to meet the current needs of metrology in Malaysia. Some counterparts cited reasons such as lack of equipment.

50.0% of the counterparts responded that the changes in Malaysia's industrialization process were major enough to warrant a change in the Metrology Project design since rapid

industrialization requires facilities other than basic standards. However, several of the counterparts noted that SIRIM is still utilizing out-dated equipment (which lacks high technology), despite the fact that partially automated calibration services had already been initiated.

20.0% of the beneficiaries noted that their company's current needs for SIRIM's Metrology Unit/Measurement Center services are different from 5 years ago.

60.0% of the beneficiaries utilize the calibration, measurement and consultation services of other organizations or labs in Malaysia while 20.0% use organizations overseas.

The beneficiaries who use organizations other than SIRIM noted that they did so because they need services not offered by SIRIM.

6) Sustainability

Counterparts rated the performance of the Metrology Unit/ Measurement Center in meeting the current needs of Malaysia's metrology system as average (3.1). The same group rated the contribution in diffusion of metrication in Malaysia today as above average (4.1).

Counterparts rated the level of metrology standards maintained by the Metrology Unit/ Measurement Center in meeting the needs of industry today as 3.0 and while they rated services 3.2.

Counterparts rated the resources for the Metrology Unit/ Measurement Center's activities as follows -- equipment was slightly below average (2.7), funding was rated from 2.7 to 3.7, human resources was rated 2.0 while facilities were rated slightly below average (2.6).

(4) Electricity

The following results are based on information from questionnaires responded to by 5 counterparts assigned to Electricity, 1 Japanese expert at Electricity, and 7 beneficiaries who are currently using Electricity in SIRIM.

1) General

All counterparts and the Japanese expert assessed the National Metrology Laboratory Project as a success in meeting the needs of metrication and the requirements of metrology in Malaysia in 1986.

2) Efficiency

Counterparts responded that the Project Input from Japan during the period from 1981 to 1986 were sufficient, although several felt the language barrier was a problem. However, with regard to Malaysian Input, 66.7% of the counterparts felt funding was insufficient while 60.0% felt staffing and facilities were sufficient although Japanese expert felt they were insufficient.

The Project's success in establishing measurement standards in SIRIM in 1986 was rated 4.5 by counterparts and 5.0 by the Japanese expert.

The Project's success in establishing calibration/verification services within SIRIM in 1986 was rated similarly.

3) Effectiveness

The level of Malaysian metrology requirements attained in 1986 as a result of the Metrology Project was rated 4.5 by counterparts and 5.0 by the Japanese expert. The contribution to the metrication programme in 1986 was rated similarly.

Counterparts and the Japanese expert rated the success in reaching Malaysia's metrology requirements today as a result of the Metrology Project as a 4.0.

25.0% of the counterparts felt the measurement standards provided by the Metrology Project met the needs of metrology in Malaysia in 1992.

All counterparts agreed that there has been improvement in measurement/calibration accuracy since 1986.

60% of the counterparts said the calibration/verification services offered by the Metrology Project meet the needs of Metrology and Industrialization in Malaysia today. However, several of the counterparts felt the services covered 70% of the needs.

Beneficiaries gave a mixed rating to the usefulness of SIRIM's calibration/measurement services, with responses ranging from 1.0 to 5.0 with an average of 3.0.

With regard to calibration/measurement services, all beneficiaries noted the need to improve turn around time, and 57.1% felt information needs to be more accurate and timely while user information on calibration and service proficiency was felt to be inadequate.

4) Impact

All counterparts responded that the Metrology Project has contributed to the industrialization process since 1986, and highly rated its importance (4.6) although beneficiaries rated it average (2.9).

All counterpart and the Japanese expert said the Metrology Project had some impact on the development of private metrology laboratories in Malaysia.

Counterparts highly rated the importance of the impact of the Metrology Project on upgrading metrology skills in Malaysia, at 4.5, while the Japanese expert rated it very highly (5.0).

Beneficiaries rated the importance of the impact of the Metrology Unit/Measurement Center activities on upgrading metrology technology/skill in Malaysia as average 3.1.

60% of the beneficiaries felt the Metrology Unit/Measurement Center activities had had an impact on upgrading metrology technology/skills of their companies, and rated the importance of these activities a 3.8.

All counterparts and the Japanese expert responded that the Metrology Project had resulted in an increase in international inter-comparison of standards maintained by SIRIM.

42.9% of the beneficiaries said production costs had increased as a result of using calibration/measurement services while 66.7% said product quality had increased.

33.3% of the beneficiaries said their products had become more competitive compared with products from other domestic companies as well as compared with foreign countries.

All beneficiaries said the measurement standards provided in the Metrology Unit/Measurement Center meet companies' metrology needs.

In addition, several counterparts felt some of the unexpected outcome included an increased awareness of equality and metrology among the public.

5) Relevance

All counterparts and the Japanese expert responded that the purpose and goal of the Metrology Project continue to be valid.

80.0% of counterparts felt the Output (i.e. measurement standards and calibration/verification services, etc) are not sufficient to meet the current needs of metrology in Malaysia. Counterparts commented that there needs to be greater diversity, higher accuracy, faster services and technology needs to be upgraded.

All counterparts felt changes in Malaysia's industrialization process were significant enough to warrant a change in the Metrology Project design. Some of these changes include increasing the level of measurement accuracy and increasing the parameters of measurement offered (optical, micro-wave, time/frequency, etc) to meet the rapid progress within industries. All counterparts responded that the Metrology Unit/Measurement Center had adapted to these changes (rating it 4.0) by providing more advanced equipment, more staff training and increased calibration parameters, etc.

16.7% of the beneficiaries felt the company's current needs for SIRIM's Metrology Unit/Measurement Center services are

different from what they were 5 years ago.

57.1% of the beneficiaries have utilized calibration/measurement/consultation services of other organizations and/or labs in Malaysia or overseas.

33.3% of the beneficiaries requested SIRIM provide additional calibration which are currently not offered.

6) Sustainability

The performance of the Metrology Unit/Measurement Center in meeting the current needs of Malaysia's metrology system was assessed by counterparts as above average (3.8).

They rated the contribution toward disseminating metrication information in Malaysia today as positive (4.6).

Counterparts rated the level of metrology standards maintained by the Metrology Unit/Measurement Center in meeting the needs of the industry today as 3.8 while they also rated the services a 3.8.

Counterparts rated resources for the Metrology Unit/Measurement Center's activities sightly below average (2.5 to 3.0), and specifically requested equipment with higher levels of accuracy.

(5) Temperature

The following results are based on information of questionnaires responded to by 5 counterparts assigned to Temperature and 14 beneficiaries currently using Temperature of SIRIM.

1) General

All counterparts felt the National Metrology Laboratory Project had succeeded in meeting the needs of metrology and metrication in Malaysia in 1986.

2) Efficiency

With regard to the Project Input from Japan during the period from 1981 to 1986, 75.0% of the counterparts felt training in Japan was insufficient, while 60.0% of the counterparts felt technology transfer was also insufficient (due to the short time-frame, the language barrier, etc.). With regard to Input from Malaysia, all counterparts pointed out that human resources were insufficient, and 75.0% of counterparts said facilities were also insufficient.

Counterparts rated the Project's success in establishing measurement standards in SIRIM in 1986 as above average (3.5).

The Project's success in establishment calibration/ verification services was rated 3.8.

Counterparts poorly rated (2.3) the Project's success in establishing training services.

3) Effectiveness

The level of Malaysian metrology requirements attained in 1986 as a result of the Metrology Project was rated 3.5 by counterparts. Counterparts also rated the contribution to the metrication programme in 1986 a 4.3.

The level of Malaysia's metrology requirements achieved today as a result of the Output of the Metrology Project was rated 4.0 by counterparts.

Half (50.0%) of the counterparts who responded to the questionnaire felt the measurement standards set by the Metrology Project did not meet the needs of metrology in Malaysia in 1992.

75.0% of the counterpart agreed that there has been improvement in measurement/calibration accuracy since 1986.

60.0% of the counterparts responded that the calibration/ verification services established by the Metrology Project meet the needs of metrology and industrialization in Malaysia today.

Beneficiaries gave a mixed rating (average 3.5) to the usefulness of SIRIM's calibration/measurement services.

Most beneficiaries (92.9%) felt the turn around time for calibration/measurement services needed to be improved, while 50.0% of them felt the accuracy and timeliness of provision of information, and adequacy of user information for calibration needed to be improved, while 42.9% felt service proficiency needed improvement.

4) Impact

All counterparts responded that the Metrology Project had contributed to the industrialization process since 1986, and highly rated its importance (4.4), while beneficiaries rated it above average (3.4).

Most of the counterparts felt the Metrology Project had had some impact on the development of private metrology laboratories in Malaysia.

Counterparts gave an above average rating (4.0) to the importance of the Metrology Project on upgrading metrology skills in Malaysia.

80.0% of the counterparts responded that the Metrology Project had resulted in an increase in international inter-comparison of standards maintained by SIRIM.

Beneficiaries rated the importance of the Metrology Unit/Measurement Center activities on upgrading metrology technology/skill in Malaysia as average (3.1).

76.9% of beneficiaries said the Metrology Unit/Measurement Center activities had influenced companies by upgrading their metrology technology/skill and rated its importance as above average (3.6).

57.1% of the beneficiaries responded that their production costs had increased as a result of using the calibration/measurement services while 76.9% agreed that product quality had increased.

66.7% of the beneficiaries felt their products had become more competitive compared to other domestic companies as well as foreign companies through use of calibrated measurement equipment in production.

92.3% of the beneficiaries said measurement standards provided in the Metrology Unit/Measurement Center meet companies' metrology needs.

In addition, most of the counterparts said there had been some unexpected outcomes such as a significantly increased awareness of the importance of measurement among industries.

5) Relevance

80.0% of counterparts responded that the purpose and goal of the Metrology Project were still valid today.

All counterparts felt the output (i.e. measurement standards and calibration/verification services, etc.) of the Metrology Project were not sufficient to meet the current needs of metrology in Malaysia. The one of reason stated was the lack of highly accuracy equipment.

All counterparts felt changes in Malaysia's industrialization process were significant enough to warrant a change in the Metrology Project design. This included requests for better equipment. (The Metrology Unit/Measurement Center adapted to these changes by purchasing new equipment with higher levels of accuracy, etc.)

25.0% of the beneficiaries responded that company's needs for SIRIM's Metrology Unit/Measurement Center have changed from 5 years ago.

42.9% of the beneficiaries use the calibration/measurement/consultation services of other organizations and/or labs in Malaysia, while 30.8% of them use organizations overseas. The

most often cited reason for using organizations other than SIRIM was the need for services not offered by SIRIM.

6) Sustainability

Counterparts rated the Metrology Unit/Measurement Center's performance in meeting the current needs of Malaysia's metrology system as above average (3.4). They also rated the contribution to diffusion of metrication in Malaysia today as above average (4.2).

Counterparts rated the metrology standards maintained by the Metrology Unit/Measurement Center in meeting the needs of industry today as a 3.0 and rated services 3.8.

With regard to resources for the Metrology Unit/Measurement Center's activities, counterparts rated equipment, 2.5, funding, 2.7 to 3.0, human resources as 2.8 and facilities, 2.5.

In addition to the above, some of the counterparts noted that they needed more transfer of technology and increased technical training in order to provide better activities and services.

(6) General

The following section is based on information from interviews with 7 officials (4 from SIRIM and 3 from other organizations), and 2 Japanese experts.

Please note that all statements are made from the interviewee's point of view.

1) Officials

4.11 A continuous upgrading and improvement programme is needed for metrology -- not enough has been invested, especially in the area of maintaining primary standards. Technical assistance and support would be welcomed.

4.12 During the Project, the metrology standards were able to serve industry, but currently have fallen behind their needs.

4.13 So, already a system of lab accreditation has been put in place such that metrology needs can be better served -- but these cater to lower level calibration requirements.

4.14 Areas needed are: more parameter standards to be maintained, and more accuracy. For this, more equipment, technology, techniques, and manpower are needed.

Malaysia (pp 4-2~3)

Following a successful implementation period, this project is no longer able to meet the actual needs of the industry in terms of the:

A. Number and variety of parameters
B. Degree of accuracy of measurement
C. Number of calibration/verification services rendered

Therefore, the following measures will be required to better meet the industry's needs:

a. Personnel reinforcement
b. Expand office space
c. Improve quality of services
d. Improve level of technology and skills

Under one of the rationalization programs, SIRIM has delegated the calibration services requiring low precision to designated private sector companies in an effort to solve the problem "C)" noted above.

SIRIM must improvement the quality and quantity of calibration/verification services it offers in order to be able to render services to Malaysian industries as well as multinational corporations.

2) Professionals

4.34 There is no doubt that quality is a very important area for the current industrialisation process..However, some changes need to be made to the current services in SIRIM.

4.35 First, more standards need to be maintained. Second, better and more accuracy of existing standards. Needless to say, continual upgrading and improvements are necessary. And this is one area where SIRIM could make a key difference to industrialisation. And SIRIM should be a standard bearer of calibrations and measurements for Malaysia. Third, there is a need to maintain better documentary support of standards, especially in SIRIM's library.

Malaysia (pp 4-5)

3) Japanese experts

The lack of highly accurate measuring devices has resulted in limited architectural techniques and experience appropriate for the surrounding environs.

Any type of project would have been helpful during the designing of the office block (e.g. carrying equipment used for high accuracy measurement).

Due to increasingly more advanced and specialized needs (e.g. increased number of parameters, improved accuracy of measurement, etc.), some types of equipment required are impossible to procure in Malaysia. Japan is therefore expected to continue its support in maintaining and improving measurement standards.

2.2.4 Fine Ceramics Project Results

3.50 Since the Fine Ceramics (hereafter FC) Project is a research project, there are no beneficiaries as such. Hence, the only two types of respondents are Counterparts and Professionals. Counterparts and Professionals gave high ratings for the success of the FC Project (Table 3C-1).

i. Fine Ceramics: Efficiency of Project Inputs

3.51 In terms of adequacy of project inputs, Counterparts felt that overall sufficient inputs have been provided. However, on the Japanese side, more could have been provided in Japanese experts. Altogether 5 long term and 22 short term experts from Japan participated in this Project. On the Malaysian side, the main complaint was that not enough staff were assigned to the Project (Table 3C-2). Altogether 16 technical Counterparts were assigned to this Project (see Table 2C-3).

3.52 The value of Japanese inputs were estimated at about $7.57 million whereas the expenditures by the Malaysian government was estimated at $242,000. This does not include the salaries of staff which were assigned to the FC Project (see Tables 2C-4, 2C-6).

3.53 As for achievements in the research areas, the FC Project received very high ratings. Oxides received a rating of 4.00 (out of 5), non-oxides, 3.5 and 4.25 for glass ceramics. High ratings were especially received for areas such as measurement and use of experimental instruments (Table 3C-3).

ii. Fine Ceramics: Effectiveness of Implementation

3.54 Achievements of the FC Project could be expressed in a number of ways, such as those indicated in the Log Frame (see Chapter 2). As these have already been discussed, it is not necessary to say anything more, except to note that the large majority of activity lists have been complied with.

3.55 Another way to examining the effectiveness was to gauge opinions of the Counterparts and Professionals. In multilateral activities, Counterparts gave an above average rating, while Professionals gave generally an average rating (Table 3C-4).

3.56 In developing researchers in FC, Counterparts also gave higher ratings compared to Professionals. Counterparts gave a 3.86 compared to about 2.5 for Professionals (Table 3C-5).

3.57 Hence, it would appear that generally Professionals gave a less favourable rating compared to SIRIM Counterparts.

iii. Fine Ceramics: Impact of Project

3.58 What has been the impact of this Project? Both Counterparts and Professionals agree that it has contributed towards developing researchers in FC (Table 3C-6).

3.59 As for the contribution to diffusion of FC research technology in Malaysia, Counterparts rated the Project's impact much higher than were given by Beneficiary and Professionals (Table 3C-13).

iv. Fine Ceramics: Relevance to Malaysia

3.60 More than 80% of all Counterparts feel that the goal and purpose of the FC Project is still valid (Table 3C-7).

3.61 Professionals see a 40:60 distribution between the research that should be invested between conventional and advanced ceramics. And that the FC Project is really a long term strategic project rather than one which would yield immediate or even medium term results (Tables 2C-8, 2C-9).

3.62 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.

v. Fine Ceramics: Sustainability since Project completion

3.63 Professionals do not see the immediate relevance of advanced ceramics research in meeting Malaysian industry's needs; they gave a rating of 1 and 2 with regards to this question (Table 3C-10). Research equipments and facilities are still highly valuable as can be seen in the Professionals' rating of SIRIM's resources in advanced ceramics; ratings of 5 for equipments and R&D were received (Table 3C-11).

3.64 Counterparts also support that view with high ratings for Project funding for all categories, ie operational, development and R&D (Table 3C-12). And they also gave above average ratings for resources allocated during the Project period (Table 3C-14).

Malaysia (pp 3-8~10)

(1) Oxides

The following results are based on information from questionnaires responded to 1 counterpart assigned to Oxides and 2 Japanese experts in Oxides.

1) General

The counterpart and all Japanese experts assigned to Oxides research assessed the Project to have been successful in attaining its purpose, i.e. strengthening the technological basis for the characterization of fine ceramics in Malaysia, and Japanese experts also agreed the success in attaining its purpose for the ASEAN region.

2) Efficiency

With regard to the Project Input from Japan, the counterpart and all Japanese experts evaluated the equipment provided as sufficient, although technology transfer was rated insufficient by one Japanese expert (50%) and one counterpart. The counterpart responded that training in Japan was also insufficient

With regard to the Input from Malaysia, Japanese experts pointed out the lack of staff although the counterpart felt it was sufficient.

As for the Project's achievements during th period from 1988 to 1992 in research activities, multilateral activities (e.g. collaborative research and regional seminars/training, etc.), the counterpart rated them above average (4.0 and 4.0, respectively), although Japanese experts rated them slightly lower (3.0 and 4.0, respectively).

3) Effectiveness

The counterpart assessed the strengthening of the technological basis for the characterization of fine ceramics to be average (3.0) although Japanese experts rated it as above average (3.5).

Meanwhile, the counterpart rated the degree to which results of collaborative research with ASEAN countries was successfully shared to be above average (4.0), while Japanese experts rated it average (3.0).

4) Impact

The counterpart felt the Project had contributed to the development of fine ceramics technology research capability in SIRIM, Malaysia and other ASEAN countries, and that it had played an important role (5.0, 5.0, and 4.0, respectively).

Japanese experts also felt there had been a contribution, and rated the contribution to SIRIM 4.0 although the contribution to Malaysia and other ASEAN countries rated as average (3.0 and 3.0, respectively).

5) Relevance

The counterpart and Japanese expert responded that the Project's purpose and development goal (i.e. purpose: a. strengthening the technological basis for characterization of fine ceramics in the ASEAN region, b. sharing the results and experiences of collaborative research work among ASEAN countries, goal: a. improvement of fine ceramics technology research in Malaysia and other ASEAN countries) were still valid.

6) Sustainability

The counterpart assessed the contribution of the Project in meeting the diffusion of fine ceramics research technology in Malaysia as average (3.0).

With regard to SIRIM resources (i.e. equipment, human resources and funding, etc.), the counterpart rated them as above average (4.0, 4.0 and 4.0-5.0, respectively).

(2) Non-oxides

The following results are based on information from questionnaires responded to by 4 counterparts assigned to Non-oxides and 1 Japanese expert in Non-oxides.

1) General

All counterparts and the Japanese expert assigned in Non-oxides research assessed the Project as a success in attaining its purpose (i.e. strengthening the technological basis for the characterization of fine ceramics in Malaysia and also the ASEAN region).

2) Efficiency

With regard to the Project Input from Japan, all counterparts and the Japanese expert evaluated the equipment provided as sufficient, but technology transfer and training in Japan were assessed as insufficient by three (75%) and two (50%) of the counterparts, respectively due to several reasons (e.g. too many short rather than long-term experts).

With regard to Malaysian Input, three of the counterparts (75%) assessed human resources as being insufficient.

Counterparts rated the Project's achievement in research activities, in multilateral activities (e.g. collaborative research and regional seminars/training, etc.) during the period from 1988 to 1992, as above average (3.5 and 3.7, respectively), while the Japanese expert rated them a little lower (3.0 and 3.0, respectively).

All counterparts felt the Project Output (i.e. services and technology transfer) justified the Input by both the Japanese and Malaysian governments between during the period from 1988 to 1992, although the Japanese expert did not agree, citing a lack of human resources from both the Malaysian and Japanese side.

3) Effectiveness

Counterparts assessed the degree to which technology had been strengthened for the characterization of fine ceramics as above average (3.5) and the Japanese expert rated it average (3.0).

As for the level of success in sharing of results of collaborative research with ASEAN countries, counterparts rated it above average (4.0) while the Japanese expert rated it lowly (2.0).

4) Impact

All counterparts admitted that the Project had contributed to the development of the fine ceramics technology research capability in SIRIM, Malaysia and other ASEAN countries respectively, and that it had been important (4.3, 4.0 and 4.0, respectively) to them.

The Japanese expert also admitted that the contribution to SIRIM and rated it 4.0, but not for Malaysia and ASEAN.

5) Relevance

All counterparts admitted that the Project's purpose and development goal (i.e. Purpose: a. strengthening the technological basis for characterization of fine ceramics in the ASEAN region, b. sharing of the results and experiences of collaborative research work among ASEAN countries, Goal: a. Improvement of fine ceramics technology research in Malaysia and other ASEAN countries) were still valid.

One of the counterparts (25%) responded that there had been major changes in Malaysia's industrialization process to warrant a change in the Project design, and pointed out the increasing requirements to applied fine ceramics from Malaysian government.

6) Sustainability

Counterparts assessed the contribution of the Project in meeting the diffusion of fine ceramics research technology in Malaysia as below average (2.8).

Counterparts rated SIRIM's resources (i.e. equipment, human resources and funding) as above average (3.5, 3.0 and 4.0, respectively).

(3) Glass ceramics

The following results are based on information from questionnaires responded to by 3 counterparts assigned to Glass ceramics and 2 Japanese experts in Glass ceramics.

1) General

All counterparts and Japanese experts assigned to Glass ceramics research assessed the Project as a success in attaining its purpose (i.e. strengthening the technological basis for the characterization of fine ceramics in Malaysia and the ASEAN region).

2) Efficiency

With regard to the Project Input from Japan, all counterparts and Japanese experts evaluated the provided equipment as sufficient, although technology transfer and training in Japan were assessed insufficient by one Japanese expert (50%) due to the lack of Japanese experts and the shortage of the training period.

With regard to the Input from Malaysia, one of the counterparts (33.3%) and all the Japanese experts noted the lack of staff, and all the Japanese experts felt budget/funding from Malaysia was insufficient and that too much of it was spent on conventional ceramics.

As for the Project's achievements in research and multilateral activities (e.g. collaborative research and regional seminars/training, etc.) during the period from 1988 to 1992, counterparts rated them above average (4.3 and 4.0, respectively) although two Japanese experts gave the Project's achievements a lower rating (2.0).

3) Effectiveness

Counterparts assessed the degree to which fine ceramics technology had been strengthened to be above average (4.3) although the Japanese experts rated it lower (2.0).

As for the level of success in sharing of results of collaborative research in ASEAN, counterparts assessed it as above average (3.7) while the Japanese experts did not rate it.

4) Impact

All counterparts felt the Project had contributed to the development of fine ceramics technology research capability in SIRIM, in Malaysia and in other ASEAN countries and that it had played an important role (4.7, 4.7 and 4.3, respectively).

5) Relevance

66.7% of the counterparts and 50.0% of the Japanese experts admitted that the Project's purpose and development goal (i.e. Purpose: a. strengthening the technological basis for characterization of fine ceramics in the ASEAN region, b. sharing of the results and experiences of collaborative research work among ASEAN countries, Goal: a. improvement of

fine ceramics technology research in Malaysia and other ASEAN countries) were still valid, but some of them pointed out the requirement to applied research in fine ceramics technology.

6) Sustainability

Counterparts assessed the contribution of the Project in disseminating fine ceramics research technology in Malaysia as above average (3.7).

With regard to resources for SIRIM activities (i.e. equipment, human resources and funding), counterparts rated them above average (4.3, 3.3 and 3.7-4.0, respectively).

(4) General

The following section is based on information from interviews with 7 officials (4 from SIRIM and 3 from other organizations), 1 professional and 2 Japanese experts.

Please note that all statements are made from the interviewee's point of view.

1) Officials

4.15 There is definitely a need for a followup programme, especially in applied research.

4.16 A rare earths programme is needed to take advantage of Malaysia's vast resources in this area.

4.17 Other opportunities exist, eg in the semiconductor or automotive industries where many possible applications could be developed. These are not yet done at the moment. SIRIM is looking into possible areas of research and commercialising those results.

4.18 Currently because of the shortage of professional manpower (many are overseas in research and academic programmes), the Ceramic Technology Centre is collaborating with other divisions to make full use of its research equipments.

Malaysia (pp 4-3)

Currently the fine ceramics industry is not yet well established among all industries in Malaysia and research and studies on fine ceramics have just begun. This project, therefore, enables the industry to pursue the full potential of future developments.

Nevertheless, its great potential has already been recognized for the following reasons and further studies including the expansion of the applied areas is strongly encouraged:

A. Fine ceramics have many applications in the semiconductor and automotive industries which are the leading industries in Malaysia. Potential demand is enormous.
B. Rare-earth, indispensable materials in fine ceramics, are abundant in Malaysia.

2) Professionals

4.36 Advanced ceramics is the right direction to go into. However, it is important to bear in mind that unless commercialisation of research results take place, there is no use to industry.

4.37 Problems with this industry are:

i. Inadequate and insufficient number of experts. SIRIM can and should play a key role in galvanising research capability. In this regard, research facilities and programmes should be widened to include researchers from outside of SIRIM; ie more collaborative research is needed. More professionals need to be brought in. More people need to be trained.

ii. Potential areas in both fine and conventional ceramics not fully exploited. For instance, in the area of advanced ceramics, opportunities exist in: insulator, spark plug, parts of electrical transmission and medical equipments, gears, ceramic packages, ball joints, dentures, pipes, and many other areas.

iii. Need also to look into the economics of this industry. Of special concern is the area of lack of inputs (eg zirconium, alumina, etc).

4.38 Of course, local firms in this area are also very short-sighted. They are suspicious of government and very insular in their attitude and thinking. And of course, they wont invest in the future unless they can see profits; and with the risks involved, it is unlikely that they would be involved. So there's a real problem with local firms in this sector.

Malaysia (pp 4-5~6)

The following are to be pointed out about fine ceramics enterprises in Malaysia:

A. For the fine ceramics industry, it is difficult to procure materials locally in Malaysia. Therefore, the competitiveness of products is weakened by th need to import.
B. There is great potential for glass ceramics in the electric and electronics industries.
C. Malaysian businesses still operate with short-term objectives and rely very little on studies which could be considered a long-term investment.

Improvement in the following areas is requested:

A. Participants outside SIRIM were laid-off after the completion of projects despite their desire to continue research activities.
B. Due to the complicated procedures, SIRIM equipment continues to be underutilized.
C. Due to the limited number of trained researchers within SIRIM, it has been suggested that SIRIM cooperate with other organizations such as universities.
D. Applied studies regarding products which can be produced on a commercial basis need to be expanded. SIRIM should involve non-governmental private organizations in researching fine ceramics.

3) Japanese experts

Although counterparts in SIRIM succeeded in acquiring basic concepts and methodology of fine ceramics, their research activities still remains at a basic level. It will take a long time -- probably 20 years until the work is put to practical use -- for the work in fine ceramics to become comparable to that of other countries in meeting high technical requirements.

As Japanese experts, we believe multilateral activities benefit interaction. SIRIM, however, believes that bilateral activities are more effective and therefore intends to shift activities from a multilateral to bilateral basis.

Despite its efforts to get recruits, staffing is too limited to properly enrich research activities.